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EDITORIAL NOTES.

Workmen's Compensation—The Rules of Procedure.

THE Workmen's Compensation Act came into force on Friday, the 1st inst.; and henceforward all the greatest industries of the kingdom, including gas manufacture on all but the smallest scale, will be carried on under entirely novel conditions. The nature of these is only slightly sketched by the paper and the discussion on the subject which formed part of the transactions of the recent meeting of The Gas Institute. During the week just past, of course, all the newspapers have been instructing their readers more or less sensibly respecting the character and bearings of the new law. The most striking feature of the bulk of this newspaper criticism is the general confession of ignorance as to how the new Act will work in practice. The organs of the Opposition naturally find fault with it all round. Thus the "Daily News" has a grumble over the delay in bringing the Act into operation; and also over the exclusion of agricultural labourers, domestic servants, and workshops from its provisions. These complaints were dealt with while the Bill was passing through Parliament; and it is waste of time to argue over them now. In a leading article on the subject, "The Times" more profitably discusses what the Act does, or intends to do. It is first pointed out that the benefits of the Act of 1897 are not restricted, as in the case of the Employers' Liability Act, 1880, to persons engaged in manual labour. The novelty and gravity of the new statute are rightly held to consist in the fact that it does what never before was done under any system of law—"it makes, broadly speaking, an employer liable for all accidents, whatever their cause." Another important innovation is that the superior employer cannot get rid of his liability by sub-letting the work, when the sub-contractor is in the same line of business. It is sagely remarked that one of the objects of the framers of the Act was to do away with the occasion for the petty litigation which so greatly marred the usefulness of previous legislation. "In this respect there is likely to be disappointment." Where there is no common understanding between employers and employed, the opportunities for litigation will remain open as before. The workman's rights at common law continue; and the Employers' Liability Act is unrepealed. "There are good reasons why an injured workman should often seek in the first instance his remedy under the old Act." This is a view that the militant Trade Unions may be relied upon to favour. In cases of disablement, it is possible to get larger compensation under the Act of 1880 than under that of 1897. Under the former, a sufferer with a very clear case "may recover damages not exceeding the estimated earnings during the last three years of a person in the same grade, which might be considerably more than the maximum provided by the new Act." The plaintiff, moreover, would have the advantage of trying his luck with a sympathetic jury, instead of an arbitrator. Again, under the old Act, the compensation is handed over without restriction, whereas the Committee or the Arbitrator under the new Act might decide to invest it for the sufferer's benefit. And if he fails under the Act of 1880, a plaintiff may still ask the Judge of the Court in which he sues to assess damages under the new Act. "It is unfortunate," observes "The Times," "that the confusion which existed before the new Act is not removed, but made worse. Such, however, is the fact." Mr. Willis, in his little handbook, agrees that the state of the law is anything but clear in this regard.

Now we have to draw our readers' attention to the statutory "Rules" recently issued for carrying the Act into effect. These Rules came into existence without many people being aware of the fact. They are published by the Queen's Printers under the title of "Master and Servant—The Workmen's Compensation Rules, 1898," dated May 27, 1898, and are actually in force. It is incumbent upon every employer under the Act to procure a copy of this official publication. The Rules are much longer than the Act itself; and it is little short of a scandal that they have not been issued long before this. They are positively alarming. As "The Times" justly remarks: "In the discussion of the measure in Parliament, there were many airy references to the untechnical, free-and-easy manner in which all questions would be disposed of. The new Rules do not encourage one to think that

"those hopes will prove true. They describe a system so intricate that legal assistance will be almost always necessary." Of course, the Rules are only to prescribe the procedure in disputed cases. Still it is cheerfully predicted that "employers must be prepared to endure a good deal of profitless worry for some months after the Act takes effect." The prospect is not one of peace, where there is not good-will among men and masters.

The Thanet Gas Company's Act.

THE Thanet Gas Bill was mentioned in this column on May 24, on the occasion of its rejection by the House of Lords Committee. It was then stated that there was a chance of the Bill being recommitted, which was, as a matter of fact, done in due course; and on Friday of last week the Bill, as reconsidered and amended, was one of a batch to receive the Royal Assent. Pressure of other matter has prevented our noticing these later fortunes of the parliamentary aspirations of the Thanet Gas Company; but it is desirable, now that an Act has been secured—though not the one the promoters of the Bill originally hoped to obtain—to place on record the manner in which Parliament has dealt with the needs and desires of the Margate undertaking. The Bill as deposited contained a number of distinct proposals, the general nature of which was described in the issue of the "JOURNAL" for the 18th of January. The opposition of the Corporation of Margate was concentrated upon the projected compulsory acquisition of land for erecting new gas-works in a situation adjoining their water-works; and the Committee gave ear to this complaint. The promoters, however, were prepared to make some sacrifices to save the financial part of their Bill; and, failing to obtain from the Committee any indication of what should be dropped, they entered into negotiations with their opponents which had the happiest result. The Corporation were brought to agree to the Bill being recommitted by being given their own way as regards the question of the new gas lands; by the illuminating power of the gas being made 15 candles; and by receiving 5 per cent. discount on the public lighting account. These particulars of the settlement come to will be found in our "Parliamentary Intelligence" to-day.

It cannot be denied that the Corporation of Margate have scored heavily against the Gas Company's Bill; but, on the other hand, it is impossible to repel the suspicion that the Company took up from the first an untenable position. The proposal to erect new gas-works on a site offering a *prima facie* case for the likelihood of pollution of the subsoil by percolation, was flying in the face of the earthly Providence represented by a Parliamentary Committee. The promoters were early made to feel this; and they approached their opponents with an offer of preventive precautions which only went to show that there was something to be guarded against. It was remarked in our last notice of these proceedings that this rock upon which the Bill split "is a matter that requires a deal more consideration from gas managers than it has usually received." We referred, of course, to pollution of the subsoil by gas manufacturing and distributing operations. Enormous expense and trouble have been caused to gas undertakings before now by this undesirable "residual product" of their works; as the experience of Edinburgh—to cite only one instance—is quite sufficient to prove. Some modern improvements effected in gas manufacture are not, unhappily, in the direction of reducing the risk of this kind of nuisance. The Thanet Company are relieved, by what may prove eventually to be the kind severity of the Legislature, from working out another experience like that with which the old Edinburgh Company were familiar. Hence the question will not be discussed with reference to the integrity of the Margate water supply. Speaking generally, however, the problem is a grave one; and the risk of getting involved in a lawsuit of this kind is one from which the wealthiest gas company may fervently pray to be preserved.

The Petroleum Committee and the Flash-Point.

THE labours of the Petroleum Committee are not concluded; and it is therefore still doubtful how far the existing practice in regard to the transport, storage, and use of mineral oil will appear to this body to be susceptible of improvement. Having decided, by a majority of one, that the flash-point of burning oil should be raised to 100°, it was suggested to the Committee by the Scotch members

that nothing further need be done to protect the public interest. The idea did not commend itself to the majority; and accordingly it is understood that the trade in even Scotch oil will be reported to be deserving of regulation of some sort, which is hardly what this particular trade interest desired. It was stated in the "JOURNAL" a fortnight ago that the Chairman of the Committee, Mr. Jesse Collings, was in favour of the suggestions for the improvement of lamps offered by Mr. J. W. Bernard Wright, the President of the Lamp and Stove Trades' Association of the United Kingdom. This gentleman has since written to "The Times" protesting that the first of these recommendations, which embodied the views of the members of the Association, was for the raising of the flash-point to 100° Abel test. This opinion was ignored by the Chairman. In repeating it, Mr. Wright uses the best argument for raising the flash-point that has yet been published. The writer says that "in those districts of the United Kingdom where a high-flashing oil is used—namely, oil having a flashing-point of over 100°—accidents with lamps are almost unknown, whereas in those districts where practically nothing but low-flash oil is used, that is, oil at 73° test, accidents are most numerous." Again, he asks how, save by raising the flash-point, are the enormous number of lamps, to be reckoned by many millions, now in use in this country, to be made more safe than they are at present? Unfortunately, Mr. Wright is uncertain as to the effect of raising the flash-point upon the price of the oil; but he acknowledges that this is a subject in which the Scotch oil producers are pecuniarily interested. It is not to the Scotch but to the Russian product, however, that the writer looks to supply the market with high-flash oil at no advance on common American oil values.

How difficult it is to see one's way to a sensible conclusion from all these arguments, from few of which is the element of trade interest wholly absent! As to Mr. Wright's statement respecting the greater safety of oil users in high-flash districts, is not this observation open to correction with respect to the quantity of the different oils consumed? If there is ten times the quantity of American oil burnt (say) in London of the whole consumption of Scotch oil in Edinburgh, should we not be prepared to find everything else about it in the same proportion? Is it quite certain, also, that the great majority of the lamps actually in nightly use throughout the United Kingdom would be rendered sensibly safer by having them all charged with high-flash oil? Mr. Wright declares that "for all practical purposes it may be assumed that the lamps in general use in this country, if used as they are intended to be used, are safe." What evidence is there to prove that these lamps would be safer, in the ordinary way, with high-flash oil; or that the improper use of a lamp, with any grade of mineral oil, is safe? What of the *Goliath* fire, and the lamp accident by which Lord Romilly lost his life? If a single accident can happen with a high-flash oil, the whole case of those who would upset the existing order of things in the trade breaks down. We are only concerned to show that those who pretend that oil-lamps can ever be rendered safe by the expedient of raising the flash-point of the oil would lull the public into a "Fool's Paradise."

The Blocking of Streets by Central Lamp-Posts.

THE English people are, and must ever be, the despair of persons of a logical turn of mind. They are so sadly unsystematic, especially in matters of government. The British Constitution, the common law, and the English language itself, are representative, in their lack of definite form and order, of every other working of the national spirit. To descend from the general to the particular, let us consider the hap-hazard fashion in which the streets of English towns are lighted. Is there any rule for the disposition of street-lamps, the quantity of the light afforded by them, or even as to what authority is to have the arrangement of this public service? Not at all. Here a County Council, there a City Corporation, elsewhere a Vestry regulate this business for London; and throughout the country the variations and distinctions between the supplying and controlling agencies in the service are endless. The general public take no heed of these things until some especially remarkable piece of practice compels notice; and then people inquire in surprise whether there is no "rule" for such things. Just now the blocking of the London

streets by the ever-growing traffic is the subject of correspondence in a daily newspaper; and, in the course of this discussion, the Marquis of Granby has condemned in the strongest manner the latest fashion in street lighting by electric arc lamps. We have already, on more than one occasion, offered the opinion that the fashion is quite wrong, from the point of view of the needs of users of the streets; and now Lord Granby declares that "the system of electric lighting which now obtains in London should never have been allowed by the Local Authorities. The plan adopted is that of placing the electric lamp-posts on small 'islands' down the centre of the street." The effect of this arrangement is in some instances to reduce by one-third the carrying capacity of a main road. While this subject is being thus ventilated, the London County Council have had under consideration a new set of regulations for dealing with the overhanging lamps, signs, and other structures by which the proprietors of public-houses, and advertising shopkeepers generally, seek to render their premises conspicuous. It is proposed, among other things, that the sanction of the Local Authority shall be required for every lamp so fixed as to overhang the public way; and that when such lamps are sanctioned, they must be kept lighted during a prescribed number of hours. What is to be the penalty for disobedience to such orders, or how it is to be enforced, does not appear. It is understood that the new code of regulations will only be put in force if they receive the approval of each of the Metropolitan Highway Authorities.

Appointment of a "Conciliator" for South Wales.

It was announced at the end of the week that a step, which may prove to be an advance towards a settlement, had been taken with regard to the South Wales coal strike. In response to the approaches of the men's Provisional Committee, the President of the Board of Trade has invited Sir Edward Fry to act as Conciliator in the dispute, under the provisions of the Conciliation Act. Sir Edward has accepted the invitation; and consequently it is to be expected that before long both employers and employed will have an opportunity of proving before him the reality of their desire to terminate their differences. The experiment now to be tried will be extremely interesting. The Conciliator will have no compulsory powers; but in the present case he is endowed with high prestige. In the letter notifying the appointment to Mr. Wm. Abraham, Mr. Ritchie lays emphasis on the fact that if the Conciliator is to do anything, he must be sure that the men's representatives are really possessed of full and unlimited authority to discuss and settle the present difficulties. What is to happen after this condition is satisfied, nobody can say. The employers will probably bide their time, and see what the Conciliator can do with the men. Whatever else the appointment means, it cannot signify that Sir E. Fry is to act as Arbitrator between two disputants. "A conciliator's business is to bring about peace if he can, and to pursue 'it with a single eye.'" In this case, it will need a pretty keen eye to enable the Conciliator to keep from doing more harm than good. Meanwhile, the shortness of steam coal is being felt wherever the South Wales staple has hitherto found its market. Few dwellers in London and the South of England knew before this interruption in the trade how much these districts were dependent for inoffensive factory chimneys, locomotives, and steamboats, upon the regular supply of Welsh smokeless fuel. There have been whole weeks of this backward summer when London has been plunged in a sooty gloom that has suggested the atmospheric conditions of the industrial North, rather than those habitual in the valley of the Thames. Prosecutions for smoky chimneys have been plentiful; yet they might have been multiplied indefinitely had the police been stricter. The conditions thus created have been good for the gas coke market; but, though it is an ill wind that blows good to nobody, gas manufacturers will be as glad as anybody to hear that peace has been restored to the distracted South Wales region.

The Sutton Gasholder and Tank.

WITH the present number of the "JOURNAL" is issued the last of the series of plates giving details of the tank and three-lift gasholder designed for the Sutton Gas Company by Mr. F. Southwell Cripps, Assoc. M. Inst. C.E., their Consulting Engineer, and now being constructed under his superintendence by Messrs. C. & W. Walker, of Donnington, and Messrs. B. Cooke and Co., of London. As our readers are

aware, the drawings have been accompanied each week by descriptive notes by Mr. Cripps, not confined to the matter more immediately concerned, but on gasholder construction generally. In bringing the series to a close, it should be pointed out that, though the drawings have been published as examples of modern construction as applied to a gasholder of moderate size required for a particular place, it by no means follows that they would be equally suitable for a similar holder to be put up anywhere else. What has been done for Sutton is believed to be the best that could have been accomplished; but it must not be assumed that it is necessarily the best that could be done elsewhere. So much depends upon the actual conditions and circumstances of each individual case, that it is unwise to follow blindly any particular design. Sutton is, in fact, a case in point. When the construction of a holder there was under consideration, designs were submitted which had been copied from a holder erected in another town; and though these were excellent in their way, and exactly suited to the place for which they had been prepared, it was felt that the conditions obtaining at Sutton were not such as to make them the most suitable there. It was the close acquaintance with these conditions possessed by the Company's Consulting Engineer which led to the preparation of the new set; and it may be added that his intimate knowledge of all the constructional details of the work and the cost of carrying it out resulted in a saving of at least £750 in first cost. This fact is cited as an example of the economy resulting from adapting a good general design to special circumstances.

WATER AND SANITARY AFFAIRS.

An interesting debate took place in the House of Lords last week, on the motion for the third reading of the Rochdale Corporation Water Bill. The Earl of Crewe moved that the Bill should be re-committed, in order to give the County Council of the West Riding of Yorkshire an opportunity of being heard in opposition to the measure. The Select Committee to whom the Bill was referred had objected to hear the Council, because, according to the rule of the House, that body had no *locus standi*. In opposition to the Earl of Crewe's motion for reviewing the decision of the Committee, it was pointed out by Lord Hawkesbury that the County Council were not a water authority. Lord Methuen went a step further, and stated that the Committee felt a bad precedent would be set if they recognized that County Councils "had anything to do with water." We may observe that it would be a happy thing for London if this principle were acted upon in reference to the Council at Spring Gardens. There we have an Authority which seems to think that it has everything to do with water, and is continually being heard upon the subject, both in the Lords and in the Commons, while promoting or opposing Bills relative to the water supply. Another question presented itself in connection with the Rochdale Bill, and one which has lately been urged before the Royal Commission on behalf of the Middlesex County Council. It is what we have called the "intensely local" view, that whatever rain falls upon a county, and whatever stream runs into it or travels under it, belongs inherently to that particular spot of earth. That there is a prior claim in that quarter we readily admit; but that is very different from conceding an absolute right. In last week's debate, the Marquis of Ripon urged that the real point to be considered was whether it was desirable, in the public interest, that County Councils should be heard in regard to proposals to take water largely from their localities for the benefit of other districts or counties. So we find it argued that Rochdale was going to rob the Calder Valley of water required by the millowners and others in Yorkshire. But the House of Lords passed the Rochdale Bill nevertheless. Certainly the people living in the Calder Valley should be secured in regard to their water supply; but if they have none to spare, surely Parliament will be informed of the fact by the proper authorities, without the intervention of the County Council. If the Council were supplying water, that body would have *locus* forthwith. But if the parties who are responsible for the supply do not cry out, why should the County Council proceed to shout? To interfere with matters outside their proper functions seems to be a process possessing peculiar charms for our County Councils in their Progressive character. If anything is left alone, it is

something which, if dealt with, threatens the loss of votes. Water Companies may be attacked, but the costermonger is sacred.

Some striking points relative to the Metropolitan Water Supply were brought to view in the evidence given by Mr. James Bigwood, M.P., before the Royal Commission last week. This gentleman is an Alderman of the Middlesex County Council, and Chairman of the Parliamentary Committee of that body. His statements on the occasion referred to not only gave support to the policy previously expounded by Mr. Littler, but let in some further light on the attitude and aims of the Middlesex authorities. These parties we find described as pleading for non-interference in regard to the water supply of their county. They were satisfied, said Mr. Bigwood, with things as they stood, though they would like to exercise some further measure of control. One objection to the main proposal of the London County Council was that Middlesex had no confidence in that body as a water authority. With respect to a priority of right on the part of Middlesex to the Thames water, Mr. Mellor suggested that every county as one went up the river had a prior right; Lord Llandaff also remarking that if Middlesex maintained its rate of growth, and claimed to be first in taking a supply from the Thames, there would "not be much Thames left for London." Mr. Bigwood's answer was explicit: "It may be so; but that is London's 'look-out.'" Not only does Middlesex lay prior claim to the river, but asserts an absolute right to "all the water which 'lies underneath its soil.'" The New River Company are accused of having sunk wells "surreptitiously" upon their own land; so taking for the benefit of other people that which the Middlesex authorities speak of as their own peculiar property. The Chairman of the Commission asked what would be left for London, with its five million people, if every county claimed the exclusive right to its own water. Mr. Bigwood's solution of the difficulty must have startled the Commission: "Then 'London would have to go to Wales.'" The Chairman shrewdly observed that "the plain English" of the affair was this—that Middlesex wished to throw the cost of fetching water from a distance on London alone. "I 'think we do,'" said the candid Mr. Bigwood. But what has Wales to say in the matter? Has it not also a prior right? Mr. Bigwood explains that Wales would be paid for its water. This is the first we have heard of it; but, if true, it affects the estimate.

Another witness before the Commission was Mr. E. J. Halsey, the Chairman of the Surrey County Council, who stated that Surrey had always opposed any scheme which would place the county under the control of the London County Council. The Surrey authorities had always insisted on having the sources of supply, as well as the means of distribution, in their own hands. Lord Llandaff observed that to this arrangement the London County Council had "very liberally agreed." Still, his Lordship wished to know whether any consideration had been given to the practical difficulties which might occur in separating existing sources of supply between London and Surrey. The witness acknowledged that his Council had not gone minutely, or from an engineering point of view, into the question of severance; but they believed that "between two friendly bodies it was possible." It was agreed that Surrey should take from the Thames as much as their existing supply, *plus* 20 per cent. But even if Parliament would not allow an extra quantity to be taken, the Surrey authorities were advised that they could get sufficient water within their own borders. This was clearly a reference to "underground Surrey," and Lord Llandaff inquired who was to have these new supplies. Mr. Halsey said that Parliament would be asked "to create the Council 'a water authority.'" Lord Llandaff discerned the situation, and described it as showing that Surrey, like Middlesex, hoped never to trouble themselves about a reservoir scheme or a Welsh project. "We do not wish to be saddled with 'it,'" said Mr. Halsey; and he then went on to explain: "Having a water supply of our own, we are content to 'supply our own population in our own way, and at our 'own cost.'" London ratepayers may be thankful for the information now given. The London County Council, in contrast with their treatment of the Companies, will very liberally allow the outer authorities to draw from the river, and to tap the underground sources, to any extent they please. If London runs short, she must go to Wales.

THE INCORPORATED GAS INSTITUTE.

PROCEEDINGS AT THE

THIRTY-FIFTH ANNUAL GENERAL MEETING,

HELD AT

THE EXHIBITION HALL, BELFAST, JUNE 21, 22, AND 23, 1898.

Mr. JAMES STELFOX, M.Inst.C.E., President.

PAPERS AND DISCUSSIONS.

(Continued from Vol. LXXI., p. 1551.)

VILLAGE LIGHTING: A COMPARISON.

By R. G. SHADBOLT, of Grantham.

From time to time, the members of this and kindred Institutions have had placed before them statements, more or less complete, showing the relative costs of gas and other illuminants. More especially has this been the case in regard to gas and electricity. Hitherto, however, these comparisons have generally referred either to undertakings such as serve our large towns and cities, or private installations for lighting country mansions, or compact blocks of town or city premises. The question of village lighting, save in exceptional cases, and under abnormal conditions, being generally regarded as outside the pale of practical competition—that is, so far as our friend and rival the electric light was concerned. However correct this idea may have been in the past, it can scarcely be considered to hold good to-day—at any rate, not to the same extent; and it is with a view to placing the present state of affairs upon a comparative basis, that the writer begs to submit for consideration the results of his observations and inquiries.

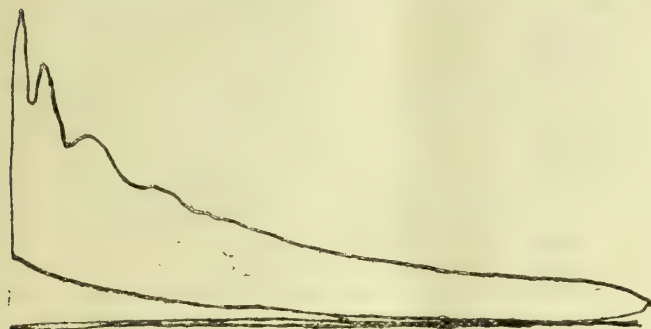
The present is not only an age of ponderous achievement, but also of exacting detail; and to minds trained in the perplexing labyrinths of technical minutiae, the writer feels that his subject and its bearings will not be deemed too insignificant to receive attention for a short time. And, moreover, considering the notice devoted in the past to the larger undertakings both of gas and electricity, the subject of village lighting may now reasonably claim a hearing.

We have for some time prided ourselves upon the fact that the cheapest method of producing the electric current for lighting purposes in small installations, is by means of the gas-engine; and the large number of such engines employed for this purpose, bears out the correctness of the claim. Economy and extravagance are, however, but comparative terms; and what may be a cheap motor with gas at (say) 2s. 6d. per 1000 cubic feet, may become an expensive source of power when gas is double this price. Generally speaking, it would naturally be expected that the cost of other fuels would increase in a similar ratio to that of gas; and such factors as smallness of demand, heavy railway rates, &c., which conspire as a rule to maintain the price of gas at a high figure, would operate equally in all cases. Yet, provided a source of energy should be available at little if any higher rate than when working alongside the half-crown gas, the case is materially altered, and the relative costs possibly be reversed.

Such, indeed, is actually the case with the natural offshoot of the gas-engine—viz., the oil-engine. It would seem as though Nemesis, in the shape of "Paraffin Oil," is to be eternally on our track; for once more we are confronted with our ancient competitor, whose stronghold has always been the villages and places where circumstances tend to a high-priced gas. The metamorphosis, however, is so complete that, but for its characteristic odour, our old acquaintance would be well-nigh unrecognizable. Nevertheless, there it is again, after playing the part of friend and foe in a diversity of ways, facing us in alliance with the dynamo, intent as ever upon ousting us wherever possible. It is not the writer's intention to wittingly tax your patience by a recital of elementary rules, rudimentary data, or irrelevant description. Yet, in dealing with a subject like the present, something approaching the rehearsal of

established facts may at times be of some assistance; and in such cases I must ask for your kindly tolerance and forbearance.

The gas-engine may be said to have long passed the initiatory and probationary stages, and earned its place as it stands to-day among the most economical and serviceable power producers at the disposal of modern science. In fact, for intermittent use, where small power is required, and given a reasonable-priced gas, it stands unequalled. The duty of this type of engine may be commercially expressed as one brake horse power per 20 cubic feet of coal gas consumed per hour, in small engines; and a gas consumption as low as 15 cubic feet per brake horse



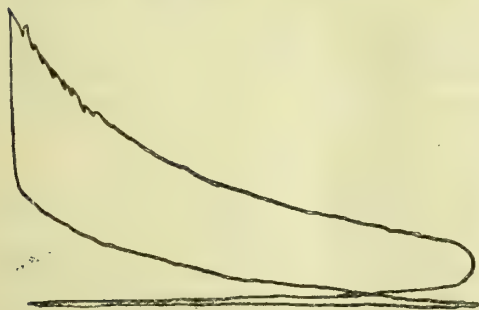
INDICATOR DIAGRAM OF 6-H.P. GAS-ENGINE.



INDICATOR DIAGRAM OF 3½-H.P. OIL-ENGINE.



INDICATOR DIAGRAM OF 8-H.P. OIL-ENGINE.



INDICATOR DIAGRAM OF 25-H.P. OIL-ENGINE.

power per hour in the larger ones. The author has fortunately obtained the results of a set of tests made recently with gas-engines of various sizes, after having been in everyday use for twelve months. These engines supply the motive power at a cycle factory; and the tests were taken independently of the makers by the factory engineer. The results of the tests are given in Table I. (p. 18).

It will be noticed that the engines were not running under the most favourable conditions for securing the irreducible minimum in the matter of fuel consumption. The tests were carried out with engines in working positions after doing considerable duty, with a view to proving the makers' guarantee, and without any doctoring for the occasion. So that claims to run as low as 15 cubic feet of

gas per brake horse power under favourable conditions may very well be allowed.

Turning to the oil-engine—which is likely to prove our greatest competitor, both as a motor and a lighting agent, in small communities—we find a machine in all its essentials closely resembling the gas-engine, from the mode of propulsion to the giving-off of power from the driving-wheel. The fundamental difference is that some appliance must be added in the case of the oil-engine for converting the fuel from a liquid to a vaporous state, in order to obtain the necessary explosive mixture. That the work done in the oil-engine cylinder is practically identical with that in the gas-engine, will be at once apparent from the diagrams indicated from gas and oil engines respectively.

The author then, by the aid of some cartoons he exhibited, described the construction and mode of working of the Hornsby-Ackroyd type of oil-engine. He then proceeded: After listening to the advocacy of the use of a heavy unstable vapour in place of one of a more permanent character, one would be quite ready to learn that combustion was less complete. Such, however, is not the case, as the following figures, from a report by Professor William Robinson, of the University College, Nottingham, will show:—

Analyses of Two Samples of Exhaust Gases taken from a 5 Brake Horse Power Hornsby-Ackroyd Oil-Engine.

Constituents.	COMPOSITION BY VOLUME OF GAS.		
	Sample No. 1. Per Cent.	Sample No. 2. Per Cent.	Average. Per Cent.
Carbonic acid	8'60	8'86	8'73
Carbonic oxide	—	—	—
Olefines and benzine	—	—	—
Hydrogen	—	—	—
Oxygen	9'32	8'86	9'09
Nitrogen	82'08	82'28	82'18
	100'00	100'00	100'00

These results indicate that the oil is completely burned in the engine cylinder, with excess of oxygen. The products of combustion formed consist mainly of steam and carbonic acid, diluted with nitrogen and oxygen, no trace of carbonic oxide being detected, so that this exhaust is not in any way objectionable.

The oil consumption in these engines has recently been brought very low. This is the most important factor of all; and below are given the consumption results of a set of tests conducted by independent experts on the makers' works.

Oil Consumption per Brake Horse Power per Hour.

Brake Horse Power of Engine.	At Full Load.	At Two-Thirds Load.
5'0 ..	0'78 pint	0'95 pint.
12'5 ..	0'75 " ..	0'90 " ..
25'0 ..	0'70 " ..	0'84 " ..
40'0 ..	0'68 " ..	0'80 " ..

The oils used in obtaining the above results were both Russian and American, of about .82 sp. gr., and chosen indiscriminately; the cost being about 4½d. per gallon delivered at Grantham.

As the tests were carried out on the makers' works, and presumably under favourable conditions, some allowance should be added for working under normal conditions. If the oil consumption of (say) a 25 brake horse power engine be taken to average 0'85 pint per brake horse power per hour, we have a figure which for all practical purposes may be compared with 20 cubic feet of gas per brake horse power per hour from a similar sized gas-engine.

Having dealt with the salient points of the oil-engine, we may now proceed to the question in which this motor may ere long play an important part. Village lighting by gas being a long-established fact, it should be possible with little, if any, trouble to obtain reliable data with reference to it; but woe betide the man who heedlessly rushes into the preparation of village gas analysis. Bitter disappointment is his inevitable portion, as witness the experience of the writer, who, after three months' incessant endeavour to obtain complete and reliable statistics of ten representative English village gas-works with annual makes of from 600,000 to 6,000,000 cubic feet, was reluctantly compelled to rest satisfied with those of eight works. Even then some of the items had to be estimated from the others. Indeed, had it not been for the kind assistance of one gentleman well

TABLE I.—Gas-Engine Tests at Cycle Factory, Feb. 8, 1898.

Type and Number of Engine.	Diameter of Cylinder.	Length of Stroke.	Revolutions per Minute.	Circumference of Fly-Wheels.	Load.	B.H.P. Developed.	B.H.P. Ordered.	Number of Shots when Loaded per Minute.	Maximum Number of Shots Possible per Minute.	Rate of Gas Consumed per Hour.	Rate of Gas Consumed per B.H.P. per Hour.	Illuminating Power of Gas.	Pressure of Gas.	Duration of Trial.	Remarks.
Horizontal No. 1	Inches. 15	Inches. 22	160	Feet. 21	Pounds. 638	64½	59	68	80	Cubic Feet. 1,020	Cubic Feet. 15½	18½	Inches. 1	15	This engine stopped after 8 minutes, as the test was too severe, and the load could not be relieved in time.
Horizontal No. 2	15	22	160	21	662½	67½	59	67	80	1,176	17½	18½	1	8	Engine was driving two 7-inch heavy belts. B.H.P. is therefore calculated at 68. Junction-ring was cracked, and allowed an escape of gas.
Horizontal No. 3	15	22	160	20½	662½	65½	59	68	80	1,200	17½	18½	1	15	Engine was driving two 7-inch heavy belts. B.H.P. is therefore calculated at 65. Trial interrupted by brake-strap breaking.
Horizontal No. 4	15	22	160	20½	638	62½	59	65	80	1,050	16½	18½	1	15	This engine would have stood severer tests easily.
Horizontal No. 5	9½	16	200	19½	208½	24½	24	81	100	540	21½	18½	1	15	One gas-burner on meter in addition to engine.
Horizontal No. 6	6½	12	220	12½	104½	8½	8	99	110	240	28½	18½	1	15	

Note.—The weight of the brake-straps was not included in the calculations.

TABLE II.—Village Gas-Works Analyses.

No.	Annual Capacity.	Annual Actual Make.	Maximum Days Capacity.	Maximum Actual Make.	Length of Mains.	Number of Consumers.	Number of Public Lamps.	Land Occupied.	Cost of Land.	Cost of Entire Plant.	Capital Invested.	Cost in Rents per Annum.	Cost in Rates and Taxes per Annum.	Office, Collecting, &c., Expenses per Annum.	Cost of Coal per Annum.	Cost of Purifying per Annum.	Amount of Wages per Annum.	Repairs and Maintenance of Entire Plant per Annum.	Gross Cost per Annum.	Received for Residuals per Annum.	Net Cost Delivered per Annum.
1	Cub. Ft. 980,000	Cub. Ft. 600,000	Cub. Ft. 9,000	Cub. Ft. 6,000	Miles. 2'75	100	25	Sq. Yds. 1,210	£ 100	£ 1,000	£ 1,100	..	£ 6 8 0	£ 11 10 0	£ 52 10 0	£ 2 17 6	£ 60 13 4	£ 20 16 8	£ 154 15 6	£ 15 0 0	£ 139 15 6
2	1,350,000	1,153,100	9,000	7,500	1'50	41	20	2,420	60	900	960	..	5 15 0	10 7 0	115 6 6	3 10 0	50 12 6	38 0 0	223 11 0	11 11 0	212 0 0
3	1,500,000	1,300,400	10,500	7,200	2'50	56	35	4,840	Rented.	1,400	1,400	7	8 19 0	16 2 0	130 0 0	4 0 0	61 2 0	24 0 0	251 3 0	29 18 0	221 5 0
4	1,800,000	1,667,600	16,000	10,200	2'00	70	30	3,630	90	1,500	1,590	..	9 12 0	17 5 0	166 14 0	5 0 0	65 19 6	48 7 4	312 17 10	45 0 0	267 17 10
5	3,000,000	2,400,000	24,000	16,000	2'50	146	43	2,000	Included in plant.	2,000	2,000	..	11 13 8	33 2 4	162 13 9	11 12 7	91 18 6	34 16 9	345 17 7	60 12 4	285 5 3
6	4,750,000	4,000,000	43,000	34,000	3'25	100	48	5,000	..	3,970	3,970	..	45 4 2	68 1 2	468 18 3	13 6 0	123 10 0	130 1 11	849 1 6	152 6 7	696 14 11
7	5,000,000	4,500,000	45,000	34,500	4'00	125	53	6,000	Rented.	4,200	4,200	50	19 18 7	48 12 2	598 10 0	9 7 0	105 3 8	141 14 2	1,063 5 7	144 15 9	918 9 10
8	6,000,000	5,250,000	45,000	40,500	3'50	150	65	5,000	Included in plant.	5,568	5,568	..	23 12 0	31 3 10	232 0 0	12 7 8	208 2 1	97 4 3	604 9 10	108 5 11	496 3 11
Total	24,380,000	20,871,100	201,500	155,900	22'00	788	319	30,600	250	20,538	20,788	57	131 2 5	236 3 6	1,926 12 6	62 0 9	857 1 7	535 1 1	3,805 1 10	567 9 7	3,237 12 3
Average	3,047,500	2,609,000	25,187	19,487	2'75	98	40	3,825	..	2,567	2,598½	7½	16 7 9	29 10 5	240 16 6	7 15 1	107 2 8	66 17 7	475 12 6	70 18 8	404 13 10

versed in this class of works, the total number would have been five instead of eight.

The idea originally entertained, and adhered to throughout, was to obtain analyses of the working of village gas undertakings in as detailed a form as possible, expressed in such terms as would render their equivalents, in electric lighting readily comparable. All the data available having been secured, it was tabulated in numerical order, commencing at the smallest works. Each item was totalled and the average of the eight works taken; this average gas-works to form the basis of comparison. The analyses will be found in Table II. appended. It should be stated that works situate on, or in close proximity to, the coal-fields have been studiously avoided; those places selected being fairly representative of small works administration under average normal conditions.

To render the "average works" analysis more comprehensive, it has, with certain additions, been divided into the three statements given below—No. 1 referring to capacities, consumers, capital, &c.; No. 2, to the entire cost of manufacture, distribution, dividends, &c.; and No. 3 showing the price at which the gas can be sold.

Average Village Gas-Works.

STATEMENT NO. 1.

Annual capacity	3,047,500 cub. ft.
" make	2,609,000 "
Maximum day's capacity	25,187 "
" " make	19,487 "
" hour's output	2,923 "
" " consumption	2,843 "
Length of mains	2.75 miles.
Number of consumers	98
" public lamps	40
Land occupied	3,825 sq. yds.
Total capital invested	£2,598 10 0

STATEMENT NO. 2.

Cost of Manufacture, Distribution, &c., per Annum.

Rents	£7 2 6
Rates and taxes	16 7 9 = { £6 8 0 per £1000 invested.
Office, collecting, &c.	29 10 5 = £11 10 0 per £1000.
Coal	240 16 6
Purifying	7 15 1
Wages	107 2 8
Repairs and maintenance throughout	66 17 7
	£475 12 6 gross cost.
Less residuals and sundries	70 18 8
	£404 13 10 net cost.
Add 5 per cent. interest on £2598 10s.	129 18 6
	£534 12 4 gross cost total.

STATEMENT NO. 3.

Price of Gas.

	Cubic Feet.
Annual make of gas	2,609,000
Less 16 per cent. lost and used	417,400
	2,191,600 total sold.
£534 12 4 ÷ 2191.6 = 58.54d.	
or (say) 48. 11d. per 1000 cubic feet including meter-rent.	

The 16 per cent. deduction for gas lost and used was arrived at by averaging the difference between that made and sold of 48 statutory gas-works as returned to the Board of Trade, with annual makes of from 600,000 to 6,000,000 cubic feet.

So far, no difficulties of any moment have presented themselves; but now we must perforce break controversial ground, and possibly encounter objections at almost every turn. It has in the past been one, if not the principal, feature of comparisons of this kind that either side should object to statements and figures advanced by the other as a matter of course. This antagonism is, however, happily passing away; and so soon as the representatives of both systems of lighting are able to make comparisons unbiassed by party feeling or diversity of interest, will our relative positions be exactly defined, and not before. The present is an attempt to reduce everything connected with the subject to ordinary working averages; taking little account of the duty of lamps, burners, mantles, &c., when

in their hey-day, and endeavouring, as far as circumstances permit, to arrive at their average efficiency.

Perhaps the greatest contention is that in connection with the number of electric lamps maintainable per horse power, and the illuminating power of the lamps. It is proposed in this comparison to go upon the basis of the nominal 16-candle power electric lamp; and one of the first determinations necessary is its equivalent in gas lighting. As the electric system under consideration is to be a low-tension one, working at 100 volts, the life of a lamp filament is taken as 1000 hours. From information received, and opinions obtained from various sources, an average light of 14 candles over the 1000 hours would appear to be a generous allowance. In face of the varying number of lamps specified per horse power by different authorities, it seems at first somewhat difficult to say what the actual number should really be; but upon going thoroughly into the question, especially in small installations, and considering the length of cable required in the present case, the writer thinks that no one will demur to an allowance of eight nominal 16-candle power lamps per brake horse power, which will include due provision for consumption at the lighting station. Respecting the gas lighting equivalent of the 16-candle electric lamp, when it is considered that a fairly good regulated No. 5 batswing burner gives, with 17½-candle gas, a light of 14 candles after 2000 hours' use, this burner may well be taken as representative of open-flame lighting. Working from these bases, an endeavour will be made to arrive at the power and cost of an electricity works equal in output to the average gas-works already delineated.

In the general statement of gas-works appended, from which the particulars of the average works were drawn, columns relating to the maximum daily capacity, and maximum actual day's make, will be noticed. These particulars are very essential, more especially the latter, as from it the maximum hour's output may be calculated; and as the electric plant here dealt with does not include accumulators, the maximum hour's load must be provided for in the generating plant itself. The average of a few small gas-works where such particulars have been obtainable, show that the maximum hour's output is about equal to 15 per cent. of the maximum day's make. Hence—

15 per cent. of 19,487 cubic feet	2923 cubic feet.
Less gas lost and used in the hour	80 " "
Maximum hour's consumption	2843 cubic feet.

Then 2843 cubic feet ÷ 5 = 569 burners, at 5 cubic feet per hour each, equivalent to 569 nominal 16-candle power electric lamps, which, at 8 lamps per brake horse power, require generating plant equal to 71 brake horse power + 5 per cent. margin = 74½ brake horse power, to correspond in output with a gas-works making 2,609,000 cubic feet per annum.

Thus 74½ brake horse power
= 569 maximum lamp-hours.
= 98 consumers and 40 public lamps.
= 5'38 lamps per consumer (average).
= 54,790 brake horse power hours per annum.
= 438,320 nominal 16-candle power lamp-hours per annum.
= 28,061 Board of Trade units per annum, allowing 4 watts per candle nominal.

As varying loads must be dealt with, this 74½ brake horse power would be provided by three oil-engines of 9½, 25, and 40 brake horse power respectively, each with its separate dynamo of suitable size. The arrangement of plant, complete with buildings, storage, and water-tanks, cottage for attendant, &c., occupies 476½ square yards.

The consumption of oil as fuel may be determined from the oil-engine test already given; the average of the whole being 0.8 pint, to which should be added an allowance of 6¼ per cent. for light running and minor defects incidental to constant working. This brings the consumption to 0.85 pint per brake horse power per hour, which, to the writer's mind, is as fair a computation as can well be made. The quality of the oil is similar to that used in carburetting water gas—refined Russian for choice. The cost, taking the average of that in various parts of England, is 4½d. per gallon. Rates, taxes, and office and collecting expenses, are calculated from the gas-works basis of so much per £1000 of capital invested; and the cost of the various parts of the plant, as given in the following statement, are all bona-fide current prices obtained from contracting electrical and mechanical engineers.

Village Electricity Works, with Oil-Engines.
Capital Statement.

B.H.P. of oil-engines.	9½	25	40	Total 74½
	£ s. d.	£ s. d.	£ s. d.	
Price of engines	160 0 0	320 0 0	480 0 0	
Special steady fly-wheels	17 0 0	26 0 0	43 0 0	
Circulating water-tank	6 0 0	18 10 0	27 0 0	
" " " connec- tions	3 0 0	10 0 0	15 0 0	
Foundation bolts	17 6	3 0 0	4 0 0	
Exhaust piping	3 5 0	6 10 0	9 10 0	
Continuous oiling gear	7 0 0	10 10 0	12 0 0	
Self-starting gear . . . . .	..	30 0 0	30 0 0	
	197 2 6	424 10 0	620 10 0	
Less 10 per cent. discount.	19 14 3	42 9 0	62 1 0	
	177 8 3	382 1 0	558 9 0	£ s. d. 1117 18 3
Dynamos	53 0 0	92 0 0	115 0 0	260 0 0
Belts and fixing . . . . .	..	..	..	35 0 0
Switchboards complete . . . . .	..	..	..	150 0 0
2½ miles of cable and laying . . . . .	..	..	..	1000 0 0
Meters . . . . .	..	..	..	500 0 0
Dynamo foundations . . . . .	..	..	..	12 0 0
	..	..	..	1957 0 0
Vaporizing oil reservoir, one month's supply, with pump, &c., to engine-tanks . . . . .	..	..	..	15 0 0
20-gallon cylinder oil-tank . . . . .	..	..	..	1 0 0
20 " bearings " . . . . .	..	..	..	1 0 0
Sundries and contingencies for plant . . . . .	..	..	..	50 0 0
	..	..	..	67 0 0
Foundations for engines . . . . .	..	..	..	24 0 0
Fixing " " " . . . . .	..	..	..	48 0 0
Buildings—Power station . . . . .	..	..	..	210 0 0
" " Cottage . . . . .	..	..	..	120 0 0
Land = 476½ sq. yds. at 2s. 6d. per yard . . . . .	..	..	..	59 11 3
	..	..	..	461 11 3

Total Capital Outlay.

Oil-engines	£1117 18 3
Dynamos, switchboard, &c.	1957 0 0
Oil-tanks	67 0 0
Land, buildings, &c.	461 11 3
	£3603 9 6

Village Electricity Works with Oil-Engines.

[Entire Cost of Manufacture and Distribution per Annum.]

Rates and taxes, at £6 8s. per £1000 of Capital	£23 1 3
Office, collecting, &c., at £11 10s. " "	41 8 9
Wages, at £2 5s. per week	117 0 0
Vaporizing oil, 0·85 pint × 54,300 B.H.P. hours = 5822 gallons, at 4½d.	109 3 3
Lubricating oil, 53 gallons, at 1s. 3d.	3 6 3
Cylinder oil, 36 gallons, at 1s. 9d.	3 3 0
Repairs and maintenance of plant, 3 per cent.	93 19 3
" " " buildings, 2 per cent.	7 16 9
Total net cost delivered	£398 18 6
Add dividends, at 5 per cent. on £3603 5s.	180 3 6
Total gross cost delivered	£579 2 0

Selling Price of Electricity.

Annual sales = 28,061 Board of Trade units.

£579 2s. ÷ 28,061 = 4·95d.—say, 5d. per unit, including meter-rents.

In the following summary are compared the two sets of statement referring to gas and electricity respectively:—

	Gas.	Electricity.
Annual sales	2,191,600 cub. ft. ..	28,061 units.
Total gross cost	£534 12s. 4d. ..	£579 2s.
Selling price	4s. 11d. per 1000 cub. ft. ..	5d. per unit.
Equivalent	4·57d. per unit ..	5s. 3·41d. per 1000 cub. ft.

Little if any comment is necessary. As stated at the outset, electric lighting by means of the oil-engine is now commercially practicable in villages and small places where from any cause the price of gas stands at a high figure; and the cost of production of the two illuminants may be regarded as practically identical.

Before dismissing the subject entirely, a few further comparisons may be drawn from the foregoing figures. If the oil-engine can successfully compete with gas as a lighting agent, through the medium of the dynamo, it must, of course, be a formidable opponent as a motor for ordinary purposes; and from the results of the tests of both gas and oil engines given in the earlier part of the paper, their relative fuel values, pure and simple, may be defined thus—

An oil-engine consumes 0·85 pint of oil per B.H.P.

0·85 pint of oil at 4½d. per gallon = 0·474d. per B.H.P.

A gas-engine consumes 20 cubic feet of coal gas per B.H.P.

0·474d. × 50 = 23·7d. per 1000 cubic feet.

Or (say) oil-engine at ½d. per B.H.P. per hour is equivalent to gas at 2s. 1d. per 1000 cubic feet.

The above comparison, of course, only holds good provided all things are equal, and refers to fuel consumptions alone. Such items as difference in first cost, oil storage &c., are not necessary considerations in the present instance. With the numerous systems of gas lighting at disposal, the comparison would be incomplete without some attempt to ascertain their relative worth. In the case of electricity, arc lighting in the present instance is entirely out of the question; and as the incandescent system alone remains, the nominal 16-candle power lamp will be taken as the standard of comparison. Allowing this lamp to yield an average lighting duty of 14 candles over its life of 1000 hours, one unit = 218·68 candle hours. Calculating from this basis, and with a price of 5d. per unit, the relative values of the various well-known systems of gas lighting work out as in the table—"Comparative Gas Lighting Values"—at foot of this page.

From these figures, it would appear that electricity is yet severely handicapped; but this is more apparent than real, for the great majority of gas consumers still cling to the open-flame system of gas lighting, and any method requiring the least attention meets with scant favour. Considering the very small margin between the price of open-flame lighting and electricity, as previously shown, it behoves us, without pessimistic alarm, to set our house in order in the small places and corners of our domains, by applying that same indomitable determination and skill in connection with our villages which has alike saved our reputation as a scientific body, and effected wondrous economies in our town and city undertakings. In what direction improvements and economies may be secured, it is not the object of this communication to indicate. Suffice it if the comparison between the two systems of lighting has been simplified in the least, and those responsible for small works administration assisted thereby.

ADDENDUM.

Since completing the foregoing paper, particulars of an alternative electricity scheme have come to hand which may be regarded as an electrician's minimum, whittled down with little regard for all-round comparison. As it would entail the reconstruction of a great portion of the paper to

Comparative Gas Lighting Values.

System of Gas Lighting.	Candle Power per One Foot per Hour.	Candle Power per Five Feet per Hour.	Unit Equiva- lent in Cubic Feet.	Unit Equiva- lents per 1000 Cubic Feet.	Renewals, &c., per 1000 Hours at 5 Cub. Ft. per Hour.	Gross Value of Gas per 1000 Cub. Ft.	Less Renewals per 1000 Cub. Ft.	Net Value of Gas per 1000 Cub. Ft.	Electricity per B. T. Unit.
Open flame	2·8	14·0	78·10	12·80	Nil.	5s. 3½d.	Nil.	5s. 3½d.	5d.
Argand	3·5	17·5	62·48	16·00	1s. 0d.	6 8	2·4d.	6 5½	5
Regenerative	9·0	45·0	24·29	41·16	1 0	17 1½	2·4	16 11	5
Welsbach	14·5	72·5	15·07	66·35	2 6	27 7½	6·0	27 1½	5
Denayrouze	17·0	85·0	12·86	77·76	2 6	32 5	6·0	31 11	5
Bandsept	17·5	87·5	12·49	80·06	2 6	33 4	6·0	32 10	

incorporate this latest addition, the details and notes are given below as received.

DETAILS OF DISTRIBUTING PLANT OF ELECTRICITY WORKS.

Distribution.

Village assumed to have six streets, each half a mile long.
Station about in centre.
Load evenly distributed.
Mean distance of load taken at 440 yards.
Total load, 600 60-watt lamps = 100 lamps per branch.
Distribution—200 volts; each branch requires 30 amperes.
Highest economical density, about 700 amperes per square inch.
Density allowed in this estimate, 430 amperes per square inch—i.e., $\frac{2}{14}$.
Concentric cable.
Greatest loss at distant end, about 19 volts, which in practice would correspond to a variation of less than 5 per cent.

Costs.

3 miles of $\frac{1}{4}$ armoured thread-sheathed concentric cable .	£570
3 miles of trenching, laying, and jointing, at 6d. per yard .	182
100 joint-boxes, at 20s. each	100
100 services and cut-outs, at 20s. each	100
100 electrolytic meters, at £2 each	200
Total	£1102

Note.—We should propose to start the engines from the cells, and so do away with any self-starters; we also propose to use one large water-tank, and connect both engines to it. You will note that our estimate for land and building is much less than yours, although we have allowed for 100 per cent. more floor-space than is required. The plant would have plenty of room in a building 25 feet by 25 feet and 12 feet high. We do not see the necessity of building a workman's cottage under the new plan. We have reduced the man's wages to £2, as we think he could make the 5s. by taking in a premium apprentice. The item of $\frac{7}{8}$ per cent. for cell depreciation more than covers the wear and tear when taken in conjunction with the fact that the current density on our cables is but 430 amperes per square inch, instead of about 700.

Estimate of Village Lighting by Electricity.

ALTERNATIVE SCHEME.

OUTLAY, &c.

Plant—	
Distribution loss estimated at 10 per cent.:	
Watts to be delivered to mains . .	40,000
Losses in machines, 10 p. ct. . .	4,000
„ belt, 5 p. ct.	2,000
„ regulation, &c., 5 p. ct. . .	2,000
Total watts to be generated. . .	48,000
B.H.P. required = 64	
Engines, &c.—	
Two, each 32 B.H.P.	£800 0 0
Two special fly-wheels for above (say) . .	60 0 0
One special water-tank.	30 0 0
Exhaust piping and water connections . .	30 0 0
Foundation bolts, £7; oil-tank and pumps, £17	24 0 0
	£944 0 0
10 per cent.	94 0 0
	£850 0 0
Foundations, £20; Fixing do., £40 . . .	60 0 0
	£910 0 0
Dynamos—	
Two 20-kilowatt dynamos with rails, bolts, &c.	£230 0 0
Foundations and fixing.	10 0 0
	290 0 0
Switchboard, including regulators, meters, instruments, switches, &c., erected complete	140 0 0
Battery—120 cells, output 90 amperes, at 220 volts $3\frac{1}{2}$ hrs., fitted complete	360 0 0
Distribution, as per particulars enclosed.	1100 0 0
Land—Engine and cell-house 30 ft. x 30 ft. + 100 p. ct. extra room, 200 sq. yds., at 2s. 6d.	25 0 0
Buildings—Power-station and cell-house.	125 0 0
Contingencies, say	70 0 0
Spares—Armatures, £45; belt, £10; engine parts, £25 . .	80 0 0
Total outlay	£3100 0 0
REVENUE, &c.	
Rates, &c.—	
Rates and taxes, at £6 8s. per £1000 . . .	£20 0 0
Office, collecting, &c., at £11 10s.	36 0 0
	£56 0 0
Wages—	
Man £2 weekly (allowing him premium apprentice)	104 0 0
Oil—	
Vaporizing, 5822 galls., at 4½d.	£109 3 3
Bearings, 52 galls., at 14d.	3 6 3
Cylinder, 36 galls., at 20d.	3 3 0
	115 12 6
Repairs—	
3 per cent. on plant—i.e., £910+290+20+120+1100=£2440	£73 10 0
7½ per cent. on cells—i.e., on £360	27 0 0
2 per cent. on building—i.e., on £125	2 10 0
	103 0 0
Interest—5 per cent. on outlay, £3100 . . .	155 0 0
Total cost, manufacture and distribution	£533 12 6
Power 64 B.H.P. Engine	
Battery 30 B.H.P. $3\frac{1}{2}$ hrs.—i.e.,	
Maximum capacity = 900 lamps, $3\frac{1}{2}$ hrs.	
28,061 units per annum, at 4 watts per c.p.	
£533÷28,061=4'56d. per unit	

This scheme does not, of course, meet our requirements in every respect; still it is of interest as showing the various ways in which the lighting requirements of villages may be met by our friends the electricians, and is but one more proof of the nearness of their competition in small places.

Discussion.

Dr. STEVENSON MACADAM (Edinburgh) thought he should like to say a word as to the relative values of oil and gas. The subject of the paper was village lighting; and with regard to that, he had undertaken a number of trials—not so much referring to the transformation of oil into electrical power, which had been principally dealt with in the paper, but rather with respect to the amount of illumination which could be obtained from paraffin oil used directly as oil in ordinary lamps. The members would know that a very large number of lighthouses were lit with paraffin oil; and that a very high illuminating power was obtained from it. When contrasting oil with coal gas, the question resolved itself very much into one of relative cost; and, if he might be allowed to say so, he thought many village gas companies were rather greedy with regard to the charges they made. Speaking from his Scotch experience, he thought they generally looked for something like 10 per cent. profit; and he feared the days of 10 per cent. were past, as much for gas as for other modes of investing money. He had made a calculation following the lines of the results Mr. Shadbolt had given, as to the relative amount of light to be obtained from coal gas and from oil, and incorporating the results of his own experiments; and he found that a usual sized cottage lamp, burning ordinary paraffin oil, would give a light of from 5 to 7 candles, while with a larger lamp, such as was commonly used in the rooms of better-class houses, one would get from 18 to 24 candle power. Calculating the amount of light obtained from one of these larger lamps, not specially constructed or designed, there was obtained from a gallon of oil—costing, say, 8d.—about 20 lbs. of sperm light; and bringing this down to a pennyworth of the material, there was obtained 146 candle hours for 1d. The cost of gas, comparatively worked out, came close to the figure Mr. Shadbolt had given for the value of gas and oil in the case of a dynamo. In order to compete with the oil, the gas would have to be supplied at about 20d. per 1000 cubic feet for 14-candle gas. Taking the smaller lamps, such as were used in villages, one did not get so much light per gallon of oil—only equal to about 15 lbs. of sperm (which would work out to 110 candle-hours at 1d.), to compete with which the gas would require to be supplied at 26d. per 1000 cubic feet. This was almost exactly the figure Mr. Shadbolt had given as the price of gas to compete with oil used in an engine with a dynamo. The only other point he wished to mention was the analysis given in Mr. Shadbolt's paper of the exhaust gases, quoted from Professor Robinson, who gave the amount of carbonic acid, and showed that there could be no carbonic oxide if the olefines and benzine were properly burned, nor any free hydrogen. He also gave the proportions of oxygen and nitrogen, but did not give the water vapour, which would have been useful, as without it they could not tell what was the total quantity of exhaust gases. He (Dr. Macadam) must express his admiration for the paper, which gave a thorough account of the use of paraffin oil vapour or gas in comparison with coal gas as a producer of motive power. This was exceedingly interesting to him, because as scientific adviser to the Northern Lighthouses, he many years ago recommended oil to be introduced for the purpose of producing gas to be used as motive power in the engines connected with the lighthouse foghorns. The subject was then in its infancy; but the oil gas proved very effective, and was still employed at Lang Ness Lighthouse, in the Isle of Man, and at the lighthouses on Ailsa Craig.

Mr. ROBERT PORTER (Elland) said, from a literary standpoint, he considered Mr. Shadbolt had been singularly successful in his paper. The subject was one they had heard very little about; but it certainly demanded attention. He thought, however, that in the table giving the relative cost of electricity and gas for lighting a village, Mr. Shadbolt had been rather too generous to electricity. The same amount of care and skill had not been directed to the designing and carrying on of small gas-works as of large ones; and consequently the capital expenditure in the first instance was often excessive. He understood that the figures were based on the actual amounts spent on eight

existing works; but if they were to be put down to-day, as Mr. Shadbolt proposed to put down an electric installation, there would be a considerable saving. The comparison was, therefore, necessarily in favour of electricity. This was the first time they had heard of the important part which the oil-engine might play in the lighting of villages and other places; and there was no doubt, from the figures submitted, that there would be considerable competition in this direction. If he had not known the author, he should, at the first glance, have been inclined to think he had some ulterior motive in portraying this wonderful means of developing power; and he had pointed out to him that it looked something like an advertisement of a particular manufacturer. He was, however, assured that such was not the case. Of course, Mr. Shadbolt could not have prepared the paper as he had done so admirably, without bringing in an engine of some make; and they would readily understand that he had taken the one he considered best. In speaking of the consumption of gas, coal gas was alone referred to; but they heard a great deal lately of what could be done with producer gas.

Mr. ISAAC CARR (Widnes) said the paper was characteristic of the author in its completeness and usefulness; and it would be very valuable for reference. He only wanted to make one remark, and that was on the point mentioned by Mr. Porter. He thought it was a mistake to introduce the name of a maker of any apparatus into a paper, when it was possible to avoid doing so; and though he was quite sure Mr. Shadbolt had no thought of advertising the firm referred to, in his opinion it ought to be a general rule for all writers of papers to avoid introducing the name of any trading firm, without special reason. The paper would have been equally interesting if it had referred to oil-engines generally. The excuse might be that this particular type of engine was superior to any other; but names should certainly be avoided if possible. Such a circumstance would not have been passed by the Institution of Civil Engineers; and they could not do better than follow their example.

Mr. WILLIAM CARR (Stalybridge) did not agree with his brother's remarks. It would be drawing a very hard-and-fast line to say that no one reading a paper should mention the name of the maker of any particular piece of machinery he wished to allude to. If ever a paper was free from the spirit of advertising, this one was. There was a great difference between mentioning a name, and reading a paper which was simply an advertisement—such, for example, as the one which received the third premium the previous day. That was a case in which exception might have been taken. They had heard so much about the gas industry being extinguished, that they had become quite callous about it; and many seemed to imagine that there was no possibility of such a thing happening. But the author had shown how electricity might displace gas, as it could be generated and applied, by the aid of the oil-engine, at a cost equivalent to gas at 2s. 1d. per 1000 cubic feet. This showed that in many villages there was a possibility of the gas company having to cease operations, or be satisfied with less profit. Dr. Macadam suggested that the days of 10 per cent. were over; and it must be admitted that in many places oil-lamps were already a serious competitor with gas-works. He was interested in one or two concerns supplying gas on a small scale; and it made him feel a little uneasy as to their value. At any rate, he hoped they would be able to reduce the price of gas to such a figure as would induce people to use it, instead of going in for the new light. If the gas-works were rebuilt on modern principles, they could compete with electricity, even at the price mentioned; but unfortunately the village gas-works had been built, and could not be reconstructed without throwing away the money already expended. They had to deal with things as they were now, not as they might be. Electricity had all the advantage of modern science; and gas shareholders were often over-weighted with capital spent in times gone by. Under these circumstances, they might have to be content in future with lower dividends. They were much indebted to Dr. Macadam for the additional data he had given.

Mr. T. P. TRAVERS (Cork) said he thought a too favourable account had been given of the oil-engine. In his experience, it caused a great deal of trouble from the choking of the valves; and for this reason, it had been displaced for a gas-engine after only a few months' working. Again, it was maintained that a 16-candle electric light was

equal to a 5-foot gas-burner. It might be when first put up, or as tested by a photometer; but he had always noticed that when electricity was introduced into a room, two or three lamps, and sometimes more, were provided to do the work previously done by one gas light. The radiating or diffusive power of the electric lamp was not at all as effective as that of the gas-flame; and the illuminating effect was not to be measured by the candle-power of the lamps installed.

Mr. D. T. LIVESEY (East Grinstead) said Mr. Shadbolt, in the case of gas-works, had apparently taken his figures from the Board of Trade returns of existing companies, many of whom had probably been established some time, and whose works might not have been erected economically, or might be badly managed. On the other hand, he took an ideal electric light installation. This was hardly a fair comparison; the gas should be taken under the same conditions as electricity. Again, in his table he showed that it was possible to get 1-horse power from 15 $\frac{2}{3}$ cubic feet of gas; but in his comparison with oil he put in at 20 cubic feet per horse power, thus placing gas at a disadvantage of 20 per cent. at once. It seemed doubtful to his mind whether, in some villages, it would be possible to buy oil at the price named. It certainly would not be in some villages in the South. On the whole, therefore, he thought the author had placed gas at an unfair disadvantage.

Mr. W. W. HUTCHINSON (Barnsley) said that this was a matter which they all had to deal with at some time or other; and they were much indebted to Mr. Shadbolt for bringing it forward in so able a manner. There was considerable difficulty at present in supplying gas in villages, with a good profit to those who produced it. He thought that Mr. Shadbolt—perhaps from the idea which had been already expressed of not underestimating an enemy—might have gone a little too far in the other direction; and they had probably not expected to hear such a long dissertation on oil-engines. In this description, moreover, he had not alluded to their well-known defects. He knew a case in which the mere sight of an oil-engine working to produce electricity was sufficient to induce the observer to at once resolve on a gas-engine, though he had to lay 500 yards of main in order to obtain a gas supply. The offensive smell was an important feature in an oil-engine. The principal difficulty was with regard to the comparatively large capital outlay which was often requisite, in order to give the public in a small village the accommodation they seemed to expect. As to the use of oil in lamps, Dr. Macadam had not alluded to the difficulty of keeping paraffin lighting up to the standard, owing to the very large amount of attention the lamps required to maintain their efficiency. The light obtained on a table, or in a photometer room, was hardly fairly comparable with what was feasible in ordinary village use. He had seen some very poor exhibitions of this kind. With regard to the mention of the name of the maker of the oil-engine by Mr. Shadbolt, he thought too much stress had been laid on it by Mr. Isaac Carr. In many cases, such a thing was quite justifiable; and it would not do to draw the line too tight, otherwise manifest injustice would be done to those inventors who had—frequently at great trouble and expense—perfected various machines and benefited, not only themselves, but the public at large.

Mr. ANDREW DOUGALL, jun. (Tunbridge Wells), said Mr. Shadbolt had compared electricity at 5d. per unit with coal gas as at present supplied to small villages, making the cost about equal. But this comparison was made with a flat-flame burner; and it occurred to him that he had often seen in his own neighbourhood incandescent burners used in villages. If the comparison were made with such gas-burners, the result would, of course, be very different. He took it the author's object was to arouse, in those interested in small gas-works, attention to the fact that they had now a formidable competitor in electricity; but he did not tell them how they were to meet the competition. It was not unusual to find in the same neighbourhood a small works charging a high price and paying no dividend, and another not far off charging a lower price and paying a respectable dividend; and when the matter was looked into, it was generally found to be simply a question of bad or good management. He was referring to very small gas-works, where they could not afford a manager; and on this, he would venture to make a suggestion—viz., that several such small companies should combine to engage the services of an engineer of standing, to whom they could

refer for advice when expending capital or otherwise; and to whom the working results might be submitted from time to time. By such a system of co-operation, they might obtain guidance which they could not afford in any other way.

The PRESIDENT said the only thing that occurred to him to refer to was that after all there was not much economy attained by this new mode of lighting as compared with gas, even with ordinary burners; and therefore there did not seem much object in changing. But if they took the table showing what was attained by the use of better burners—which were constantly being improved—there was really no comparison at all.

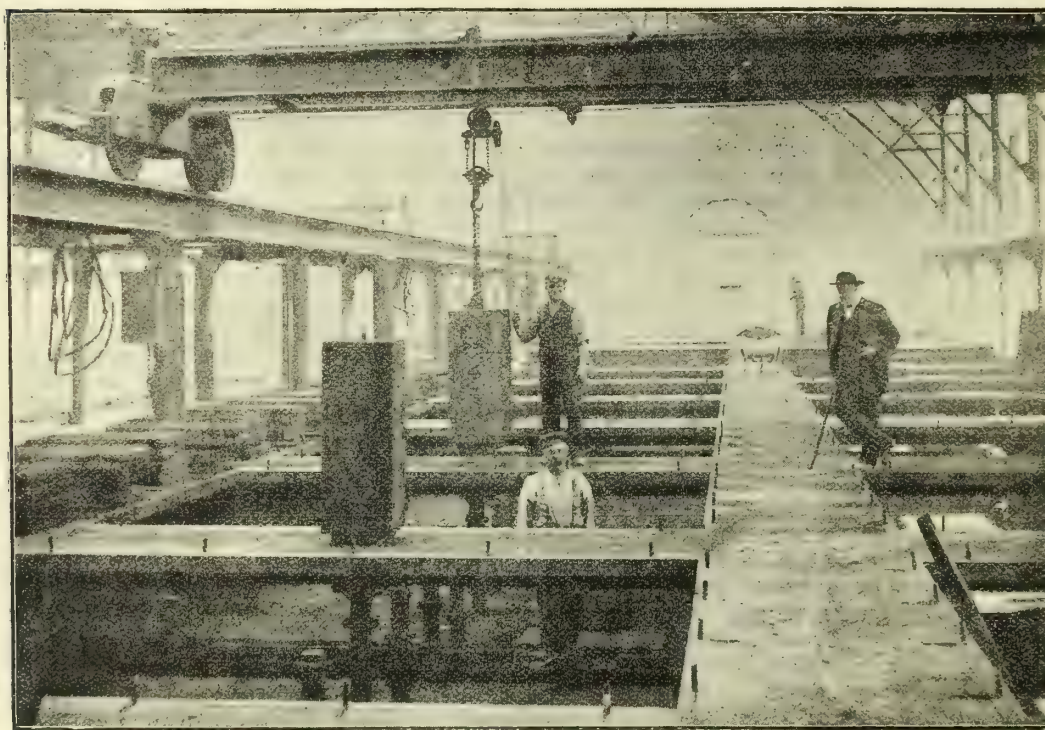
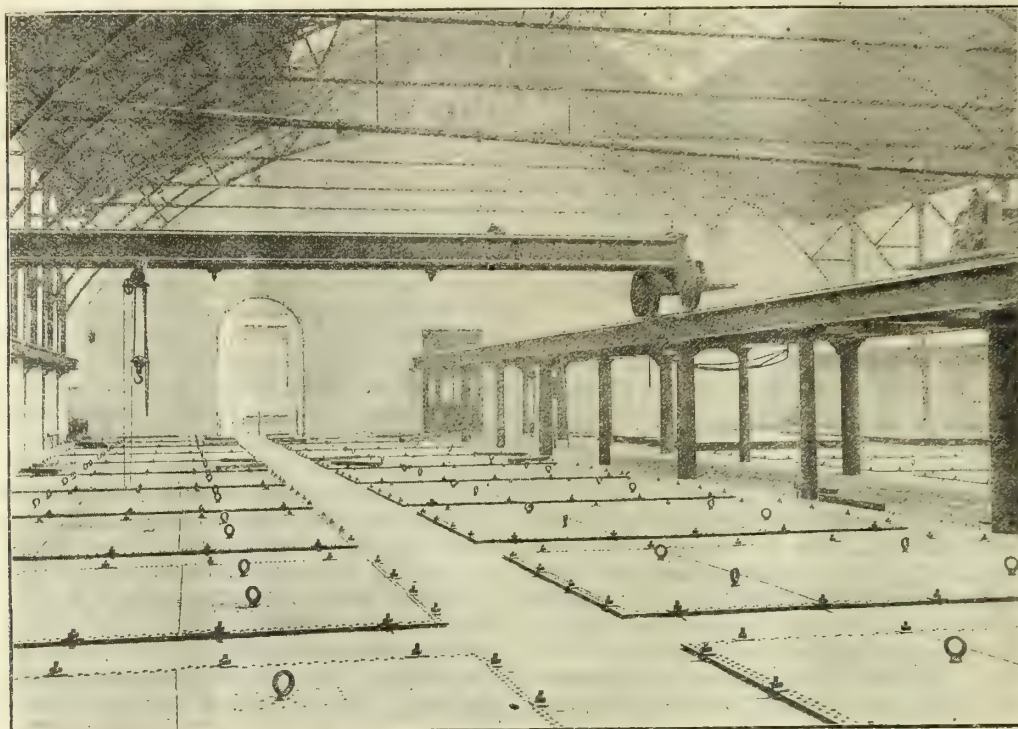
Mr. SHADBOLT said he must thank Dr. Macadam for adding to his figures in the way he had done; and he had no doubt that a careful study of the facts he had given as to the relative value of oil and gas when used direct, would be as useful as his own figures, if not more so. With regard to the analyses of the products of combustion, they were actually made by Professor Frank Clowes. Professor Robinson tested the engines, and took samples of the gases to Nottingham; and this was how it happened that the moisture which naturally condensed out, had not been estimated. He quite expected that his friend Mr. Porter and others would take up the obvious point of the different bases upon which the comparison had been made—between existing gas-works, antiquated and almost antediluvian some of them, and electric light works replete with every modern appliance. But they *must* take things as they were; and these antiquated gas-works existed. The money had been spent upon them; and it would have to be all thrown away before they could start again. Given an ideal case of a village which required lighting, and would take 2 or 3 million cubic feet of gas a year, and new works had to be provided, the gas would be put on a much more favourable basis. But his object had been to draw attention to the fact that they were supplying gas in villages at present at a certain rate, and that the electrician could come in and supply his light at almost the same price, by means of an oil-engine. This brought him to a point which affected him personally. Some of his friends had drawn his attention to the fact that the name of the makers was printed in large letters on his drawings, and had expressed their regret at seeing it. It might be due to his ignorance, or his innocence, but he was the last man in the world to take credit to himself for what other people had done. They had on some former occasions had very able papers, written by someone other than the ostensible author; and papers admirably illustrated, for which credit was given to the author though he had not prepared the drawings. He might be wrong; but he preferred to give honour and credit where it was due. Had he brought before them drawings of an installation of retorts, or of machinery, governors, or any other apparatus which appertained to their own business, and the reading of a paper on which might have meant orders to the firm making it, he should have considered it an advertisement pure and simple. But in this case he did not make the drawings; they were supplied to him by Messrs. Hornsby, who designed and made the engine. He did not, however, think they would get many orders in consequence of the paper. It was said that extremes meet; and on this occasion they had heard Mr. Isaac Carr "going for" him, while his brother took an opposite view. The pendulum swung from one extreme to the other; but he believed they were not far from the happy mean, which would set matters right. They had had *trade* on the brain for some time; and if the name of a manufacturer was mentioned in a paper, it was at once put down as an advertisement. It was possible, however, to go to an extreme; and he was glad the question had been raised, because it gave him an opportunity to protest against it. They would never have anything less approaching an advertisement than what had been referred to that morning. Probably before long the pendulum would swing back in the opposite direction; and ultimately he hoped they would arrive at the happy medium. Mr. Porter asked why he spoke so exclusively of coal gas. But he did so advisedly; and he was rather astonished that such an authority on carburetted water gas should have put the question. He knew, from his own researches, as well as from other sources, that there was a considerable difference in the consumption of a gas-engine, according as it was supplied with pure coal gas or with water gas and coal gas mixed; and on this account he

specifically stated it was coal gas he was dealing with. Mr. Travers referred to oil-engines getting their valves blocked; but if he might once more call attention to the engine he had described, he would point out that the vaporizer communicated directly with the cylinder, without any valves or working parts whatever which could get blocked. There were oil-engines giving a very high duty which had this great drawback—where they actually retorted the oil and made it almost into a permanent gas, then admitted it by a valve and ignited it, almost as in a gas-engine. He had seen no other vaporizer so simple as the one described, nor one that worked so efficiently. He would also point out that the engine worked at a very low temperature—nothing more than a black heat, in fact. They relied more on the heat generated by the compression than on the temperature of the walls of the vaporizer to bring about ignition. The study of oil-engines and the effects of compression was very interesting; and if for no other reason than this, he was glad that he went into the question, because he knew a good deal more now about vapours and compression charges than he ever did before. With regard to the power of the lamps and burners, all the way through he had avoided individual cases of high duty, and had tried to arrive at their average efficiency over 1000 hours' work. One might take a 16-candle lamp working with a high voltage, and obtain 25 candles out of it when new; but the deterioration would be rapid, and its life short. He had taken 100 volts over 1000 hours; and on the average the lamps would have an illuminating power at the end of the time of 10 to 12 candles. As to the equivalent in candles of a 5-foot burner, he arrived at the figures from his own experiments; and they worked out to 14 candles with a good batwing regulator burner, after 2000 hours. He thought that it would not look well to be too nice in splitting hairs, so he brought the average light of a 16-candle lamp up to 14 candles, to put it into line with a No. 5 gas-burner. Mr. Livesey alluded to the figures in the table as being referable to the Board of Trade returns; but that was not necessarily so. In two cases they were; but the others were obtained privately. The basis of comparison he had already dealt with. If they were making a comparison between two works to be put down in a new place, the difference would be much in favour of gas. With regard to the price of oil, the makers of these engines had hundreds of them at work in different parts of the country; and for many reasons they preferred to supply the oil themselves. They could set the compression right, and were sure the oil was suitable. Buying in large quantities, they could supply it cheaper than their customers could obtain it themselves; and the price named was the actual average figure paid. Mr. Hutchinson said he had not alluded to the defects of the oil-engine; but this was because they had been almost entirely eliminated. As to the smell, considering the inodorous condition of most gas-works, no doubt the smell of paraffin would be very very obnoxious if one had to work in it constantly; but he did not think in a separate station, working under ordinarily good conditions, the little smell there would be very objectionable. With regard to Mr. Dougall's remark on the comparison of a flat-flame burner with the electric light, he might have overlooked the table of "Comparative Gas Lighting Values," in which the values of a unit of electricity in comparison with different forms of burner were given. They were not the maximum results, beginning with a new mantle, and so on, but the average of 1000 hours in each particular case. The object of the paper was simply to institute a comparison; and Mr. Dougall's suggestion of how improvements could be made was rather a question for another time. Personally, he agreed with it; and a very similar suggestion was made by Mr. J. T. Lewis, the President of the Midland Association of Gas Managers, in his recent Inaugural Address. The idea was a good one; and if it could be made practicable, no doubt it would place the smaller companies in a much better position.

THE CONSTRUCTION OF, AND MODE OF WORKING, PURIFIERS.

By HENRY GREEN, of Preston.

At the express wish of my friend, our President, I appear before you, though it is with some degree of diffidence I venture to do this, feeling that the experience I have obtained will be common to most gas engineers. But



INTERIOR OF PURIFIER-HOUSE AT THE PRESTON GAS-WORKS.

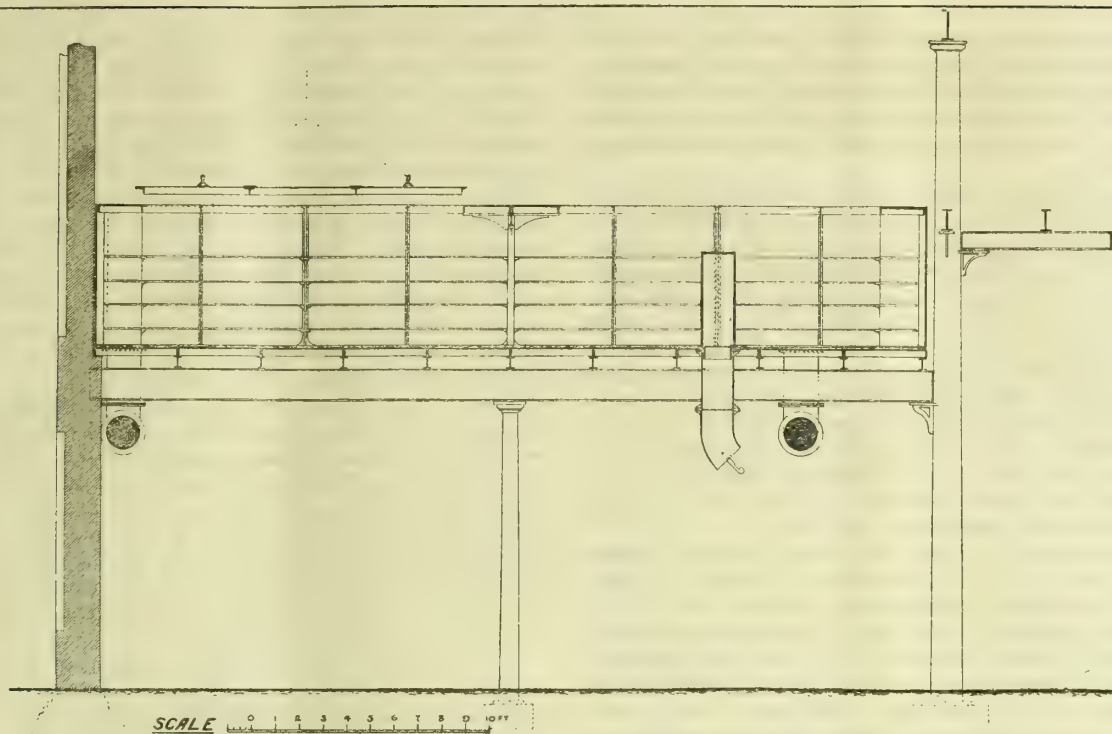
having to some extent departed from the usual lines adopted in the construction of, and mode of working, purifiers, I venture to hope that these departures may prove of interest to, and receive the favourable consideration of, the members. At the outset, I may say that I do not propose to deal with the chemical aspect of gas purification, but shall confine myself to the plans I have adopted as they relate to the construction of purifiers and the mode of working the same.

Some years ago, in consequence of the increasing demand for gas, our Walker Street station was pressed to its utmost capacity; thereby causing a serious increase in the back-pressure on the purifiers, and a consequent blowing of the hydraulic lutes. This became so troublesome during the winter months of 1884-5, that it was absolutely necessary some steps should be taken to overcome the difficulty. Three courses suggested themselves: (1) To increase the size of the independent main through which the gas, not only from the Walker Street, but also from two other works, passes to the principal gasholder station, a distance of about a mile and three quarters. (2) To erect exhausters at the gasholder station. (3) To alter the purifiers and

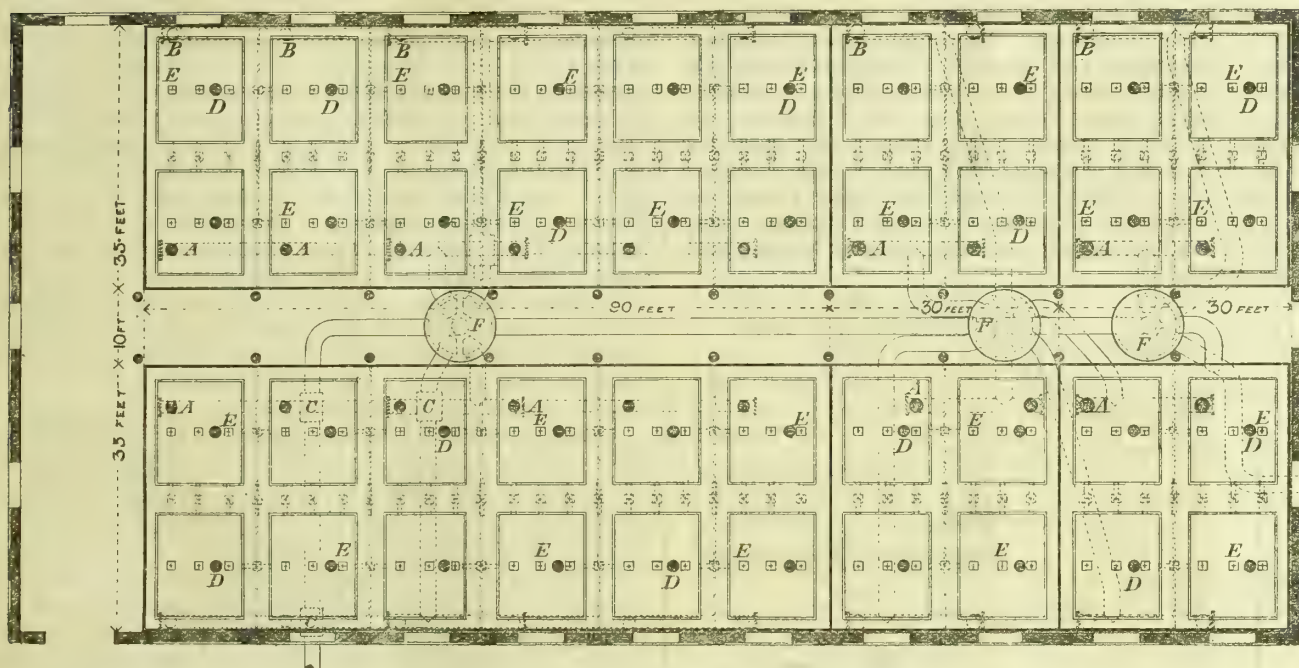
the method of working them, so as not only to remove the evils which existed, but to enable the purifiers to meet the strain which the increasing demand for gas would put upon them.

Though the first would have been the most natural solution of the difficulty, the heavy expenditure of capital which would have been entailed in its execution, was a serious objection to its adoption. Regarding the second plan, not only did the same objection apply; but if adopted, a further considerable annual expenditure, arising from the maintenance and working of the plant, would have to be incurred. The third plan, though involved in uncertainty to some extent, suggested itself as presenting the least difficulties; the structural alterations required being simple, and the outlay inconsiderable.

It was therefore decided to adopt this course; and so it became necessary to alter the construction of the purifiers, by which I largely increased the area and reduced the number and thickness of the layers of oxide of iron through which the gas had to pass. The change, when effected, practically increased the area, by 100 per cent., and reduced by 30 per cent. the thickness of the oxide;



CROSS SECTION OF PURIFIER AT THE PRESTON GAS-WORKS.



A. Inlet Pipes. B. Outlet Pipes. C. Crossing Boxes. D. Emptying Shoots. E. Standards. F. Centre Valves.

PLAN OF PURIFYING-HOUSE AT THE PRESTON GAS-WORKS.

the first being increased from 432 feet to 864 feet, and the latter reduced from 90 inches in six layers to 60 inches in four layers of 15 inches each. Prior to the change, the purifiers at our Walker Street station were ten in number, each 18 feet by 12 feet. Eight of these were worked in two sets of four purifiers in each, and were loaded with Irish bog ore; the remaining two being charged with lime. The alteration effected was to change the construction of the centre-valves, and convert the eight oxide purifiers into two large ones. In carrying out the change, the boxes themselves were not interfered with; but the inlet-pipes of four of the purifiers were connected together, as also the four outlet-pipes—thereby converting four purifiers into practically one box 48 feet long by 18 feet wide. I also erected a catch purifier, having four small dry sealed lids, and the top intersected with gangways.

After the purifiers were put into action, the result of the change so fully answered expectations, that it was determined when getting out plans for the reconstruction of our Moor Lane station to adopt the same construction of, and mode of working, the purifiers. This was carried into effect by the erection of six purifiers—two for oxide, each 90 feet

long by 35 feet wide by 5 ft. 3 in. deep; the remaining four (three to be used for lime and one for catch) being each 35 feet by 30 feet by 5 ft. 3 in. It will naturally occur to you that, in erecting purifiers of a size such as the larger ones, several points would have to be carefully considered; some of these being: (1) In case hydraulic seals were used, the covers, from their size and weight, and the appliances needed for lifting them, would prove to be both costly and unwieldy. (2) In the absence of mechanical means, the loading of the purifiers would be inconvenient. (3) Measures would have to be adopted for giving stability to the tops and sides; for it must be borne in mind that in a purifier of the size named, with a back-pressure often existing of 24 to 30 inches, there would be a strain on the top of 150 to 200 tons, and 70 to 85 tons on the four sides. By the adoption of dry sealed covers, and dividing the tops of the purifiers into a series of gangways, I was able to deal successfully with these three points.

Description of the Purifiers.

As shown in the accompanying engravings, the building where the purifiers are erected is 166 feet long by 80 feet

wide; the whole area, except 16 feet at one end, which is used for storing oxide, being taken up by the six purifiers, and a centre-passage in which the centre-valves are fixed. The purifiers abut against the walls of the building on three sides; there being three on each side, and a centre-passage 10 feet in width.

A very good general idea of the building and tops of the purifiers may be obtained from the illustrations. The lower floor of the house is on a level with the surrounding yard, and the upper floor, which is formed by the tops of the purifiers and passage, is about 20 feet above this level. The lower floor, on which the foul oxide is discharged through shoots in the bottoms of the purifiers, is mainly used for storing and revivifying the oxide. On each side of the centre-passage rising from this floor, there are columns 15 feet apart for supporting the girders which carry the purifiers. These columns pass the sides of, and extend 7 feet above the tops of, the purifiers. On the tops of the columns, the girders and rails are fixed for the travellers used in lifting and moving the lids.

In the centre-passage, there are three hydraulic centre-valves—the first, or No. 1, controlling the two large purifiers; No. 2 controlling the three lime purifiers; and No. 3, the catch and bye-pass. The main pipes to and from the purifiers range from 24 inches to 12 inches in diameter; these gradually diminishing from 24 inches as the various branches are taken off the main. To obtain more head-room on the lower floor, the crossing-box invented by our able President was adopted. Details showing the construction of this will be found in the "Transactions" of the Institution of Gas Engineers for 1895.

The inlet-pipes, after leaving the centre-valves, run lengthwise underneath the purifiers. At every 15 feet, branches are taken from these and coupled to the bottoms of the purifiers; the outlet-pipes being arranged in a similar manner. I may, however, here say that I lean to the belief that the distribution of the gas in the purifiers would be as uniform if one 24-inch pipe were coupled to the bottom of each purifier instead of these numerous branches; thereby avoiding considerable expense. The estimate of weight which I shall shortly refer to, is based on this assumption.

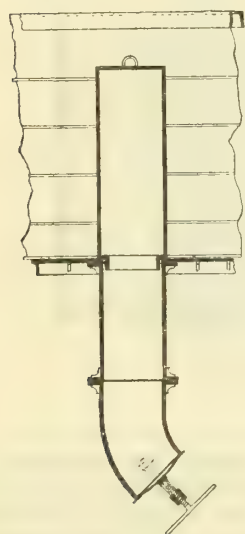


FIG. 1.

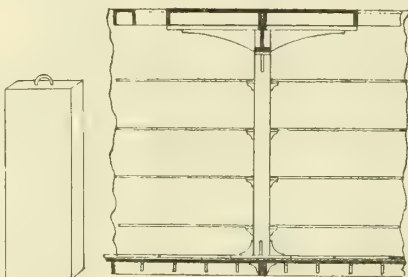


FIG. 2.

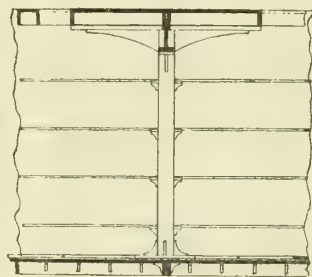


FIG. 3.

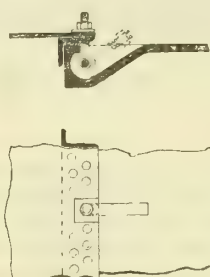


FIG. 4.

The purifiers or boxes are of cast iron; the metal being $\frac{3}{4}$ inch thick. Three of these are on each side of the house—i.e., one 90 feet by 35 feet, and two 35 feet by 30 feet. The three are built as one large cistern, 150 feet long by 35 feet wide; the purifiers being divided from each other by cast-iron partitions, the plates of which are bolted between the flanges of the bottom, sides, and top gangway plates. At convenient distances, there are a number of pipes or shoots (fig. 1) bolted to the bottoms of the purifiers. Through these shoots the foul material is discharged. Their lower ends, when the purifier is at work, are closed by means of lids, on a principle very similar to an ordinary luted retort-lid.

Others who discharge the foul oxide through the bottom of the purifier have no doubt, with me, noticed the trouble and serious distress experienced at times by the men from

the gas which becomes liberated, when, to obtain access to the discharge shoots, the oxide and grates are being disturbed and removed. To obviate this, hollow iron blocks (fig. 2), each 17 inches square, are placed over the openings in the shoots. The tops of these (which are 4 feet long) extend a little higher than the top grate. When a purifier has to be emptied, these blocks are lifted from their positions; thereby leaving a clear open space over each shoot, through which the oxide may be discharged. When these, before a purifier is loaded, are placed in position, the joints between the blocks and the tops of the shoots are made good by means of mortar luting; thus giving extra security against any escape of gas from the mouths of the shoots.

It will be seen from the plan and photographic reproductions, that the tops of the purifiers consist of a series of gangways and covers. The gangways round the sides are 2 feet wide. The one running full length and up the centre of the three purifiers is 4 feet wide, as also are the cross-gangways, of which there is one at a distance of every 15 feet. The spaces between the gangways are the openings into the purifiers; these being 13 ft. 6 in. by 11 feet each. There are twelve of these openings in each of the larger, and four in each of the smaller purifiers.

The importance of staying purifiers of this size has already been alluded to; and at the time of their erection some of my friends prophesied disaster. I am, however, pleased to say the prophecy is still unfulfilled; and I may further state that I have never seen purifiers of even a small size more rigid—no indication of springing either of the tops or sides under our heaviest back-pressure having been detected. To obtain for the sides this stability, stiffening or gusset-plates 2 feet wide are fixed at distances of from 7 ft. 6 in. to 8 ft. 9 in.; these extending from the bottom to the top plates, between the flanges of which, as well as to those of the side plates, they are securely bolted. The stability of the top of the purifier is insured by means of the standards or pillars which carry the bearers for the grates; these standards under the gangways (fig. 3) being bolted to the bottom plates of the purifiers, and to those forming the gangways. These standards under the longitudinal gangway are 3 ft. 9 in. apart, and 8 ft. 9 in. under the cross-gangways. Where the standards, as under the cross-gangways, are 8 ft. 9 in. apart, the gangway between the standards is supported by a small cast-iron girder 6 inches deep (fig. 3). This extends between, and is bolted to, the upper part of the standards.

The covers or lids I am about to describe are dry-sealed, each 14 feet by 11 ft. 6 in. These lids, though known for many years, have been little used. In the adoption of covers such as these, it may be assumed that they would require securing at more points than is the case with an ordinary hydraulic cover. This being so, to avoid some of the extra trouble arising from having to remove and replace the nuts of the holding-down bolts whenever the covers had to be raised or lowered, a number of pockets (fig. 4) were cast in the gangway-plates round the openings into the purifiers in which the holding-down bolts were hinged. By this plan it was anticipated that, after the nuts were loosened, the bolts would easily be knocked back out of the slots in the covers, so as to clear them when being raised or lowered. As others may be inclined to adopt this or some similar plan, it is desirable to point out that in practice it has been found that these pockets get choked with oxide or lime; the bolts becoming rigid, and the device useless.

Each lid consists of three wrought-iron plates 5-16ths inch thick, and butt jointed. The joint is overlapped by a butt strap $7\frac{1}{2}$ inches wide, double riveted on each side. Underneath each joint there is a tee-iron bar, 4 inches by $3\frac{1}{2}$ inches by $\frac{3}{8}$ inch; this being secured to the plates and butt straps by means of two rows of rivets, one on each side of the butt joint. Extending round, and on the underside of, the outer edge of the cover, there is secured an angle-iron ring 4 inches by $3\frac{1}{2}$ inches by $\frac{3}{8}$ inch (fig. 4); the rivet heads on the face of the angle-iron being countersunk so as to obtain a flat surface for the rubber or gasket which forms the joint. As before stated, there are twelve of these lids in each of the large purifiers, and four in each of the smaller ones. Each lid weighs $26\frac{1}{2}$ cwt. The holding-down bolts, of which there are 18 to each cover, are from 3 feet to 3 ft. 6 in. apart. When lifting a lid, the man stands upon it and raises it by means of a two-ton differential pulley-block. Two lids are removed on the traveller at one time.

The medium used for making the cover gas-tight is soft vulcanized rubber, in strips of about $1\frac{1}{4}$ inches wide and $\frac{3}{8}$ or $\frac{1}{2}$ inch thick; but loose spun gasket has also been used with a fair amount of success. It is, however, very necessary that, whatever medium is employed, means should be taken to make it adhere firmly to the cover; and for this purpose, for the rubber strips ordinary rubber solution has been used, and for gasket white lead. It is also essential that the sticking of the medium to the top of the purifier should be prevented. A paste composed of black-lead and tallow, applied to the metal surface, has answered the purpose. Though the system of bolting down these covers is not (neither was it expected to be) quite as expeditious as in the case of hydraulic lids, this disadvantage is largely counter-balanced by the advantage arising from the facility with which the covers can be handled in consequence of their reduced size and weight.

In addition to the advantages already alluded to, economies in the cost of purifiers constructed on this principle and the reduced space occupied by them, are further great gains. Respecting space, as an illustration, take eight large purifiers, each 37 ft. 6 in. by 35 feet, and having the same purifying area as the six now described. These eight, with the usual 6 feet surrounding passages, would occupy 180 feet by 92 feet, or 16,560 square feet, as against 150 feet by 80 feet, or 12,000 square feet.

In considering the question of cost, as the price per ton may vary according to varying circumstances, it may be better to take as a basis the weight. But in doing this, it must not be forgotten that these purifiers, being of a simpler construction and having much less expensive covers, can be erected at considerably less cost per ton than can purifiers on the ordinary system. I am indebted to Mr. Wright, of Messrs. Ashmore, Benson, Pease, and Co., for some useful information as to the weight of the several parts of various sizes of purifiers, which that firm have either erected or estimated for, and which enables me to give the following details:—

SIZE OF PURIFIERS.	20 ft. by 20 ft. by 5 ft.		30 ft. by 30 ft. by 5 ft.		70 ft. by 30 ft. by 5 ft.		50 ft. by 30 ft. by 6 ft.		40 ft. by 30 ft. by 6½ ft.		Average	Three Purifiers at Preston. 150 ft. by 35 ft. by 5½ ft.
WEIGHT OF PURIFIERS.*												
Pipes, exclusive of centre-valve . . .	7'14	5'0	Not given.		6'41	2'54	5'27	1'72				
Boxes . . .	23'00	18'5	17'5	16'20	15'50	18'10	15'80					
Covers . . .	4'20	4'5	4'1	7'20	4'20	4'80	2'18					
Total . . .	34'34	28'0	..	29'81	22'24	28'17	19'70					

* In lbs. per cubic foot of area.

A total saving is therefore effected on the weight, as compared with the average, of 30 per cent.; 67 per cent. on the pipes; 13 per cent. on the boxes; and 54 per cent. on the covers. But in addition to the saving effected in these parts, there are further economies arising from the reduced number and strength of the girders, &c., carrying the purifiers, and the cheaper and simpler apparatus required for lifting and removing a series of small covers, each weighing $26\frac{1}{2}$ cwt., as against one large cover weighing from 20 to 30 tons.

In bringing this subject under your notice, it was my intention originally to deal with it from a structural point of view only. But you will probably not demur to my giving you a short account of the mode of working the two oxide purifiers, and the result so far as it affects back-pressure. Already I have described the objects I had in view when a change was made in the form of the purifiers at our Walker Street station; these being to increase the area of the space, and reduce the thickness of the purifying material through which the gas had to pass, so as thereby to reduce the back-pressure.

From the foregoing, it will be seen that the system of purification adopted has been the substitution of two large purifiers for four having the same total area, but worked on the usual system of one at rest and three at work; these two being controlled by a hydraulic centre-valve so arranged that one purifier at a time could be worked or the gas might pass alternately through first one and then the

other. Besides these, there are three smaller purifiers for lime, and one catch purifier; but I propose mainly to deal with the two large oxide purifiers. At the outset of this section of my paper, I may say that no air or oxygen is passed with the gas; and as our hydraulic main is dry, the exhausters work at zero.

In each of the two purifiers, there are two 15-inch layers of oxide. Gas, therefore, when working through both purifiers, has to pass four layers; these being equal to 5 feet thickness of oxide. Reasonable care, I need scarcely say, requires to be exercised in loading; but I find that, given this care, the oxide when discharged is very evenly fouled. Both purifiers are kept at work until the gas shows a foul test on the top of the third layer of oxide; thus relying on one layer of clean oxide during the time the foul purifier is being discharged and reloaded. When first deciding on this system, a doubt existed in my mind as to whether it would be safe to rely on one layer of oxide; but consideration convinced me (and results have fully justified this opinion) that it would be safer to pass gas slowly—i.e., at half the speed through 15 inches thick of oxide, with a superficial area of 3150 feet, than more rapidly through 30 inches with an area of 1575 feet.

There are several reasons why I cannot give such complete details as to the working of these purifiers as I should desire; these being: (1) When I erected these purifiers, I never anticipated that I should be so injudicious as to consent to read a paper on either this or any other subject; hence such observations and records were not kept as otherwise would have been. (2) At our Moor Lane station both coal and carburetted water gas are passed through the same purifiers. (3) The same oxide is used for absorbing the sulphuretted hydrogen contained in the waste gases from the manufacture of sulphate of ammonia; and the importance of this point may be gauged from the fact that this plant deals with the whole of the crude ammoniacal liquor produced from a make of 400 million cubic feet of gas per annum. This latter point seriously affected the working life of the oxide; considerably reducing its usefulness for, and making the following details somewhat unreliable respecting, the coal-gas purification.

These purifiers were first loaded from a cargo of 500 to 550 tons of Irish bog ore. I estimated that 300 to 350 tons would be loaded into the two large boxes; the balance—about 200 tons—being either at rest or in use in the sulphate of ammonia purifiers. During the time the oxide was in use, the purifiers were changed 22 times, and it purified 552 million cubic feet of coal gas—an average of 25 million for each change of boxes—and when disposed of, the spent oxide, weighing about 800 tons, contained 55 per cent. of sulphur. From this, taking into consideration the increase in bulk which during use takes place in the oxide, it may be assumed that the same oxide was in use in the purifiers about five times.

The oxide at present in use—a cargo of about 600 tons—has purified 240 million cubic feet of carburetted water gas, and 450 millions of coal gas. It now contains 40 to 45 per cent. of sulphur. The boxes have been changed sixteen times; and I estimate the same oxide has passed through the purifiers about four times. During the past winter, from Nov. 10, 1897, to Feb. 28, 1898, the purifiers were changed three times, and purified 150 million cubic feet; 59 millions being carburetted water gas, and 91 millions coal gas—thus giving an average of 50 millions per box.

The figures in the table on next page record the result of three to four winter months' working, and give a clear idea as to the back-pressure on each of the oxide and lime purifiers at various intermediate dates. During this period, the oxide in use would contain from 30 to 45 per cent. of sulphur.

It will be seen from these figures that, during the earlier period, after a purifier has been changed, there is comparatively little back-pressure on either of the oxide purifiers, even when the oxide is largely charged with sulphur, and the maximum daily make of gas is passing, this pressure usually ranging from 5-10ths to 10-10ths of an inch. But a very rapid and considerable change occurs when the gas, after passing the third layer—or through 3 ft. 9 in. thick of oxide—shows a foul test; this increase in from 24 to 48 hours ranging on the first purifier from 1 to 11 or 12 inches, thereby at times compelling us to change the oxide purifiers earlier than we otherwise should have done. I may mention that this increased back-pressure does not

Working of Purifiers from Nov. 10, 1897, to Feb. 28, 1898.

Date.	Number of Days after Change of Purifiers.	Day on which Gas showed a Foul Test on the Third Oxide Layer.	Average Hourly Make of Gas in Thousands of Cubic Feet.			Millions of Cubic Feet of Gas Purified.	Back-Pressure in Tenths of an Inch.				
			Coal Gas.	Carb. Water Gas.	Total.		Oxide Purifier.		Lime Purifier.		
							First.	Second.	First.	Second.	
1897. Nov. 10 to Dec. 26	20	44th	35	30	65	Coal gas . . . 38 Carb. water gas . 27 Total . . 65	10	6	6	16	
	35		37	31	68		13	8	18	28	
	29		37	23	60		14	8	23	8	
	43		37	29	66		17	8	8	9	
	44		36	29	65		23	7	8	11	
	45		37	29	66		78	7	7	8	
	46		37	..	37		76	4	7	10	
	47		36	..	36		112	3	6	11	
Dec. 26, 1897, to Jan. 19, 1898	1	24th	36	..	36	Coal gas . . . 22 Carb. water gas . 11 Total . . 33	3	..	6	11	
	5		37	30	67		8	..	23	14	
	9		36	23	59		8	..	22	15	
	14		37	7	44		10	4	26	18	
	19		34	34	68		11	5	28	24	
	23		35	30	65		14	5	24	14	
	24		36	32	68		22	5	24	15	
	25		37	32	69		123	5	23	14	
1898. Jan. 19 to Feb. 28	1	37th	37	32	69	Coal gas . . . 31 Carb. water gas . 21 52	5	..	14	20	
	6		34	30	64		6	..	22	23	
	11		35	24	59		6	..	20	11	
	13		35	31	66		6	4	11	25	
	18		34	14	48		8	4	14	20	
	23		34	29	63		9	4	20	22	
	30		29	22	51		8	3	18	13	
	36		26	29	55		9	4	10	13	
	37		28	16	44		54	2	4	5	
	39		28	25	53		59	4	10	15	
	40		29	15	44		70	2	6	4	
	41		29	28	57		80	2	5	3	
	41						101	4	15	10	

arise in any respect from the hardening or caking of the oxide, as when the purifier is opened the oxide is found to be loose and fairly free.

I cannot fully explain the cause of the sudden rise of pressure. But I conclude that so long as there are less than three layers, or 3 ft. 9 in. thick, of foul oxide, through which the gas has to pass, back-pressure in our case does not exist to any serious extent; but immediately these three layers become foul, it increases so rapidly, and to such an extent, as to become troublesome. If this has been our experience, notwithstanding our large purifiers and the reduced number of layers and thickness of oxide it may be reasonably assumed that with more purifiers of a less size and having six layers—or, say, 7 ft. 6 in. thick of oxide, 5 feet of which being foul—back-pressure will not only be great, but continuous.

In submitting this paper for consideration, I do not wish to press my views unduly upon the notice of the members; but, in conclusion, I may say that the advantages I have derived from the changes made are in my opinion so beneficial that I should not think of reverting to the old system, either of construction or mode of working my purifiers.

Discussion.

Mr. JOHN WEST (Manchester) said they must all be thankful to the President for inducing Mr. Green to read his paper, which would be very useful to the members. He had had an opportunity of seeing the purifying-house in operation, in company with a large number of Lancashire members; and they were much impressed by what Mr. Green had to show them. He himself was impressed with the ease and facility with which the covers were removed. At first, he had a little prejudice against them; but this was removed after the explanations they had received, and when they saw the way they were manipulated. Mr. Green proved beyond doubt that his plan was successful; and therefore practical men might take his views as being of considerable advantage in his special case, and perhaps in others. One of the great advantages of large purifiers was the slow velocity of the passage of the gas, which no doubt accounted for the purifying material having to be changed so seldom. It was stated that Mr. Green only moved it five times in order to get 50 per cent. of sulphur taken up; and he (the speaker) did not think many could say so much as that. Besides the saving in first cost, Mr. Green must also save in labour. He thought the purifiers that were changed when the Lancashire contingent visited the works, had not been changed for some months. A special arrangement had to be made to show it even then; and they were surprised at the ease with which the light covers were lifted. There was one point,

however, which Mr. Green took credit for, which he did not think he would give him, because they could do the same with lutes. It was unnecessary to have a cross space between lines of purifiers. It was possible to take up all the area if two rows were put down the house, with a passage through the centre. There might be a division-plate with two lutes upon it. Personally he thanked Mr. Green for the information he had furnished, and should like to know if he could give any figures as to the relative difference in cost of plant and working.

Mr. GREEN said the weights were given in the table. They were based on the figures he had had with respect to the weights of the five sets.

Mr. S. Y. SHOUBRIDGE (Lower Sydenham) said there was so little variety in the construction of purifiers—which differed now, in the great majority of cases, only in their size from what they were almost a hundred years ago—that it was refreshing to come across the decided originality Mr. Green had shown. He was one of the few—if, in fact, there were any others—who purified the gas from the sulphate plant and the water-gas plant, as well as the ordinary coal gas in the same set of purifiers.

Mr. GREEN remarked that his paper did not quite express what he meant to convey, which was that he purified the gas from the water-gas plant and the coal-gas plant in the same set of purifiers; but not that from the sulphate plant, which was dealt with separately.

Mr. SHOUBRIDGE said he was struck by the large area of purifiers Mr. Green had in proportion to the make of gas; and he should be glad to know how the cost per 1000 cubic feet for purification compared with the purifiers Mr. Green had before, and also how long the india-rubber luting lasted. The adoption of this form of lid seemed a great improvement on the old system of water luting. If the material used for the joint was perfectly tight, and lasted a reasonable time, it would be a great advantage, and would very considerably reduce the cost of construction, and the difficulty of working.

Mr. ISAAC CARR (Widnes) asked if Mr. Green had any particular reason for not employing the air process. The figures he had given of the work done by these purifiers, without the admission of air, were sufficiently wonderful; and the results were doubtless due to the slow velocity at which the gas passed through the purifying machinery. But it occurred to him that, if the result with oxide alone could be so much above that obtained in ordinary purifiers, a proportionate increase might be obtained by the admission of air. He might then be able to purify such an abnormal amount of gas that he might have to change only in some two or three years, judging by the proportionate length of life which was gained in ordinary purifiers by the adoption

of the air process. They knew now that air could be admitted without any sacrifice in illuminating power, or any other attendant disadvantage; and he was rather at a loss to discover why Mr. Green had not adopted it.

Mr. R. G. SHADBOLT (Grantham) was struck, on reading the paper, with the part which dealt with the sudden rise of back-pressure when the third layer became foul. They were all more or less acquainted with the important effect in purification of lime contact, and most of them had a very fair idea as to the minimum time with which they could purify; but very few had any experience which would lead them to place the maximum limit. Mr. Green had evidently reached this limit. In purifying, especially with oxide of iron, there preceded the gas as the oxide became foul a kind of moist film, composed principally of water vapour; but added to this was a little oily vapour, according to the condition and capacity of the various other apparatus through which the gas travelled. By maintaining a certain velocity, this might be driven forward through five or six tiers of materials; but one could imagine that if the velocity were reduced below a certain limit, it had time to accumulate, and so formed a kind of veil, until it reached a certain stage, when it became of such a thickness, and offered such resistance, as to cause the back-pressure which had puzzled Mr. Green.

Mr. S. W. DURKIN (Southampton) said he could not see why the form of cover which Mr. Green had adopted at Preston should not be more generally introduced. They all knew that the covers of purifiers, especially when large, were a troublesome part of the plant to keep in order; and the wear and tear was very great. When one came to a rising back-pressure, it meant an increasing depth of the lutes, so as to restrain any blowing tendency. In his case, with an increasing production of gas, this had been getting greater; so that every time new purifiers had been put down deeper lutes had to be provided, in order to maintain a proper seal. He hoped the ventilation of this subject might lead engineers to a fuller demonstration of the principle of the dry-luted cover. He presumed Mr. Green was not troubled with the sulphur clauses; for he understood that he used oxide in the first instance, and some lime to arrest the carbonic acid. Some of them in the South of England were being troubled with the sulphur clauses; and consequently the lime came into operation first in nearly all the works there. At Southampton, they had not been under the sulphur clauses by any Act of Parliament, but would be in the course of a month or two. For some years past, however, they had been working as if they were. He presumed this method of putting so many boxes together would require some modification, if the lime process was more to the front than the simple extracting of sulphuretted hydrogen from the gas with oxide.

Mr. W. H. HARDIE, jun. (North Shields), said he noticed Mr. Green increased his purifying area by about 100 per cent. They all knew that increasing the area of purifiers ought to decrease to a large extent the cost. Therefore, it would be interesting if he could give the cost of purification before and after this enormous increase. It was interesting to note the saving in space, and also in initial cost; but it seemed to him that there would be a good deal of wear and tear on the india-rubber joints and gasket. He would like to know if Mr. Green could give the cost that his purification worked out at, and also of the repairs and maintenance of the luting arrangement.

Mr. THOMAS CANNING (Newport) said they were much indebted to Mr. Green, even if he had done nothing more than bring before them the improvement he had made in purifiers. He agreed with Mr. West's observation, that it was quite possible to ameliorate the condition of affairs in respect of the cross-gangway system by the old method of luting, as he had a set of purifiers in action at one of his stations put up in 1879. The whole set was in one tank; the lutes being simply divided by cross cast-iron partitions. When putting them up, he had no heroic intention of introducing any novelty. He was simply in a corner for want of space, and had to adopt this plan or none. It was suggested at the time by a good many, that some accidents might occur if there happened to be a leakage between a box in action and one out of action, and that if the seals became equalized one of the boxes might blow. No such accident had occurred; and all the purifiers were worked without any cross-floor gangways. It would be a great advantage, too, if the lute could be done away with altogether, in consequence of the very great wear and tear that went on,

owing to the action of the water on the lids. At the same time, he confessed that, without further information on this point, he should hesitate before adopting Mr. Green's system of fastening down the covers. He did not say it would be impossible—that would be absurd, after his experience—but he should like to know, as far as Mr. Green could give it, what the cost was, both in material and labour, of his jointing process; and also if he had noticed any chemical action taking place on the india-rubber by contact with the gas in the purifiers. He should think himself that there must be considerable labour, and a certain amount of risk; and there would probably also be some large expense in renewing the jointing material.

Mr. J. H. BREARLEY (Longwood) said Mr. Green had placed his figures before them in a remarkably lucid manner; but he should like a little further information with regard to the manner in which the oxide was taken from the revivifying cellar into the boxes again, as he could not see from the illustration that an elevator was used. He was one of the members of the Manchester District Institution who were privileged to inspect the boxes; but he did not remember seeing an elevator. In his works, he found the charge for carting the oxide round to the top again when it was revived underneath was more than it could be done for on the same level as the boxes; and consequently he took the oxide out of the top in barrows, and revived it in the yard, instead of in the cellar. He thought there were managers present who could testify to the fact that oxide could be worked up in five times to 50 per cent. of sulphur. He had experienced this even without the addition of air.

Mr. WILLIAM CARR (Stalybridge) said, like some other members of the Manchester District Institution, he had had the privilege of seeing these purifiers in actual work; and though he knew nothing about the cost of the rubber jointing, he could testify as to its effectiveness. He was never in a purifying-house that showed less escape of gas; and a large proportion of the purifiers were closed, and had gas passing through them at the time. Some of these purifiers, he believed, had been closed for a very long time. In fact, they had been working without the lids being taken off for a longer period than he remembered—for over twelve months. He thought it was somewhat unfair for gentlemen to ask what the cost of the purifying was, after Mr. Green had stated at the beginning that he could not give such complete details. He said he had not got the figures; and then one speaker after another wanted to know as to the difference in cost.

Mr. JOHN LYNE (Wexford) said that if he understood the matter aright, Mr. Green used a rather small opening in place of the large water-sealed cover, and employed rubber for making this small cover tight. Several gentlemen who had spoken considered this a costly joint; and he thought so too. If these comparatively small openings were desirable in such large covers, was there any reason why a water joint could not be substituted for the dry or rubber joint? With regard to the oxide changes, Mr. Green having stated that the purifiers were changed 22 times, he (the speaker) failed to understand the following sentence: "From this, taking into consideration the increase in bulk which during use takes place in the oxide, it may be assumed that the same oxide was in use in the purifiers about five times."

Mr. T. N. RITSON (Kendal) said he had recently had the privilege of seeing the purifiers at work at Preston; and he was sure it would repay any member who had not already witnessed the process to pay a visit to Mr. Green's works. There was one question he would like to ask, and that was whether Mr. Green found the gas passed evenly through the entire mass of oxide in these large purifiers; or whether there was any tendency to what he would call "stratification," owing to the gas having found an easy passage through one portion of the purifying material and left another portion unacted upon.

Mr. JOHN BOOTH (Southport) said he had seen this system at Preston. Shortly before at his own works, unfortunately for himself, he had put up a new installation of purifiers; for had he seen Mr. Green's arrangement earlier, he believed he should have introduced it. He did the next best thing, by putting up his purifiers in the way mentioned by Mr. West. With regard to increased pressure, he had found since he introduced carburetted water gas that, after carefully examining the purifiers as they were being emptied, there was a film of oil on the

oxide; and to this, and this alone, he attributed the increase in pressure.

The PRESIDENT said he should like to add a word on this paper, as Mr. Green had made him responsible for his presence—a responsibility he was very glad to accept, and he hoped that he would appear before them again. He could not let the opportunity pass without expressing his feeling of gratitude to Mr. Green for a great many useful hints. Having recently to spend an hour at Preston, he wired to his friend that he should be glad to see him. In the course of conversation, Mr. Green proposed to take him across to see these purifiers. In a few minutes, they found themselves walking over the top of the purifiers with a lantern. Of course, Mr. Green being the master he could not say much about it; but he told him that if he did that in his works, he should have sacked him on the spot. However, after thinking about it, it seemed to give him an opening which he had not previously seen his way to; and, with Mr. Green's permission he sent a draughtsman over who made such notes as enabled him to carry out the same design to suit his own place, in connection with his first water-gas plant. He got a couple of 40-foot boxes constructed; and through these they had passed the water gas from one of their plants during the last two seasons, introducing something less than $\frac{3}{4}$ per cent. of air. They ran these boxes last year for nearly six months; and when they ceased working for the season, the test was perfectly clean after passing 125 million cubic feet of gas through. A good deal had been said about the rubber. He was afraid of the effect of oil gas on rubber, though Mr. Green's experience with coal gas rendered him less timid; but he thought, as a matter of cost, he would try something else. He used ordinary yarn, twisting it round the bolts, and screwing the lids down; and they were perfectly tight. When the purifiers were opened for cleaning, they threw the yarn away, and put in fresh, which cost very little, especially as it only occurred twice a year. One was not a bit afraid of blowing. Of course, it took somewhat longer to remove the nine lids off the 40-foot box than to deal with an ordinary hydraulic cover. But they could do this and clear out the box of about 200 tons of oxide in a day, by putting a gang of men on each of the nine openings; and there was no inconvenience whatever. In these circumstances, he preferred to be without a water lute. The pressure ran up to over 30 inches; but there was no symptom of heaving or anything to apprehend.

Mr. GREEN, in reply, thanked the members for the kindly manner in which his paper had been received, and also Mr. Carr for answering the question about the cost of purification. He could not give it, for he had not come prepared. He could only look at the cost from this point of view: He was using the same oxide for his purification as was used with the sulphate of ammonia plant; and the cost of revivifying the oxide was largely mixed up together. Therefore, any figures he could give would not be of much use. But they might take it that, given a large area of purification such as he had, the gas was passing at a much slower rate, and must necessarily come into more intimate contact with the material than it would when rushing through at a high speed; and this being the case, the purifiers would naturally last longer. Again, with regard to loading and emptying, when one put a gang of ten or twelve men to shoot the stuff out and get it up, it would be done at much less cost than keeping three or four men about the place emptying or loading the purifiers day by day or week by week. And lastly all who had had experience of oxide purification were aware that one of the most important matters was revivification; for purifiers would not last if the oxide were put in warm, or even if after being cooled it was not properly revivified. In his case, he seldom emptied a purifier under a month; and the result was that the spent oxide lying about on the floor so long was properly revivified throughout; whereas if one had a system of small purifiers, it was apt to be picked up before it was properly revivified. Mr. West remarked that oxide spent after passing five times through the purifiers was a good result; but he (Mr. Green) might say it was not quite so good as appeared on the face of it, because the oxide, being used in the sulphate of ammonia plant which gave off an enormous quantity of sulphuretted hydrogen, became spent sooner than it otherwise would have been. Mr. West also said gangways could be avoided by the old system of luting. But the members

must not forget that they had no mechanical appliance for loading; and this being the case, the nearer the oxide could be brought to the place where the men worked the better. If one took a purifier like this, 90 feet by 35 feet, but with water lutes and abutting against a wall, the men bringing the oxide on one side, 35 feet away from the men loading on the other side, there must be considerably more expense in filling and loading than was the case with the gangways he had described, which enabled them to bring the purifying material within some 5 or 6 feet of the men loading. The great advantage, to his mind, in these purifiers was not only the cover but the gangways, whereby it was possible to go all round and over the purifiers with the barrows, as if the tops of the purifiers were an ordinary floor. Now, with regard to the question asked by several gentlemen about the cost and durability of the rubber. The first cost was rather great; but he had had these rubber joints at work five or six years; and the same rubber was still in use. On examination, he found that the gas had no effect on it, except just on the inner edge, which came in contact with the gas. They would understand that when the lid was tightly screwed down, the gas did not come in contact with any part of the rubber, except the edge which was inside the purifier. Mr. Isaac Carr asked why he did not use air. Well, he was a little bit conservative. He did strike out sometimes, but at other periods he was rather timid; and he always had the impression that by using air there was some reduction in the illuminating power. He was told by some that there was, and by others that there was not. He was, however, rather disposed to use air; and probably he should shortly do so to some extent. If he did, probably the purifiers would last until the oxide was nearly fully charged with sulphur. With regard to back-pressure, he could not give any reason why it came so rapidly forward when the third layer got impure; but it did during the winter months. In summer, they did not feel it so much, because less gas was going through. They always tested the gas on the third layer; leaving one clean layer for the gas to pass through while they changed the other box. He always found if they waited for the third layer to show a fairly darkish test, up went the pressure. It did not creep up in a week, but in the course of one night. There might be 5-10ths on the first purifier, and the next day it would jump up to 12 or 13 inches. Why it was so, he did not know; but it was a lesson which all ought to take to heart, because where the old system of purification was in vogue, working three purifiers and one idle, and four layers of foul oxide through which the gas was passing, this to his mind accounted for the continual heavy back-pressure which existed at some of the works where oxide was used. No doubt this pointed to a fact which was not known—that if there was more foul oxide than a certain thickness, there would be a heavy back-pressure. Mr. Durkin alluded to the sulphur clauses. Probably he might have gone more into the chemical question; but he was one who believed in letting well alone, and as they were not under the sulphur clauses, he did not trouble his mind about the matter. Three or four years ago, Professor Lewes tested their gas, and found 19 grains of sulphur. If they were ever brought under the sulphur clauses, the position he should be in would be this: He might then have to bring the lime boxes first. If so, all he would have to do would be to take out the cast-iron partition, and move it to another position. He should not alter the construction, but simply remove the partition from one part to another, and have the smaller purifiers first instead of last. One gentleman asked why he did not adopt the water-lute system. It would not do to have a number of water-lutes 2 feet deep dipping down into the purifier every 15 or 20 feet. Half the depth of the purifiers would be taken up with the water-luting; and no doubt this was the reason why a number of smaller lids with water-luting were not used in one large purifier. With regard to oxide being used five times, as he had explained in the paper, though the purifiers were changed twenty-two times the same oxide only went in about five times; for if the increase in the bulk of the oxide which took place in consequence of the absorption of sulphur was brought into consideration, it would be found that the oxide which, when fresh, would be sufficient to fill a purifier (say) three times, would do so four or five times when charged with (say) 40 or 50 per cent. of sulphur. Hence the same oxide was only loaded into say every fourth

purifier, or five times out of twenty-two changes. Regarding Mr. Ritson's inquiry, on reading the paper, he would find it stated that, given reasonable care in loading the oxide, when discharged it was found to be very evenly fouled. He (Mr. Green) might, however, further add that the adoption of large purifiers with a maximum or winter's make of gas, would in effect be practically the same as small purifiers with a minimum or summer make. He thought it would be agreed that, with gas passing slowly through a purifier, there was less liability to its either rushing through the oxide in patches or blowing a hole through the oxide as was the case where the purifiers were too small for the make. If any gentlemen liked to visit his works, he would be only too pleased to let them see the purifiers. As a rule, he had not gone much among gas engineers; preferring generally to stay at home. But he was always pleased to see his friends, and was very gratified by the Manchester Institution coming over to visit his works.

INCLINED RETORTS AT SALFORD.

By S. Y. SHOUBRIDGE, of Sydenham, London.

As increasing attention is being given to inclined retorts, a short account of the installation at the Salford Gas-Works may prove of interest to the members of the Institute, for it differs in some respects from others of the kind. The Salford Corporation in the year 1893 had to build a retort-house; and in order to decide whether it should be designed for stoking machinery or for inclined retorts, the Gas Committee were authorized to visit a number of gas-works, where the best examples of both systems could be seen. The writer accompanied the deputation which was appointed; and he desires here to acknowledge the courtesy which was shown by the engineers of the works visited, who most readily afforded all the information they could give.

Reasons for Adoption.—After careful consideration of the advantages and disadvantages of both systems, as shown by the examples which they saw, the Gas Committee recommended the Council to adopt inclined retorts in preference to stoking machinery, for the following reasons: (1) Less first cost. (2) Less wear and tear. (3) Fewer men required, and these unskilled. (4) Simpler and easier to work. The Committee advised the Council not to adopt the Coze arrangement of retorts, but an improvement upon it; whereby the difficulties which were encountered in that system would be avoided.

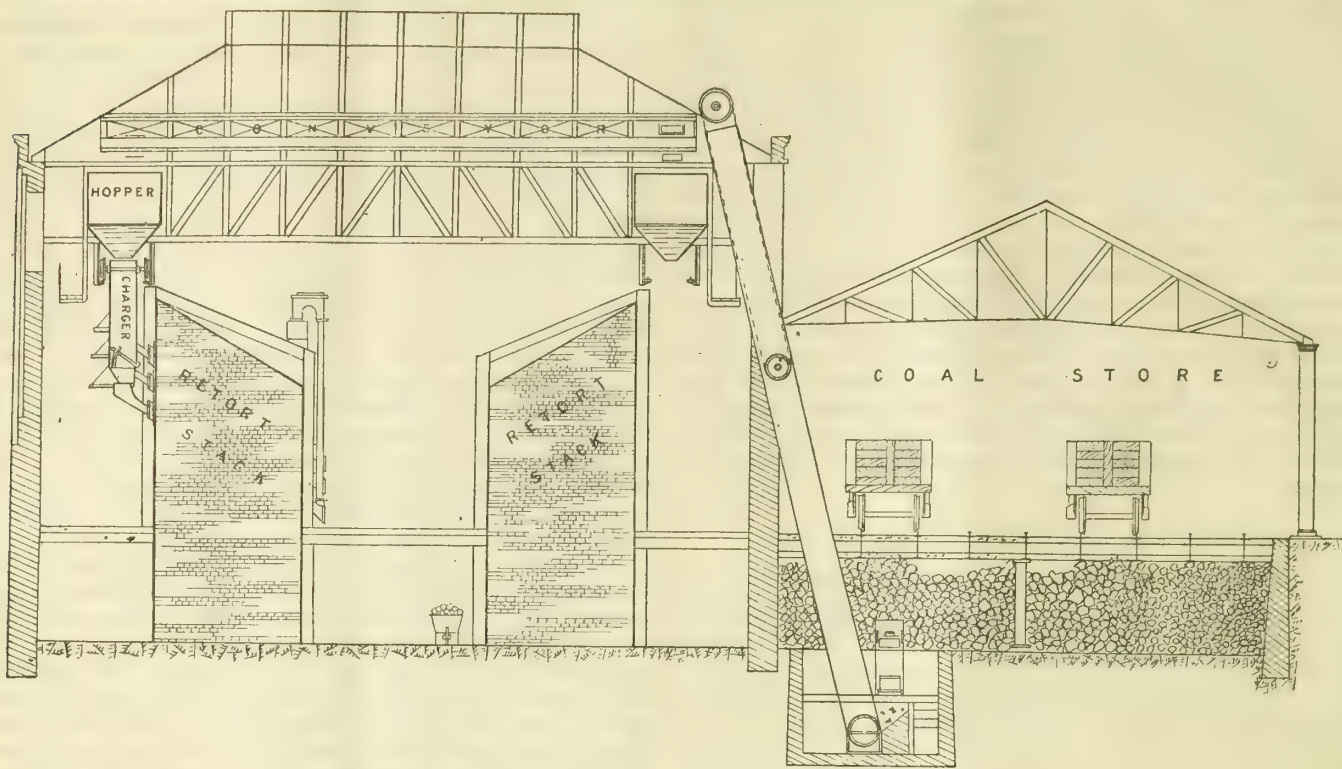
It will be remembered that in the Coze installations (some of them of considerable magnitude), each retort has a cast-iron bend at its upper end, forming the shoot through which the coal descends into the retort. This bend is built in the brickwork; and its upper end stands slightly above the top of the retort-bench. The bends are arranged so that the charging-ends are all in one line and at one level on the top of the bench, in order that they can be charged from a tipping-truck, running on rails alongside them. In practice, it has been found that these bends separate from the retorts, owing to the unequal expansion of the iron and fire-clay. The gas escapes at the joint, and, igniting there, soon burns the bends so badly as to prevent the coal sliding into the retort. Not only this, but owing to the position of the joint, it is impossible to stop the leaks effectually while the retorts are hot; and a large proportion of the gas, therefore, is wasted. Another difficulty is that tarry matter often accumulates in the bends, and prevents the even flow of coal into the retorts, so that the charging is most uncertain and irregular. On the other hand, it often happens, owing to the want of means for controlling the discharge of the coal into the retorts, that the bulk of the charge runs down to the lower end of the retort, leaving the upper part bare. The result is, of course, excessive heat at the upper end near to the bend, and insufficient heat, with consequently a large production of tar, at the lower end. So much was this the case in one of the largest installations seen, that a trough was fitted under the mouthpieces to catch the tar which ran out, and convey it to a receiver. The original Coze retort has had to be abandoned, owing to these defects, and is not now in use, the writer believes, in this country. It was very unfortunate that so many of them were erected before the system had been thoroughly tried; for not only was a large sum of money wasted thereby, but much prejudice against inclined retorts was created.

In the later installations which were seen, the built-in bend was discarded, and straight-through retorts, set at various angles, were adopted. The external shoots used with these are three in number, made to suit the several tiers of retorts. They have a bend, hinged to the bottom of the straight shoot, to facilitate the connection with the retort, and are open right through; but they have an adjustable baffle-plate fixed inside, at the lower end. They run on an overhead railway in front of the mouthpieces, and are, in some cases, supplied with coal from a truck travelling on rails above them, and in others direct from an overhead storage-hopper constructed along the whole length of the retort-bench. In either event, the coal falls from one level to the three tiers of retorts; and there is therefore a greater drop to the middle tier than to the upper, and a greater drop to the bottom tier than to the middle. As a consequence, the momentum of the coal in charging differs in each tier of retorts; and this causes uneven charges and imperfect carbonization. It was soon seen by those who adopted this arrangement that it was necessary to devise means for regulating the impetus of the coal. An attempt was made to effect this by fixing the adjustable baffle-plate in the mouth of the shoot before referred to, so as to offer more or less resistance to the coal, according to the angle at which it was fixed. It was intended that the stoker should adjust this plate to suit the quality of the coal, whether fine or large, so as to give an even distribution in the retort. This contrivance improved the charging somewhat; but owing to the difficulty of regulating the flow of coal when falling with considerable velocity, and also to the carelessness of the workmen, the charging was often very unsatisfactory, and the coal accumulated at the lower end of the retort—causing not only bad carbonization, but considerable labour in getting the coke out. The drawing, in some cases, was almost as laborious as with horizontal retorts. A great improvement was made by Mr. Braidwood, of the Greenwich Gas-Works, who patented an arrangement of charger and shoot, whereby the coal is discharged gradually into the shoots, and its impetus regulated by a series of baffle-plates arranged so that the coal falls from one to the other in its passage down the shoot.

Charging.—When designing the Salford installation, it appeared to the writer that, instead of discharging the coal into open-ended shoots of different lengths from one level, and checking the flow into the retort by placing obstacles in the way of the coal, it would be better to find out the proper height of fall required to give even charges, and then to deliver the coal from this height to each tier of retorts. In order to effect this, a charging-machine having three measuring-chambers and sliding-shoots was devised. Each measuring-chamber is constructed to hold rather more than the maximum charge required, and has a hinged door at the bottom, counter-weighted so as to close automatically. When closed, the door is held fast by a weighted catch. These doors are inclined so as to deliver the coal into the shoots beneath in the opposite direction to the retort; and by an arrangement of lever and stop, they can be quickly adjusted to open to any desired extent, so that the volume of the stream of coal flowing into the retort can be controlled to a nicety. The discharging doors of the three chambers are fixed at the same relative height above the retorts they have to charge, so that there is a uniform drop and momentum of the coal to every retort in the setting. Each measuring chamber is provided with an adjustable flap-door, covering an opening in the front of the charger. By this means, the quantity of coal per charge can be speedily and accurately regulated, as required.

The measurement of the charge is very simple and certain. Having fixed the flap-door at the height necessary for the charge, the attendant allows the coal to run from the overhead hopper into the charger until it reaches the door and opens it, showing that the proper quantity has been put in. The supply is then shut off. To vary the quantity of the charge, all that is necessary is to slide the door up or down, and so increase or diminish the size of the measuring-chamber. The charger is suspended from an overhead tramway; and when loaded with three charges of coal, it can be easily and quickly moved by one man. It is supplied with coal from a storage-hopper placed above and midway along the retort-bench; continuous hoppers being quite unnecessary.


The numerous experiments which have been made with the charger, have proved that an even charge throughout



INCLINED RETORTS AT THE SALFORD GAS-WORKS.

the retort can be obtained with certainty, with any description of screened or unscreened coal that has passed through the breaker, and this without any skill on the part of the attendant, who has simply to release the catch, pull a handle, and wait until the coal has run into the retort. The labour of charging is thus reduced to the minimum, and made as pleasant and simple as possible for the men. The men employed at Salford to charge and draw these retorts had never been engaged in a gas-works previously; and they performed their duties admirably, in a very short time—no skill or training being necessary. Two men in each shift charge the eight beds of retorts in the bench, and attend to the elevator and conveyor; and they could easily do more. Perfect charging having been obtained in this way, the even heating of the retorts and the automatic discharge of the coke are assured. In Salford, one man in each shift does all the work of discharging the coke from eight beds of retorts, including the opening and closing of the retort-lids. He also removes and replaces the stoppers (which keep the coal off the mouthpieces), and clears the ascension-pipes.

General Arrangement.—The retort-house, which measures 228 feet long, by 85 feet wide, by 49 feet high, was constructed to contain four benches of retorts; each bench consisting of eight beds of nine retorts, or 288 in all. At present, only two benches are erected. The coal-store is parallel with and adjoins the retort-house, and is arranged so that the coal falls direct from the railway-trucks into the coal-breaker, whence it is elevated to the overhead store-hoppers in the retort-house. One breaker and one elevator serve two benches; the coal being conveyed across the house in a scraper conveyor. The breaker, elevator, and conveyors are driven by a 14-horse power gas-engine, which has been found to be a most convenient and economical motor for the purpose; the consumption of gas being less than 15 cubic feet per ton of coal carbonized.

The first retort-bench was built in 1893, and the second in 1896, by the regular staff of retort-setters employed at the works. In the first bench, the settings contained nine retorts each, and in the second only seven; it having been found that the heating of the smaller number is the more satisfactory. The retorts are  shape, 18 feet long on the slope, 21 inches by 16 inches at the top, widening gradually to 23 inches by 16 inches at the bottom. By tapering the retorts in this way, the friction of the coke against the sides is obviated, and the discharging greatly facilitated. In fact, so rapid is the discharge that the man who removes the stoppers has to be very careful to prevent the coke from rushing out too quickly. The angle at which the retorts are set is 32°, which has been found to be suitable both for charging and discharging. They are

heated by regenerator furnaces of a simple and effective design, one to each setting. The charging ends of the retorts are toward the sides of the retort-house; the coke being discharged in the centre. This arrangement was adopted as being most convenient for the removal of the coke, which falls through shoots into barrows on the ground floor, and is then quenched and wheeled to the yard at both ends of the house. The coke-floor being of cast-iron plates bedded on concrete, makes the wheeling of the coke a very easy matter. The discharging-floor is constructed of iron plates on girders; and the charging-floor, of girders and concrete.

First Cost.—The cost of the installation, excluding the retort-house, but including everything else above the foundation of the benches—i.e., all brickwork in the arches and piers, regenerators, settings, flues and chimneys, retorts and fire-bricks, the charging, discharging, and coke floors, all the ironwork of the benches and floors, and chimneys, columns and girders, buckstays, mouthpieces, ascension-pipes, hydraulic mains, gas and tar mains, valves, gas-engine, coal-breaker, elevator and conveyors, overhead store-hoppers and charging machine, &c.—works out to about £63 per mouthpiece, without royalty. An installation of horizontal retorts in a stage-floor house, built as far as possible under the same conditions as to strength, size of retorts, furnaces, &c., and equipped with power stoking-machinery, would cost about £76 per mouthpiece. There is, therefore, a very substantial difference in favour of inclined retorts.

Cost of Working.—In working inclined retorts, there is no saving in wages in the matter of foremen, firing, or coke-wheeling, which are the same as with horizontal retorts. The saving arises in the charging and drawing, and in conveying the coal to the retorts. At Salford, the charges for this work are as under—

Inclined Retorts.

No. of retorts, 112; coal carbonized, 134 tons per 24 hours.

Number.	MEN EMPLOYED.	Rate.	Total.	Cost per Ton Carbonized.
	Class.	s. d.	£ s. d.	
6	Chargers	5 0	1 10 0	
6	Drawers	5 0	1 10 0	
6	Hoppermen	4 0	1 4 0	
2	Enginemn	4 4	0 8 8	
			4 12 8	8'29d.
2	Coal unloaders . . . .	..	0 11 2	1'00
	Gas used in breaking, elevating, and conveying, oil, waste, and sundries. . . . .	..	0 8 4	0'75
22	Totals . . . . .	..	5 12 2	10'04d.

The cost for similar work in the horizontal retorts worked by hand, is as follows:—

Horizontal Retorts at Salford.—Hand Charging.

No. of retorts, 192; coal carbonized, 237 tons per 24 hours.

Number.	MEN EMPLOYED.	Rate.	Total.	Cost per Ton Carbonized.
	Class.	s. d.	£ s. d.	
68	Stokers.	5 0	17 0 0	
17	Coal wheelers.	4 0	3 8 0	
1	Hoistman	4 0	0 4 0	
1	Engine and boiler man .	4 4	0 4 4	1s. 9'08d.
			20 16 4	
4	Coal unloaders . . . .	..	0 19 9	0 1'00
	Fuel, water, oil, waste, and sundries per ton .	..	0 14 10	0 0'75
91	Totals . . . . .	..	22 10 11	1s. 10'83d.

The cost by the hydraulic machinery used in another retort-house is given in the following table:—

Machine Charging at Salford.

No. of retorts, 140; coal carbonized, 168 tons per 24 hours.

Number.	MEN EMPLOYED.	Rate.	Total.	Cost per Ton Carbonized.
	Class.	s. d.	£ s. d.	
6	Chargers	5 6	1 13 0	
6	Drawers	5 3	1 11 6	
6	Backers-up	5 0	1 10 0	
6	Lid-openers and pipe-jumpers	5 0	1 10 0	
6	Coal-breaker attendants .	3 6	1 1 0	
3	Enginemmen	4 4	0 13 0	
1	Fitter	5 4	0 5 4	
1	Boilerman	4 4	0 4 4	
35			8 8 2	
10	Less value of the firing done by these men . .	..	2 10 0	
25			5 18 2	8'44d.
5	Coal unloaders . . . . .	..	1 4 6	1'75
	Fuel, water, oil, waste, and sundries per ton . .	..	1 1 0	1'50
30	Totals . . . . .	..	8 3 8	11'69d.

It must be borne in mind that these figures are the actual costs paid at Salford, under the conditions as to rates of wages, peculiarities of retort-houses and surroundings, &c., which prevail there. Probably better results, so far as the cost of working goes, are obtained elsewhere with larger installations worked under more favourable conditions. This applies to all three systems.

Time occupied in Charging.—The average time occupied in charging and drawing the inclined retorts, from the opening of the first lid to the closing of the last, on a draw, averages a trifle over one minute per retort; and the charging is, to say the least, as well done as it can be by the most perfect charging-machines, while the discharging is easier and quicker than is possible by machinery, however perfect.

Wear and Tear.—The first bench of inclined retorts at Salford (which it should be remembered was built by men who had had no previous experience with inclined retorts, and with retorts made by a firm who had not produced this kind before) worked for 1092 days before resetting. This is not a bad record for a first setting; but the second lot put in will, of course, last much longer, for there will be no further shrinkage of the brickwork of the bench. There is every reason, therefore, to expect that the durability of inclined retorts will be greater than of the horizontal type. This is not remarkable when it is remembered that no rakes or scoops are put into them, and that the evenness of the charges equalizes the strains imposed. The wear and tear of the machinery and gas-engine have been very slight. In two years, the cost of labour and material used on repairs to engine, coal-breaker, elevator, conveyor, and charging-machine was £13.

Gas Produced, Illuminating Power, and Residuals.—As the inclined retorts form but a small proportion of the total number at Salford, it has not been possible to work them entirely by themselves for a long period. But they were worked independently for about six weeks in the summer; and the results, both in yield per ton and illuminating power, were found to be practically the same as obtained

from horizontal retorts—the difference being slightly in favour of the slopers. It was not, however, possible to determine the yield of tar and ammoniacal liquor separately. All that can be said is that the total yield of these residuals per ton has not diminished, nor perceptibly increased, since the inclined retorts have been at work. The quantity of coke per ton is the same in both systems; but the quality is slightly superior from the inclined retorts. Altogether the results have been so satisfactory that the Gas Committee have decided to adopt inclined retorts exclusively in future, and to convert the existing horizontal settings to this system as opportunity offers.

In view of its many advantages, it is difficult to understand why the inclined system has not been more largely adopted in this country. Possibly the early failures have done a great deal to retard it, and also the heavy royalties. But there are now many successful installations at work in this country and on the Continent; and when the royalties cease by the expiration of the Coze patent in June of next year, there is no doubt it will be greatly extended.

In conclusion, the writer desires to express his obligations to Mr. Woodward and Mr. Hartley, the present Engineer and Assistant Engineer of the Salford Gas Department, for the great assistance they rendered him in constructing and perfecting the installation described.

Discussion.

Mr. DAVID TERRACE (Middlesbrough) said Mr. Shoubridge had put the case for inclined retorts very well. In Middlesbrough they worked on much the same lines; but with one or two slight differences in details. Instead of a triple shoot, they had separate shoots (on Mr. Shoubridge's principle), one for each level of retorts, which he thought an advantage because, not only could the charging be done very simply, but they were much lighter. Instead of the central tank arrangement, they had the old continuous hoppers, so that the single shoot was charged immediately from them. Instead of having to travel to the centre and back again, they charged from the coal immediately overhead. They were now working the inclined retorts by themselves, and found the cost something like half what it was with horizontals—namely, 1s. 10d. instead of 3s. 4d. per ton, including taking the coal from the store or the truck, until the coke was put into the yard; neither of which was included in Mr. Shoubridge's figures. They worked a steam-engine, though a gas-engine would be better; but they had an old steam-engine which was made use of. He was quite satisfied that inclined retorts were the retorts of the future, and that horizontals would disappear in time. In comparing inclined retorts with machine stoking, the size of the works must be taken into account. No doubt machinery was good for large works which could keep it in constant action; but for medium-sized works, he thought inclined retorts preferable. Mr. Shoubridge had not said anything about the creeping of the coal after it was put into the retort. They used Durham coal exclusively—twelve different kinds, one of which did creep; but the others remained perfectly as they were laid.

Mr. J. F. BROMLEY (Batley) said Mr. Shoubridge seemed to have combined in his charging apparatus some of the best points to be found elsewhere. They used shoots similar to those referred to by Mr. Terrace; but the best of them were faulty as to level charging. Take one line of retorts—the top lot, for instance—and charge a dozen. Eight of them would be beautifully charged; but in the other four most of the coal would be at the bottom or occupying about two-thirds of the retort, and the other one-third with no coal in would be white hot. In another case, some of the coal would stop in the middle; tapering one way or the other. This in a measure arose, he believed, from the coal—especially the fine coal—taking fire instantly and sticking to the bottom of the retort. In other instances, the coal would be nearly all at the top. If something could be devised by which this could be altered, and uniform charges put in, it would be a great improvement. His idea was that it would be better to use double screened nuts. He had tried them, and found they could put in level charges; but with coal of different sorts, some screened and some unscreened, the charges could not be put in uniformly, resulting in the charge being about half burnt off. Another point was that it was said one man did the whole of the work of the drawing stage for eight arches of sevens. He thought this was a little too much; and he should not like to ask any man under him to attempt

it. One man might do on the charging stage; but certainly not less than two on the drawing stage. With regard to the expeditious manner in which the coke was discharged from the retorts, this was all right enough when the charges were thoroughly burnt off; but if they were not, there was considerable difficulty in getting them out.

Mr. W. A. VALON (Ramsgate) congratulated Mr. Shoubridge on his admirable paper. He had had the pleasure of visiting the works at Salford; and most certainly, of all the installations of sloping retorts he had seen, it was one of the prettiest and most successful. Still, he was not converted to this principle as superseding horizontals, and hesitated to believe that the days of horizontals were numbered. He looked upon the sloping retort as a valuable additional mode of carbonizing coal under certain circumstances; but he did not think, all things being equal, that there was anything to warrant the belief that they would drive the others out of the market. Mr. Shoubridge commenced by recommending the retorts for certain reasons; but he would suggest that these reasons were all arrived at before he tried them. Very likely his experience with the retorts afterwards confirmed the reasons for having adopted them; but they could not well be the reasons for their being adopted. In the paper the whole cost per mouthpiece was put at £63, and that of horizontal retorts and machinery at £76. He presumed this meant that one sloping retort cost £126; while the cost of the other would be twice £76. His own opinion, deduced from experience, was that the erection and construction of sloping retorts were very much more expensive than with horizontals, leaving machinery out of the question. They had to be built higher; and the retort-house itself must be higher. The only thing, as far as he could judge, in which there was any saving was in ground space, which, in some cases where new works were not being laid out, was of great consequence. But, putting all this aside, he did not think that the comparison between sloping and horizontal retorts was in favour of the former. In comparing the cost with other systems, he thought it had been kept down on one side—he did not say purposely or unfairly—and fully charged on the other. For instance, in Mr. Shoubridge's paper, on the machinery side six coal-breaking attendants had been charged, but under the heading of inclined retorts nothing was charged; and it seemed to him that coal breaking was as necessary in the one case as in the other. Then there was a charge for a fitter and boiler man on the one side, which did not appear on the other. Of course, with the gas-engine a boilerman was not required; and perhaps, the installation being new, a fitter had not yet been wanted. Nevertheless, these men were needed at some time; and though the installation was new, this should be taken into consideration. The comparison was between machine-charged retorts which had been at work for some time, and the new system. Now as the machinery in use at Salford was of a somewhat antiquated type, he did not think this was a fair comparison with sloping retorts of the newest and most approved pattern; and he thought the best possible system of carbonizing coal by machinery should be compared with what was acknowledged to be the very best mode of using sloping retorts. It was impossible to discuss a paper where the line was drawn at certain particulars and others were not given, so as to arrive fairly at what would be the expenditure in both cases for cost and maintenance. He hoped at some time they would have a paper dealing with all these details succinctly. The other day Mr. Harman in London gave as the figure for hand labour, 1s. 6d. per ton; for inclined retorts, 10d.; and for stoking machinery, 4½d. Mr. Tysoe, of the South Metropolitan Gas Company, a short time since gave 1s. 3½d. per ton with West's machinery as the total cost of the coal from the retort-house to the coke-yard, including everything. If they could get a corresponding figure for sloping retorts to that given by Mr. Tysoe, and it compared favourably, he should be glad to have it. He was still in favour of horizontal retorts charged and drawn by the best kind of stoking machinery; and, all things being equal, he was convinced, from study of the subject, that with a fair balance struck as to first expenditure, maintenance, and cost of carbonizing, the relative make per mouthpiece with the same size and length of retort, taken as it should be taken as a whole, horizontal retorts were at the present time more economical to construct and work than sloping ones. At the same time, he fully agreed that the erection of sloping retorts might be justified by circumstances.

Mr. ALEXANDER WILSON (Glasgow) said he had had a good deal of experience with machine charging; and on taking out the corresponding charges at their works to compare with those stated in the paper, adding up the different items, they worked out to £6 16s. 6d. for 240 tons, as against £8 8s. 2d. for 168 tons carbonized at Salford. Adding the same proportion for fuel, water, oil, waste, and sundries—1s. 5d.—gave on the same lines, with 1d. per ton for coal unloading, a total of 9s. 33d., against the figures given by Mr. Shoubridge of 11s. 69d. for machines and 10s. 04d. for inclined retorts. One gentleman spoke about the uncertainty of charging the inclined retorts. With machine stoking there was no uncertainty. The retorts could be charged just as they chose—either level, or if one end were hotter they could put in a heavier charge—and if, as sometimes happened, one part was found duller, they could keep part of the charge out, which could not be done with inclined retorts. The time for charging and drawing was stated to be about one minute; they never exceeded this at Glasgow. Their men did about forty retorts per hour; and the charging time was 35 minutes on the average. It had been done in 25 minutes. They were getting over the difficulty about ground space by putting in settings of twelve where they had only eight before, and heightening the machines. With hand charging they could only get up to a certain height. Mr. Stelfox showed them the previous day how much higher they were able to go in Belfast; but he did not think they could get men generally to charge such high retorts as he had. With machinery one could go to any reasonable height; and he did not know that they were going to stop at twelve. It was merely a question of getting equal heats over the setting. Coal breaking and machine charging required a great deal of attention; but he did not think six coal-breaker attendants were necessary for 168 tons per day. At Dawsholm, they had only three coal-breaker men for 240 tons—one on each shift.

Mr. H. HAWKINS (Todmorden) said a few years ago the inclined system was adopted at Todmorden; the retorts being 20 feet in length, set at an angle of 32°. In his first season's experience, he had a great deal of difficulty in connection with the charging. In the first place, they found that, however careful they were in putting in the charges, before they were long in, the retort was completely bunged up at the bottom. These retorts were tapered 4 inches; and the coal used was slack. They did not get any round coal at all. He also found by slackening off the bottom cover about half an hour after the charge was in, that the coal had swollen up and got almost to the top of the retort. This impeded the progress of the gas to the ascension-pipe; and so they were troubled with a large number of stopped ascension-pipes. He paid great attention to that; and very often during the day men had to go to the same ascension-pipe several times. The cause he found to be that the coal, when put into the retort at a certain speed, caused an amount of dust to come forward, which accumulated with the tarry matter; and, when taken out, it was found to be simply coal dust. This difficulty had since been overcome. They were now putting in a fresh arrangement; the Council having just decided on the matter—viz., working with one bed as through retorts, putting the mouthpieces at the top, with ascension-pipes also on the bed of the hydraulic main, and connecting the two with the foul main. It would be completed in about three weeks; and they were looking forward to testing it during the summer months. He felt sure that the days of horizontal retorts were numbered, and was satisfied that inclined retorts were far cheaper when properly worked. He could not say he obtained such excellent results as Mr. Shoubridge mentioned; for men would not work in Yorkshire as they did in Lancashire. He was looking forward to the results of one bed with the eight retorts; and if it was satisfactory, no doubt the Committee would give him permission to go on with the whole lot.

Mr. C. A. CRAVEN (Dewsbury) said some time ago he had a great prejudice against inclined retorts; for he went to some places (which he would not particularize), and was not favourably impressed by them. Since then, however, the system had made great progress; and to-day he was prepared to corroborate the opinion of Mr. Hawkins, that greater progress would be made by inclined retorts than by horizontals, and that more installations of them would be put up. At Dewsbury, they had put in an installation of eight sets in one bench, and eight retorts per set. They

had working about Christmas time six beds of horizontals in sevens, and four beds of inclined retorts in eights; and with regard to wages, there were eighteen men on the horizontals, and nine men and an engineman on the slopers. They made more gas with the ten men than with the eighteen. He did not find any difficulty at all about the charging. Everyone commencing the new system would find many difficulties at the beginning; but it was only a question of attention. Everyone who went in for the system must be prepared to give a good deal of care to it; and eventually, he believed, they would overcome the difficulties. Their retorts were 20 feet long, eight in a setting; and they were getting 130,000 cubic feet of gas per 24 hours, charging every six hours. He did not quite agree with Mr. Shoubridge, with regard to his storage. He preferred to have a single hopper for each set. They had storage for ten tons, in each hopper, and had three fixed measuring chambers for each bed, holding about 8 cwt. each, which gave 11 tons 5 cwt. of storage. By so doing, he got the coal elevated during a portion of the day, and had no machinery going at night. The machinery was actuated by a 10-horse power gas-engine, which worked admirably. It did not cost more than $\frac{1}{2}$ d. per ton for crushing, elevating, and conveying to the hoppers. If the coal was dropped into elevated hoppers at one point only, no doubt in some parts the round coal would go to the sides, and the small to another place; and, when this was the case, they did not charge so well. For every hopper they had three slides; so that they could direct the discharge of the coal in the first section, and then follow with the others, and thus get a better and more equal size of coal throughout the bunker. He agreed with Mr. Shoubridge in his remarks with regard to the quantity and quality of the gas and tar and ammoniacal liquor. He could not thoroughly substantiate the two latter items; but he was certain that the gas required less canal to keep up the standard. With regard to tar, he was under great apprehension at one time that it would be too thick—and, in fact, the tar contractor told him before beginning the work that he probably should not be able to pay the same price for it. Yet, though they obtained very good heats—indeed, if they liked they could easily burn the stack down—he was glad to say they had had no difficulty whatever about the tar. He thought it was rather thinner than before. He was inclined to agree with Mr. Bromley that the labour Mr. Shoubridge had put down was rather too little. At Dewsbury they were working on a more liberal scale. With regard to the general saving in wear and tear, this was most decided; the advantage lay with slopers as compared with machinery. The firing cost very little; about 14 lbs. of coke per 100 lbs. of coal carbonized amply sufficed for the Dewsbury inclined-retort installation. They had elevators and crushers in duplicate. The railway went immediately past the end of the retort-house; and they had a sliding arrangement with shoots and stops to regulate the speed, which almost worked automatically. All the attendance required was that of a youth to pick out anything the colliers might leave in the coal. Sometimes they would leave wedges, or perhaps the top part of a pick. He did not think it was done intentionally; but still it wanted looking after. He arranged the check-stops so as to divide the coal into two streams; and the youth who looked after the coal delivery had within reach a lever, by which he could stop the machinery instantaneously, and re-start it again as required. Then, with regard to labour, now they had got down to two beds, it was a great difficulty, as it cost more in labour than when one employed more retorts. It was possible to work more economically with a whole set of four, six, or eight beds; when one got below four, it was necessary to leave the eight-hour shift, and adopt what the men called twelve-hour shifts, but which were really ten-hour shifts. All this work could be done in the ordinary way, with more than two beds, for 1s. 2d. per ton, embracing everything—and including a leading stoker—and he found there was a great saving over the old system. In large works, where they could keep a full set of retorts going all the year round, considerable saving would be effected over any other system.

Mr. ISAAC CARR (Widnes) said he had had an opportunity of inspecting the inclined retorts at Salford, and was very pleased to agree with Mr. Valon in saying that it was certainly one of the finest installations—if not the finest—in the whole country. It reflected the greatest credit on Mr. Shoubridge's constructive ability and mechanical ingenuity.

The paper was an excellent one for inclined retorts; but he was not sure it was so excellent against them—*i.e.*, that difficulties which had to be encountered had not been mentioned. They had had a little of the other side from Mr. Bromley, who said something about coal creeping. Then there was another common term in connection with inclined retorts, known as "tickling." These were pretty names, which the stokers understood very well, and had peculiar ways of giving expression to. He had seen an inclined retort tickled; and he must say he would rather have drawn half a dozen horizontals than tickle that one inclined. At the same time, in common fairness to Mr. Shoubridge, he must say that this did not occur at Salford. The installation there worked like a charm. At the time he saw it, the coke came out without any difficulty. He believed the retorts were subject to certain vagaries with the coal. While one class of coal did very well, with other classes of different sizes or quality all sorts of difficulties arose. With regard to the comparative cost of the erection, he should have liked to know the author's cost of erecting horizontal retorts without stoking machinery. Mr. Shoubridge gave a figure of £13, or £6 10s. per annum for maintenance of the gas-engine and machinery; but he trusted he did not ask them to accept that in all seriousness as the cost of maintaining the big installation for a period of two years. Rakes and shovels could not be bought for any system of ordinary retorts for this money that would keep them going for a quarter of the time. It might be that everything being perfectly new, it did work for this time at the low cost named; but he (Mr. Carr) could not accept it as being the cost at which it was possible to maintain such a plant. With regard to the figure of 10d. and a fraction per ton for the cost of carbonizing, it was certainly very wonderful, if true. He said "if true" because he feared that the figure was not inclusive of all the charges of the carbonizing department; for on turning to other works where nothing but inclined retorts were employed, as given in "Field's Analysis," he found, in the case of Brentford, that the cost of carbonizing was put as 2s. a ton. He wanted to know how it was that at Salford they could do it for less than half the money.

Mr. GEORGE TOOLEY (Leeds) said his Committee visited Mr. Shoubridge's works, and also those at Brentford; and from the information obtained from them they decided to put up something like 200 retorts, which he expected to get into work when he returned home. One very important point had been missed in the discussion, though Mr. Craven just touched on it. Mr. Shoubridge—like Leeds—was in a hot-bed of Unionism, and suffered from the difficulties which arose when some big man came from London and persuaded the men that they had a grievance which they did not know before, and that they ought to have more money and do less work. This led him and his Committee to put up inclined retorts. They were in the same position at Leeds. The point was this: In a retort-house (and he had three) with 300 men to handle, if they got obnoxious, it was a very great gain if the number could be reduced by half. He expected to do more than this, when the system was put to work.

Mr. J. P. LEATHER (Burnley) said, after his experience of about eight years with inclined retorts, he was still in favour of them as compared with horizontals, though he did not say that at his works he had all the advantages he might if he were putting up a new installation now. Mr. Shoubridge's was erected after seeing his and others; and he was able to hit upon an improvement which Mr. Terrace had himself adopted to some extent. With reference to Mr. Valon's remarks, the points put forward in the paper as reasons for adopting these retorts, were found by experience to be good reasons for putting up others when the time came. The first reason was smaller first cost. This was a rather difficult question, as there were so many different ways of designing a retort-house for either inclined or horizontal retorts. It was easy to spend the £76 per mouthpiece Mr. Shoubridge mentioned on horizontals; and it was possible to put them in for less even with machinery. Their cost for inclined retorts, 15 feet long, would come to rather less than £63 per 10 feet, as stated in the paper. But there was also a saving in the retort-house. When the house was built, they were not quite sure which system would be adopted. It was only decided to have inclined retorts when the house was nearly finished; and all they had to do was to add 2 feet to the height. The width was the same; and they got 30 feet of inclined retorts, in place

of only 20 feet of horizontals—that was, two 15 feet set the opposite way to Mr. Shoubridge's, with the charging stage in the middle. This he still thought rather the better plan, though in his case they were a little bit too close together. Then with regard to wear and tear, as they were first put up the wear and tear would be a little bit more. It was certainly necessary to make everything good and strong and well stayed at the bottom, to prevent slipping and spreading out. If once it came out, there was no putting it back. If inclined retorts were well set and stayed in the first instance, their experience was that they would last longer than horizontals. His second lot, put up in 1892, were still in use, though they had not been worked so fully. Still, they had gone four good seasons, and were ready for work again. The saving in labour was nearly 1d. per 1000 cubic feet as compared with West's manual stoking machinery used on other parts of the works.

Mr. JOHN WEST (Manchester) said everybody appeared to be so satisfied with what he was using himself, that it seemed a most pleasant position for those present to listen to them. He had seen Mr. Shoubridge's installation, and had been much impressed by it. It was undoubtedly the best piece of construction in connection with inclined retort work he had seen; and for moderate and small-sized works, he was disposed to think Mr. Shoubridge's arrangement of a travelling shoot was most economical. He did not propose to go into the relative cost of the different systems. He built both, and should be prepared to take any number of orders for retort-houses on the horizontal system—including machinery—at the same price as was paid for the inclined system. With regard to the saving, various things had to be taken into consideration—particularly the relative size of the works, and the position each manager was in when he required to make extensions. There were situations in which he should be disposed to recommend slopers. This would be in a narrow house, where one could not get in manual or power machinery. When there were a large number of retorts which could be worked continuously, there was no doubt that power machinery was by far the cheapest method of carbonization. Mr. Wilson had given figures of what they were doing in Glasgow up to a certain point; and Mr. Valon, inclusive figures for the South Metropolitan Company. In all cases, it would be well to get a figure including everything, from the taking of the coal from the store to the tipping of the coke in the yard. This would include the tickling business in connection with the inclined retorts, which had been referred to. There were great differences of opinion as regards the cost of working. The other day he heard Mr. Harman read a paper before the Society of Engineers, giving his practical experience of carbonizing by hand labour, power machinery, and inclined retorts. He did not take the whole of the charges into account; but picked out the relative number of men and cost per ton of coal carbonized for simply drawing and charging the retorts under each system. He gave the cost of hand labour at 1s. 6d. per ton; inclined retorts, at 10d.; and power machinery, at 4½d. The previous week Mr. Marshall gave the cost at 1s. 6d. per ton; but to this he added afterwards 3d. for getting in the coal and taking out the coke. He was glad to hear from Mr. Terrace that his total figure was 1s. 10d. per ton. He wanted to get the total figure as a basis to guide managers, though personally he did not care which system was adopted. Each had a certain amount of machinery connected with it; and this would suit him. He thought inclined retorts might go on; but he did not believe the horizontals would be knocked out any more than electricity would knock out gas.

Mr. R. H. TOWNSLEY (Leeds) said he had followed the paper with very great interest; and he was sure the members were indebted to Mr. Shoubridge for bringing before them a subject which was at the present time exercising the minds of most engineers, particularly those who had extensions in hand, and had not made up their minds as to what system of carbonization to adopt. As most of the members would be aware, they had erected at Leeds what he believed to be the largest installation of inclined retorts in England. They proposed starting them during July; and he would be pleased on a future occasion to give the members some information as to their working. With regard to the relative results obtained from the two systems of machine stoking and inclined retorts, they had had great diversity of opinion that morning; but he failed to see how any fair comparison could be made without taking into

consideration the conditions as to wages and surroundings of the various works mentioned. They all knew that no two works were alike; and for this reason, what could be accomplished in one place was impossible in another. Seeing, however, that Mr. Shoubridge had the two systems working under similar conditions and surroundings, he (Mr. Townsley) thought the information he had given was reliable, and proved that the cost of working with the inclined retorts was less than that of machine stoking. He was very much surprised, when reading the discussion on Mr. Marshall's paper the previous week in London, to find that several engineers had experienced a "creeping" of the coal in the retorts, more especially those who carbonized Durham coal. Mr. Shoubridge, speaking on this subject, mentioned that he had not had any creeping with the Lancashire coal he used. He (Mr. Townsley) would like to ask him if he had employed Yorkshire coal, and, if so, whether he had had any difficulty in this respect. As at Leeds they used coal from about thirty different collieries, the matter was of great importance to them. There was no doubt the system of carbonization by inclined retorts had a great future before it; and, in his opinion, it would very largely supplant horizontal retorts.

Mr. ROBERT PORTER (Elland) said he might give a few figures with regard to the cost at Elland. He had put in an installation of retorts with 64 mouthpieces, together with an elevator and conveying and charging machinery; and the total cost was £41 per mouthpiece, including West's manual stoking machinery. The settings were eights, fired with generator furnaces; and the smallest production per bed was 65,000 cubic feet in 24 hours. He named this because Mr. Craven gave a valuable figure as the production of a through setting of eight inclined retorts at 130,000 cubic feet per 24 hours. This was equal to two single beds, or one through bed of horizontal retorts. This gave 65,000 cubic feet per single bed—the same as he was getting with eight beds of eights. But this was only with six-hour charges; and it could be considerably increased if required. He might further refer to an installation now being put up which, including elevating and conveying machinery for taking the coal from the canal boat and delivering it opposite the retort mouthpieces ready for hand charging, and including also regenerative furnaces, stage floor, and all new ironwork complete, was to cost £55 per mouthpiece. He thought these figures compared most favourably with those given in the paper; and that from them it would appear the advantages claimed for increased production of gas in the inclined settings were not so large.

The PRESIDENT said this had been a very useful discussion; and both sides of the question had been put forward. He had not seen all the installations of inclined retorts; but he must say that if ever he wished to induce anyone to give them a trial, he should send him to Salford. With the exception of the setting he saw of Mr. Braidwood's some years ago, and that at Salford, he had not had the pleasure of looking at any which did not require to be tickled before giving up their contents.

Mr. SHOUBRIDGE, in reply, said he was very pleased to find that his paper had produced such a good discussion, which more than repaid him for the trouble he had taken in writing it. His object was not to institute a comparison between inclined retorts and stoking machinery, but simply to describe what had actually taken place at Salford. The necessities of the case, however, compelled him to bring in the question of stoking machinery, because it was the competing system; and all gas engineers must decide between the two, when considering extensions and the building of large retort-houses. He went round to various works to see what had been done before commencing to design the retort-house which had been described. Mr. Valon's remark that his reasons for adopting inclined retorts must have been arrived at after, not before, erecting them was a mistake, because his Committee formed the opinion from what they saw, and from the figures given them, that there would be less wear and tear, less first cost, &c.; and the facts had thoroughly confirmed this. As to separate shoots and a continuous hopper, which Mr. Terrace preferred, this was a matter of opinion. At Salford, they found no difficulty in working with a single hopper in the centre of the bench; and it was a much cheaper arrangement than a continuous hopper. With regard to the charger, in large installations probably single or double shoots worked on this plan would be better than

triple shoots; but for somewhat small installations, such as that at Salford, the triple shoots were to be preferred. Mr. Terrace and several others called attention to the creeping of the coal. He did not mention it in the paper, because he had experienced no trouble in this respect, though there was no doubt it was a difficulty with some kinds of coal. Mr. Frank Livesey had pointed this out recently; and others had noticed the same thing. He had tried all kinds of Lancashire coal, cannel, and a good many varieties of Yorkshire coal, and had never found creeping to take place with them. Before coming to the meeting, he wished to verify the matter; and on his way he called at Salford and inspected a large number of retorts which had been charged, both at the top and the bottom, and made further inquiries. This fully confirmed his experience while there, that creeping did not take place with the kinds of coal he had mentioned. No doubt it did occur with some sorts of Durham coal; but it was a difficulty that probably could be overcome by adopting special means. Mr. Bromley seemed to think he had condemned separate shoots; but it was not so. He only pointed out that with these shoots, which had no means of controlling the flow of the coal, one did not get an even charge. The great difficulties in getting out the coke, and the blocking up of the retorts which had been alluded to, had arisen from the coal being put into the retorts without proper regulation. It did not do to deliver the coal from one level to three tiers of retorts without regulation; but where the flow of the coal was properly controlled, the charging was absolutely even with any sort of coal of which he had had experience. The coal did not block up the bottom of the retort. The carbonizing was just the same as with the horizontals; and the coke came out like an avalanche. Mr. Valon was still a firm believer in horizontals and stoking machinery, and so were several other speakers; and there was no doubt that in very large installations stoking machinery gave excellent results, and would work as cheaply as inclined retorts. The difference was in the first cost and in the maintenance. Those who, like himself, had had lengthened experience of stoking machinery as well as inclined retorts, would know that after a time there was considerable wear and tear, and more trouble in looking after the machinery than there was with inclined retorts. Mr. Valon thought there was no saving in the first cost compared with horizontal retorts worked without machinery, except economy of ground space. This was wrong; for with the inclined retorts only one hydraulic main and one set of ascension-pipes were required. This made a considerable difference in the cost, and went far to compensate for the additional brickwork needed. It must be remembered also that though one had to increase the height of the brickwork with inclined settings, the width was diminished; and he had found, after taking careful account of the cost of inclined and horizontal settings, that there was no more expense in building inclined retorts than horizontal retorts in a stage-floor house. In reply to Mr. Carr's question, it cost about £62 per mouthpiece at Salford to build horizontal retorts, in the same way so far as the size of retorts, description of furnace, &c., in a stage-floor house without machinery; but he was aware that it could be done for less. The cost depended on the design of the setting, and the prices of the materials, which varied in different localities. In writing the paper he did not desire to hold up the Salford installation as the best, and one for everybody to imitate, but simply to show what had been done there. They could all form their own conclusions, and improve on his plan, as much as he hoped he had improved on some others. It was only one step in the progress of the inclined system. Mr. Valon thought that, in giving the account of the cost of working, he had cut it down in some way, so that it did not compare fairly with machine charging. He had not cut anything down or put anything in; he simply took the actual cost of the working from the books. The figures were not arranged to show up one system, or to run another down, as had been suggested. The same gentleman called attention to the coal-breaker attendants. At Salford, they had a peculiar arrangement of coal conveyor, which necessitated two men filling the scoops as they went up; and this caused the cost of the work to be larger than it was in other installations where these men were not needed. If he had to describe an ideal system, he should have given the best possible results in each case; but he had not done so. He had given the exact cost of the working at Salford. Mr.

Leather and Mr. Craven thought the figure he had stated as the cost of working inclined retorts was a great deal too favourable. But they seemed to have overlooked the fact that it did not include taking the coke out of the retort-house or the firing. It was not an inclusive figure. The rod, therefore, must not be compared with other figures where all charges were included. The Salford installation, he was aware, owing to local conditions, was not the best so far as cost of working went. Mr. Craven had got his total figure down to 1s. 2d. They could not do this at Salford. They started with an installation having only eight beds in line, which was not sufficient for the most profitable employment of the men. In other places, where there was a much larger number of retorts in use, better results were attained. The total cost at Salford worked out to about 1s. 9d., all included; but it had been done for much less in other works. If they had the best possible arrangement of inclined retorts, he thought the cost would compare favourably with the best possible arrangement of stoking machinery, such as Mr. West had given. With a large house, in which stoking machinery dealt with thirty settings of tens, the cost would naturally be very low; but it depended so much on local conditions that fair comparisons were very difficult to make. Mr. Bromley said he was struck with the fact that only one man was required in drawing eight beds of retorts, and said it could not be done. He could only say that it was done every day; and the man was not overworked either. Opening and shutting the lids and putting in the stoppers was practically all he had to do. In some works, there had been a great deal of the tickling which Mr. Carr spoke about; but this was owing to the charging being bad, so that the coal had gone to the bottom and swelled, and jammed in the retort. In such a case, it needed a great deal of tickling to get the coke out. Some people who erected inclined retorts, knowing they would not require to use rakes, had reduced the depth of the retort; and this, of course, had added considerably to the difficulty. Mr. Wilson pointed out that there was no uncertainty in machine charging. This was quite true; but there was also no uncertainty in charging the inclined retorts at Salford. In some other places, he was aware the charging had not been very regular. Mr. Hawkins referred to the difficulty of stopped pipes; but this was a trouble which some of them had had with horizontal retorts. There had been only one stopped pipe in the Salford installation since it started. Stopped pipes were not a necessary consequence of inclined retorts; and with a proper arrangement of the hydraulic main, they could prevent them, both with the inclineds and horizontals. Mr. West asked for complete figures; but he had designedly not put them in his paper, because in his opinion they were confusing when they dealt with the coke which was removed from retort-houses in all sorts of ways. There were, however, some figures in the records of the Institute which might be referred to, and Mr. Craven had given one in the discussion. It should be remembered that stoking machinery had been in use for very many years, and had had the advantage of the most painstaking and thorough work of Mr. West and others, who had done wonders in improving it, and had brought it to a very high pitch of perfection. The inclined-retort system was in its infancy; but when it had been going on for twenty years, probably very different results would be obtained. Speaking generally, all he could say was that his faith in inclined retorts was stronger than ever; and he believed they would see a great increase in the number of them erected during the next few years.

STANDARDIZING OF METER UNIONS.

By ROBERT S. CARLOW, of Arbroath.

The reading of this paper—some extracts from which were given last week, p. 1551—gave rise to the following

Discussion.

MR. ALEXANDER WILSON (Glasgow), who was one of the members of the Sub-Committee, said their first idea was to make the work of small managers as easy as possible when they had to change a meter; but as soon as they commenced to think about the matter, they found that, though it pressed somewhat hardly on the managers of small works, the expense in connection with large works was very serious, and it was not thought very much about

because they got into a sort of rut. If a standard, or a set of standards, were adopted, the change of meters, both for large and small companies, would be very much simplified; and the idea was to try and get a standard set for themselves. They thought that, if they went into a scheme for obtaining a standard for the whole country, it might be very difficult to arrange; but if they took the matter in hand for Scotland, they might settle it for themselves. They had arranged it to their satisfaction; and a standard was about to be brought into operation, when they were met by the communication from Mr. Chaney. It would have been a very serious matter if, after agreeing to a certain set of standards, the Board of Trade had stepped in, and another standard, which might or might not be as good, were introduced. And so it was thought better to leave the matter over, and get the assistance of The Gas Institute and the Institution of Gas Engineers, so as to have the matter finally settled. There could be only one view about it. The unions adopted were chosen as being suitable for both large and small companies; and making them with the Whitworth thread, it was thought that if a union happened to get squeezed, the manager might take his ordinary gas-thread tap and make it right again without much trouble. If a Joint Committee could be arranged of the North British Association and The Gas Institute, they might go over the matter again, and perhaps find a better standard; but they would be glad to adopt any system that would suit the convenience of all. The benefit in the course of a few years would be great, and would be worth all the trouble which had been taken.

Mr. J. P. LEATHER (Burnley) said the question was very simple. No doubt it would be an advantage to all works if the unions were alike; but he did not understand what the Board of Trade had to do with it. Whatever standard was adopted, if his Committee did not like it they would not have it. If he wanted a special standard, he asked the meter manufacturers to make it; and he found they were prepared to supply him. He had meter makers coming to him to ask for a share of his orders, who told him that if he ordered even half a dozen meters they would make any union he desired. He had given an order for half a dozen; and they were made just to his union, without any difficulty. He had about 20,000 meters in use, about 14,000 of which were made to one set of unions; while among the other 6000 there were perhaps twenty or thirty different makes. As the old meters came in for repair, he put in in most cases standard unions, or where practicable changing the ring and tail-piece—perhaps putting a die on to the other part to make them fit. If some decision could be come to which accorded pretty much with his own practice, he should be ready to go along with them; but if they were very different, he should probably keep to his own sizes.

Mr. J. W. GLOVER (London) said to his mind it was a matter really of supply and demand. The experience narrated by Mr. Carlow, though limited to Scotland, would have led them to see the inutility of the suggestion made at an early stage of the discussion—that, if the matter were laid before the meter makers, they would of their own initiative adopt a uniform standard. The duty of a meter maker was to suit the convenience of his customers; and this was best done in each locality by the maker continuing to supply meters with similar connections to those he had sent out ten or fifteen years before. Hence, each variety of pattern became stereotyped. If the Institute could influence the members of this and similar societies, and so create a general demand for meters with connections universally interchangeable, they would have taken the most effective step towards what Mr. Carlow rightly called “an eminently desirable reform.” The Board of Trade could do nothing without an Act of Parliament or an Order in Council. If this course were taken, there would no doubt be a provision in the Sales of Gas Act that no meter should be stamped unless it had the standard connections; and then at once there would be a legal standard fixed for all time. Hence the importance of discussing the subject, and informing the Board of Trade as to the best and most convenient standard to be adopted. In London, The Gaslight and Coke Company did exactly what Mr. Leather had described. They insisted on a standard of their own; and some years ago steel gauges were prepared to which all makers supplying the Company must conform. The Company's meters of a given size were now interchangeable. This referred to over a quarter of a million meters. The meters sent out by his firm were all of a similar pattern to

those of The Gaslight and Coke Company, unless otherwise specially ordered; and he believed that for more than half a century some makers had been sending out unions which were interchangeable. He had brought with him two dry meters more than fifty years old—one a 3-light, by Richards, dated 1846, and the other a 5-light of obsolete pattern, of which the unions were practically the same as those being sent out to-day. And the same unions he found interchangeable, in several instances, with both Scotch and English meters of these sizes. The one practical suggestion he had to offer was that they should not only confer with the Institution of Gas Engineers and the Board of Trade, but with The Gaslight and Coke Company, and any others who had standards of their own, so as to arrive, if possible, at only one standard, instead of several as at present, varying more or less in the different sizes of meters.

Mr. JOHN WEST (Manchester) considered this was a very simple matter. Engineers all used the Whitworth thread; and he did not think they need go to the Board of Trade. The meter makers were reasonable men; and the best plan would be to accept the proposal of the Scottish Association, that a Committee of the Institute should be formed to deal with this matter. He should suggest that they should appoint themselves engineers, and draw up a specification; and the whole thing could be speedily settled. Of course, they would specify that all meter connections should be of the Whitworth thread; but the whole of England must combine. If a meeting were called of the whole of the meter makers of the United Kingdom, they would be found to be reasonable business men, and would fall into line and meet the suggestions at once.

Mr. J. L. CLOUDSLEY (London) said uniformity was gradually increasing; and in a short time he believed it would be accomplished. If the Whitworth thread were adopted generally, an enormous expense would be involved, as they would have to change nearly all the meters in the United Kingdom. He thought it would be much better to let things go on as they were; and in a short time matters would adjust themselves.

Mr. WEST said he was speaking for the future. He was not going back to the past.

Mr. THOMAS WILSON (Coatbridge) said they would all agree with Mr. Carlow that, in the interest of everyone concerned, meters should be made with couplings of a uniform pattern. The North British Association did not want them to adopt the couplings that they had selected, but any that might be approved of generally. Even in a small town, where they had to change 500 meters in a year, a considerable saving would be effected by uniformity.

Mr. T. O. PATERSON (Birkenhead) said this was a matter of detail, which could hardly be settled at such a meeting as the present one.

Alderman JOHN MILES (Bolton) said he was prepared to move a resolution that the Council be requested to put themselves in communication with the Institution of Gas Engineers, and also with the North British Association of Gas Managers, with a view to arriving at a standard for the United Kingdom.

The PRESIDENT said there might be some difficulty in getting two or three associations to meet together; and he suggested that the resolution should be to refer the matter to the Council to consider what steps should be taken.

Alderman MILES said he would gladly accept the suggestion, and would move the resolution in that form.

Mr. ALEXANDER WILSON seconded the resolution, which was carried unanimously.

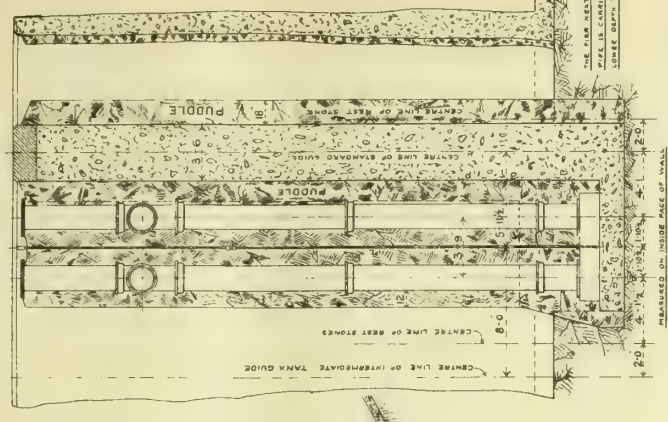
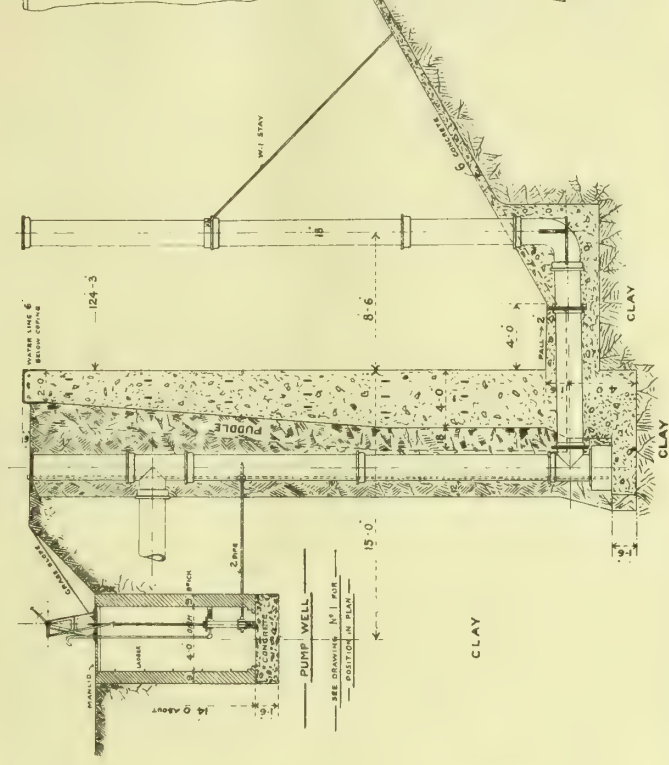
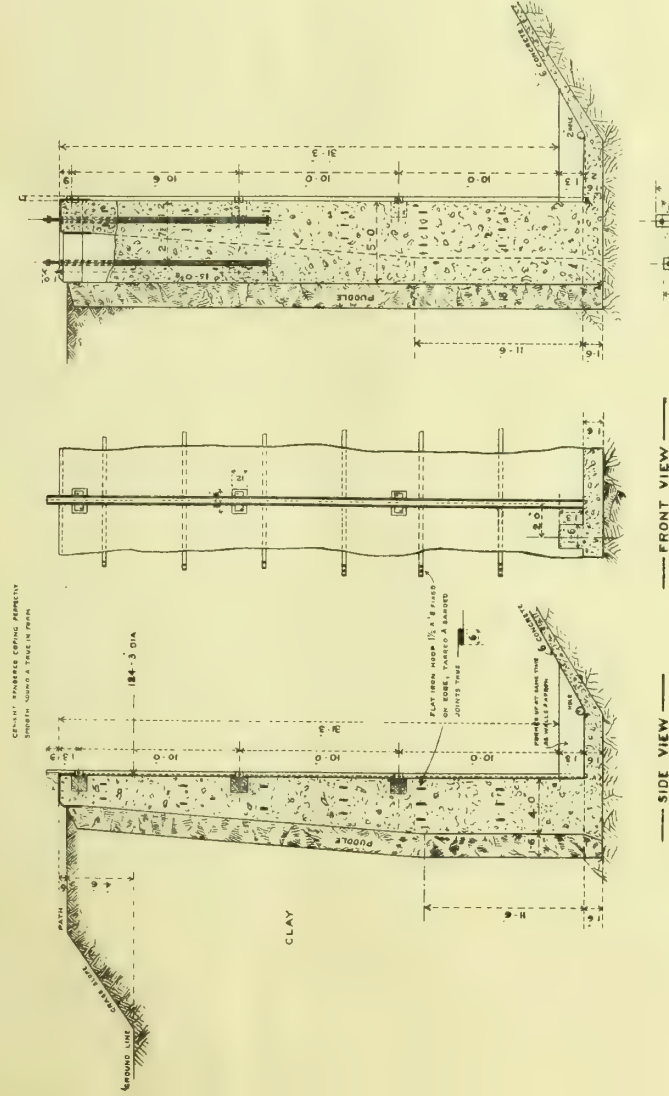
THE NECESSITY FOR AMENDMENTS IN THE GAS-WORKS CLAUSES ACTS, 1847 AND 1871.

By W. F. COTTON, of Dublin.

[Taken as read.]

In dealing with the subject of this paper, it will be unnecessary for me, before a gathering of gas managers, to go into minute detail; and I therefore purpose to commence by stating briefly the relations existing between the undertakers (gas companies), local authorities, and private consumers. I am convinced that few gas managers have not, at one time or another, felt the necessity for amending the Gas-Works Clauses Act, 1871. The Act, as it stands, is very loosely framed. Many of the clauses are defective—thus causing from time to time differences between gas

DETAILS SHOWING WALLS, PIERS, HOOP IRONS, IRONWORK TO BE BUILT IN, &c.



ELEVATION OF TANK GUIDES

SECTIONAL ELEVATION & PLAN OF HOLDING DOWN BOLTS & PLATES, ALSO GUIDES OPPOSITE STANDARDS

ELEVATION OF INLET & OUTLET PIPES

- BACK ELEVATION OF INLET & OUTLET PIPES



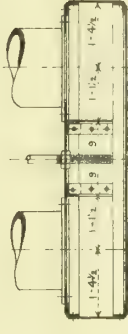
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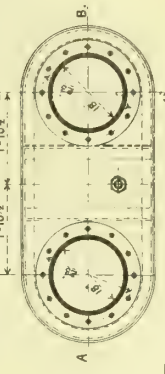
—SCALE FOR DETAILS



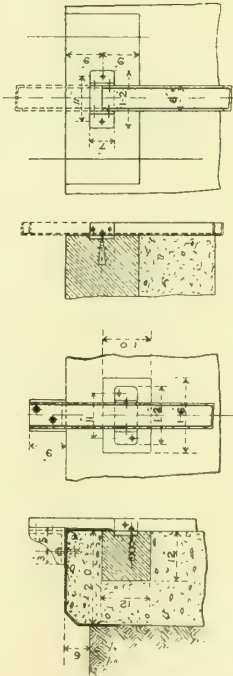
- CAST IRON FLANGE



- CAST IRON FLANGE



WROT IRON FLANGE



-INTERMEDIATE TANK GUIDES-----STANDARD TANK GUIDE

-PLAN OF SYPHON BOX

NOTE!

ALL IRONWORK SHOWN ON THE DRAWING,
EXCEPT HOLDING DOWN BOLTS & PLATES
TO BE FIXED BY THE CONTRACTOR FOR THE
GASHOLDER BUT ALL BUILDERS WORK IN
CONNECTION THEREWITH TO BE DONE BY
CONTRACTOR FOR TANK.

F. S. CRIPPS, A.M.I.C.E.
ENGINEER

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undertakings and local authorities, and sometimes private consumers, very often ending in litigation. I will simply give a few examples of the most glaring defects in the Act, which in my opinion should be amended.

Private Consumers.—By the 13th section of the Gas-Works Clauses Act, 1847, it is enacted that: "The undertakers may from time to time enter into any contract with any person for lighting or supplying with gas any public or private building, or for providing any person with pipes, burners, meters, and lamps, and for the repair thereof, and may also from time to time enter into any contract with the commissioners, trustees, or other persons having control of the streets within the limits of the Special Act, for lighting the same or any of them with gas, and for providing such commissioners, trustees, or persons with lamps, lamp-posts, burners, and pipes for such purpose, and for the repairs thereof, in such manner and upon such terms as shall be agreed upon between the undertakers and the said commissioners, trustees, or other persons." Here we have an enabling, as distinguished from a mandatory or compulsory, section.

Section 11 of the Gas-Works Clauses Act, 1871, enacts that the undertakers shall, upon being required so to do by the owner or occupier of any premises situate within 25 yards of any main of the undertakers (or such distance as may be prescribed by the Special Act), give and continue to give a supply of gas for such premises, and further that they shall furnish and lay any pipe that may be necessary for such purpose, subject to the conditions following: "The cost of so much of any pipe as may be laid upon the property of such owner, or in the possession of such occupier, and of so much of any such pipe as may be laid for a greater distance than 30 feet from any pipe of the undertakers, although not on such property, shall be defrayed by such owner or occupier." The section then points out the manner in which the owner or occupier requiring a supply shall proceed; and it entitles the undertakers to require the owner or occupier to enter into a written contract to continue to receive and pay for a supply of gas for a period of at least two years, of such an amount that the sum payable shall not be less than £20 per cent. per annum on the outlay incurred in providing the pipe, and further imposes on the owner or occupier the obligation of giving security for the payment of all moneys which may become due. Now this section differs materially from section 13 of the Act of 1847, to which I have previously referred, inasmuch as it makes it compulsory on the undertakers to supply gas to the owner or occupier of any premises within the limits stated, and also to provide and lay the necessary service, and to bear the cost of such service up to a distance of 30 feet, provided it is not laid on private property (and not, as in the Act of 1847, which throws the whole cost on the owner or occupier); and in return for this outlay, the undertakers are entitled to require the owner or occupier to enter into a two years' contract.

Public Lighting.—Until the passing of the Gas-Works Clauses Act, 1871, the supplying of gas, services, and the repairs of same, to local authorities, were matters of contract (Section 13, Act 1847). But—as in the case of private consumers—section 24 of the Act of 1871 imposes on the undertakers the obligation of supplying gas to any public lamps within the distance of 50 yards from any of the mains of the undertakers in such quantities as the local authority may from time to time require—"the price to be charged for all gas so supplied to be settled by agreement, and in case of difference, by arbitration; regard being had to the circumstances of the case, and the prices charged to private consumers in the district." This section, it will be observed, is altogether silent on the subject of the supplying and laying of services, and, as I contend, only makes it imperative on the undertakers to supply gas; leaving the supplying and laying of pipes, repairs, &c., in the same position (as between the undertakers and local authorities) as it stood under section 13 of the Act of 1847—namely, one of agreement or contract. However, this, as will be seen from the following facts, is not the view of the Irish Courts.

For a period extending over fifty years, a Gas Company carried out works in connection with the public lighting of a city, at the expense of the Local Authority. The right of the Company to charge for the works so executed, including long service-pipes, was not disputed until the year 1894. The general nature of the work done may be classified into expense incurred for the removal of public

lamps (the property of the Local Authority), the cutting off of gas from the public lamps, the resuming and connecting of same, and several alterations, such as change of site, all being carried out by direction of the Authority; also the laying of services to new lamps—the works being paid for without dispute, in accordance with their nature.

In 1893, the Local Authority refused to pay for this work, and referred the Company to the Gas-Works Clauses Act, 1871, section 24, under which they alleged that the Company were bound to carry out all similar works free of expense to the Local Authority; the Gas-Works Clauses Act, 1871, being incorporated with the Company's Acts. The Company, on the other hand, contended that the obligation imposed on them by the 24th section was to supply gas, and that in supplying gas they were not under any obligation to lay down apparatus and carry out from time to time numerous descriptions of alterations free of expense to the Authority. The Local Authority argued that the true meaning of the 24th section was that the Company were bound to supply the apparatus necessary to make the gas available for illuminating purposes, in order to comply with the obligation of the statute, and were also bound to lay the necessary services and apparatus up to, and connect same to the uprights of, the public lamps without charge, so long as the distance from a main to the lamp to be supplied did not exceed 50 yards.

Ultimately the Company were obliged to sue the Local Authority for works executed between the years 1890 and 1894. When the case went into Court, the Judge held that, in order to find out what the Legislature meant by section 24 in the Act of 1871, it was necessary to go back to the Gas-Works Clauses Act, 1847, section 13; so much of the provisions of that Act as were not inconsistent being incorporated with the Company's Special Act of 1866. Section 13 of that Act enacts that "the undertakers may from time to time enter into any contract with any person (the word "person" includes corporation), for lighting or supplying with gas any public or private building, or for providing any person with pipes, burners, meters, and lamps, and for the repair thereof; and may also from time to time enter into any contract with the commissioners, trustees, or other persons having the control of the streets within the limits of the Special Act, for lighting the same or any of them with gas, and for providing such commissioners, trustees, or persons with lamps, lamp-posts, burners, and pipes for such purpose, and for the repairs thereof, in such manner and upon such terms as shall be agreed upon between the undertakers and the said commissioners, trustees, or other persons."

It is evident from this section that there is a clear distinction drawn between the gas, and the service-pipes, connections, meters, &c., which makes it available for use. It is also clear that the Legislature contemplated the making of contracts between the local authorities and gas undertakers. To use the words of the Judge who tried the case, "It was an enabling, as distinguished from a compulsory, clause; and the object the Legislature had in view in framing the 24th section of the Act of 1871, was to make it compulsory on all incorporated gas undertakings who had incorporated the Gas-Works Clauses Act of 1847, to supply gas to any lamp or lamps within 50 yards of the mains of a company," and that section 13 of the 1847 Act may be read together with section 24 of the 1871 Act.

It was pointed out that before the passing of the Act of 1871, local authorities had merely enabling powers, under the 13th section of the Act of 1847, which placed them in a position to agree with gas undertakings in relation to supplying them with gas at a price to be fixed, and for the execution of works—such as the alteration of lamps, the supply of pipes, the laying of new services, &c., in connection with the lighting of a city, on terms to be agreed upon. It may be taken for granted that in the framing of the Act of 1871, the Legislature, seeing that to a great extent gas undertakings had a monopoly, had a reasonable amount of obligations cast upon them, such as would not leave their dealings with local authorities merely questions of contract; and hence the introduction into the Act of 1871 of section 24, making it compulsory on gas undertakings to supply gas to public lamps if they were within 50 yards of a company's mains, and also providing for the manner in which the gas was to be estimated and paid for.

For some time previous to the passing of the Act of 1871, the Legislature had awakened to the fact that private consumers were suffering an injustice by reason of gas

companies supplying gas to public lamps at a price much under that which large consumers were paying—and, in fact, in many cases at a loss, which loss had to be made good by the private consumer. The result was that in numerous Acts of Parliament a clause was introduced stipulating that the price to be charged for gas supplied to the public lamps should be the lowest price charged to private consumers. Is it at all probable that, under such circumstances, the Legislature intended that all such preliminary works connected with a supply of gas to public lamps for lighting a city should be executed at the cost of the undertakers, or free of expense to the local authority? while in the 11th section of the same Act, when dealing with private consumers, two things are to be considered; one being the gas to be supplied into the private consumers' premises, and the other the expense incurred by the company in laying pipes to meters, &c.—ample provision being made for a reasonable division of the cost between the consumer and the company.

However, in the case I refer to, after two days' hearing, the Judge ruled that the Company were entitled to payment for the works executed to the order of the Local Authority; merely leaving to the Jury the prices charged for labour, materials, &c., and a few minor matters, such as whether they conceived they were reasonably compensated for the work done. The Jury found for the Company to the sum of £307 18s.; the amount claimed being £308. Against this finding, the Local Authority appealed. The appeal was subsequently heard in the Queen's Bench Division by four Judges, with the result that they found the Company were subject to the 24th section of the Gas-Works Clauses Act, 1871; that "the Legislature enacted as it had been done in that statute, that the undertakers shall supply gas to any public lamps within 50 yards of any of their mains;" that "the natural meaning of this language is, that anything which may be required to bring the gas to the lamps must be done by the undertakers;" and that, "so far as finding in the enactment anything to support the contention that the work is not to be paid for, they thought there was an express direction to the contrary." The Judges contended that, in fixing the price of gas under section 24 of the Act, with one exception—viz., the charge for connecting meters in the event of an average-meter system—all items should be sunk in the price charged per 1000 cubic feet; or, in other words, when fixing the price for public lighting by arbitration under the 27th section of the Act or otherwise, the whole service should be included. They altogether ignored the 13th section of the Gas-Works Clauses Act, 1847, as having no bearing on the case, and disallowed the charges.

Assuming the ruling of the Judges of the Queen's Bench Division to be correct, no stronger evidence for amending the Act of 1871 could be adduced; for in fixing the price under the 24th section, it would be utterly impossible to say what amount per 1000 cubic feet should be included to cover the alterations and shifting of lamps and services, the number and cost of services up to and under 50 yards for new lamps, alterations of sites, &c., without doing an injustice either to the local authority or the undertakers. Until the law in this respect is amended, undertakers, when fixing the price for public lighting, must take care, in making contracts or settling the price by arbitration, to be on the safe side, and add sufficient to cover all such items, though doing so can be nothing more than guess-work, as it would be impossible to arrive at it correctly.

It may be mentioned that in the case I refer to, when the award under which the price of gas for public lighting was fixed was under discussion, none of the items similar to those disallowed were taken into consideration. The question did not arise; such items having been paid for under a contract for an average-meter system that had been in operation for years. Moreover, one of the conditions of the award is that "the average-meter system shall continue to be used as heretofore." It never entered the minds of anyone connected with the undertakers that such items would be disputed—in fact, the arbitration was to fix the price of gas per 1000 cubic feet, no question of supplying pipes or carrying out alterations being brought before the Arbitrators.

Testing.—I now come to the testing of the illuminating power and purity of gas. By the 28th section of the Gas-Works Clauses Act, 1871, it is enacted that the undertakers shall provide, at the spot prescribed, a testing-place, with apparatus, for the purposes following, or such of them

as may be prescribed by the Special Act: (1) For testing the illuminating power of the gas supplied. (2) For testing the presence of sulphuretted hydrogen in the gas supplied. The apparatus must be in accordance with the regulations prescribed in Part I. of Schedule A to the Act, or according to such rules as may from time to time be substituted in lieu thereof by any Special Act, and shall be so situated and arranged as to be used for the purpose of testing the illuminating power and purity of the gas. Turning to Schedule A, Part I., we find: "The apparatus for testing the illuminating power of the gas shall consist of the improved form of Bunsen's photometer known as Letheby's open 60-inch photometer, or the Evans enclosed 100-inch photometer, together with a proper meter, minute clock, governor, pressure-gauge, and balance;" the burner employed to be such as shall be prescribed by the Special Act.

It is clear that the Act of 1871 contemplated the use of Letheby and Evans photometers of the type then known. Their definition, however, was left sufficiently loose to enable numerous so-called improvements and alterations to be made in them; the result being that in the apparatus of the present day, the original types are scarcely to be recognized. I shall not waste your time by giving in detail the numerous alterations which photometers have undergone; no doubt they are known to you. Unfortunately, most of the so-called improvements have been detrimental to the suppliers of gas. In my opinion, there ought to be one standard photometer, or at the outside two—a Letheby and an Evans—and that a full description of them should have been scheduled to the Act of 1871, not only for the sake of uniformity, but also to prevent the imposition on suppliers of gas of photometers which were not contemplated by the Legislature, many of which were altered with a view of compelling undertakers to supply gas of a higher standard than intended.

In Schedule A, Part I., of the same Act, it is enacted "that the burner to be used for testing the gas shall be such as shall be prescribed"—meaning prescribed by the Special Act. It is hard to comprehend why the framers of the Act omitted to prescribe the burner to be used for testing gas of different qualities, more especially for 14, 15, and 16 candle power (one or other of such standards being almost universally adopted), instead of leaving them questions which have had to be fought out on many occasions in Committees in the Lords or Commons. I cannot see that any sound reason exists against the Standards Department of the Board of Trade being called upon to define burners for different qualities of gas. Such burners should be standardized and scheduled to the Act under discussion, as it must be evident to those conversant with the question, that the test-burner is one of the chief factors in arriving at the quality of the gas under testing.

Under section 29, the local authority of any district within the limits of the Special Act where the gas is not supplied by such local authority, "may, after the passing of the Special Act, appoint a competent and impartial person to be gas examiner to test at the testing-place provided in conformity with the provisions of the Act, the illuminating power and purity of the gas on any or every day," between the hours therein named. And under section 30, "where the testing of the gas is imperfectly attended to by the local authority, two Justices, on the application of not less than five consumers, may by order in writing appoint some competent and impartial person to be gas examiner; and such person may, at any time within the hours aforesaid, on producing said order, enter on the premises of the undertakers, and there test the illuminating power and purity of the gas supplied by them."

The 29th section referred to, clearly enacts that the gas examiner so appointed is not alone to be a competent but also an impartial person. Unfortunately, these conditions are as a rule lost sight of when appointments are being made; and in some cases the office is conferred upon persons who are known to be hostile to gas undertakings when managed by companies. It should be made clear that no appointment be held valid, if the person so appointed be an officer of the local authority or other body appointing him, or receiving salary or emolument from them, or holding an office the nature of which places him in a position antagonistic to the undertakers. An officer in the position of a gas examiner should be without bias in favour of his employer, and should be as unprejudiced, and as disinterested, as a Judge.

Section 31 of the Act enacts—"the undertakers may, if they think fit, on each occasion of the testing of the gas by the gas examiner be represented by some officer; but such officer shall not interfere in the testing." Numerous constructions have been applied to this section. In most cases gas examiners contend that the representative of the undertakers is not entitled to occupy a position which will enable him to check the observations or readings of the disc of the photometer, the weighing of the candles, or the consumption of gas. I hold that, so long as a representative of the undertakers does not interfere with the testing, he should be entitled to an opportunity of witnessing every operation in connection with it; but, unfortunately, the powers of a representative being undefined, in many cases advantage is taken of this omission to throw obstacles in his way, and prevent him fulfilling the functions which were evidently intended by the Legislature.

A case is known to me, where a gas examiner absolutely obliges the representative of the undertakers to take up a position at the end of a photometer next the gas-burner (the photometer being an Evans); and should he attempt even to move, he is immediately told by the examiner that he is interfering with the testing, while a person who accompanies the examiner under the guise of an assistant takes a note of the objection. From the position occupied by the representative, it is impossible to see the weighing of the candles, the disc of the photometer, or the consumption of gas. In this same case, the representative is not allowed to see the results of the observations recorded, which are supposed to be entered in a small notebook held by the examiner.

No secret should exist in the matter of testing gas. Everything connected therewith should be open and above-board, as in London, where the books containing the records of testings are at all stations open to the inspection of representatives of the undertakers, and the results recorded in their presence. A like rule should be in force for all gas undertakings. The Act should be amended, so as to permit the representative of the undertakers to occupy a position in the testing-station which will enable him to see the test carried out in accordance with the rules laid down in Part II., Schedule A, of the Act. This could be done without interfering in any way with the testing.

The results of the examiner's observations should be recorded in presence of the representative, who should see the candles prepared and weighed, and go over the records or calculations requisite to neutralize the effects of the difference of weight above or below the standard quality. The consumption of gas should be regulated to 5 cubic feet per hour; and if during the testing either an increase or decrease of the consumption takes place, the calculations necessary to neutralize the effects should also be recorded. The representative should be permitted to take readings of the disc during the experiment. This would not interfere with the examiner. The book in which the records are made should be open to the inspection of the representative, or other officer of the undertaking.

Among other provisions, the 34th section of the Act of 1871 should be amended by altering the number of persons who shall be entitled to accompany the gas examiner, or representative of the local authority, at the testing-place. At present the number is unlimited; and I have known cases where eight or ten persons have been present, consisting of aldermen, town councillors, the gas examiner, and other persons under the title of experts. Under such circumstances, it would be impossible to test gas properly.

Penalties.—Under the head of penalties (section 36), the undertakers are liable to a penalty not exceeding £20 on any day the gas supplied is of less pressure, less illuminating power, or less purity than it ought to be. I venture to suggest that few having the management of gas undertakings are aware that failure in the illuminating power to the extent of a tenth of a candle renders the undertakers liable to a penalty of £20, which may be levied at the discretion of any Justice, regardless of the size of the undertaking, so long as it is within the Act under discussion. In London, a margin of half a candle is allowed; the highest penalty that can be inflicted there being £2 for the first half candle of deficient power, after a series of tests. Thus, while a London undertaking carbonizing 2 million tons of coal per annum is only liable to a penalty of £2 for a failure to the extent of half a candle, most other undertakings are liable to a penalty of £20 for a failure to the extent of a tenth of a candle. I am not suggesting that £2

is not sufficient—on the contrary, I consider it ample, as failures, when they do occur, I believe to be beyond the control of the parties responsible. No undertaking could afford to risk systematically avoiding its parliamentary obligations by supplying gas under the standard.

Similar penalties are in force for excess of impurities and failure of pressure. There are some incorporated gas undertakings who have special provisions in their Acts, modifying the above penalties; but they are very few indeed.

Out-Going Tenant.—There are many other sections in the Acts which require amendment. For instance, where a consumer who is indebted to the undertakers for gas for one set of premises, takes possession of other premises from which the gas supply has not been discontinued, from failure of the out-going tenant to give notice of his intention to leave, section 11 of the Act of 1871 makes no provision for the incoming tenant giving notice to the undertakers; nor is there any clause in that Act dealing with it. Section 15 enacts that no consumer shall connect a meter; but here we are dealing with a case where the meter has not been disconnected. Under such circumstances, the only alternative is to serve the consumer with a seven days' notice to provide security, under section 11; failing which the gas supply can be discontinued. But if the consumer complies with the notice, and gives security before the gas is disconnected, such supply cannot be interfered with for non-payment of a debt incurred for the lighting of other premises. The Act should provide that a person entering premises where the gas has not been discontinued should be bound, under penalty, to give notice that he has become a tenant of other premises, and give notice to the undertakers of his intention to take a supply of gas; and payment should be made for any gas consumed on the premises vacated. The undertakers should be empowered to discontinue the supply so long as the consumer is indebted to them. It would be well, also, if a similar power existed with regard to meter-rent, stove-hire, engine-hire, &c.

Conclusion.—I think it will be agreed that, owing to the lapse of 27 years since the passing of the Act of 1871, the time has arrived when Parliament should amend it.

A proper description of the photometers should be scheduled to the Act, in addition to a notification of the burners to be used in testing.

The 24th section should be altered so as to make it clear that when fixing the price of gas to local authorities, either by agreement or arbitration, the price so fixed should include gas only. All doubt should be removed as to whether the cost is to include services, alterations, shifting of lamps, &c.

The 29th section should be amended to provide that persons appointed as gas examiners should not only be competent and impartial, but also be independent of the authority from whom they receive their appointments; and section 31 requires amending to enable the representative of the undertakers to occupy a position in the testing-station that will enable him to fulfil the functions which Parliament evidently intended—namely, to check the experiment being carried out by the gas examiner.

Section 34 should set out clearly the person or number of persons entitled to accompany the gas examiner to the testing-station.

Provision should be made to enable the undertakers to withhold a supply of gas from a new tenant, so long as he is indebted to the undertakers for premises which he has vacated.

The penalties clause should be modified.

LABORATORY NOTES.

By JOHN T. SHEARD, of Sheffield.

[Taken as read.]

I.—On Gas Analysis.

The analysis of gases for technical purposes has of late years received considerable attention. Among the best known and most deserving of the many forms of apparatus which have been devised for this analysis, that of Hempel occupies a foremost place. As commonly employed, however, Hempel's apparatus, while furnishing results sufficiently correct, for practical purposes, of some of the more important constituents of coal gas, is not very

suitable for complete analyses. The object of the present "Note" is to describe a modification of Hempel's apparatus, which—without departing from the simplicity of construction and ease of application which are so marked features of that apparatus—is capable of affording, with careful manipulation, results of considerable exactitude in a complete analysis.

Referring to fig. 1, the burette A has a Greiner-Friedrichs stopcock D, and is connected to one limb of a manometer or pressure-gauge F, whose other limb is connected to a "correction tube" B, which is filled with air at atmospheric pressure, and saturated with aqueous vapour. Both burette and correction tube are enclosed in the same water-jacket C, which ensures that the gas in the burette and the air in the correction tube are exposed to the same temperature, while also maintaining, to some extent, equability of temperature during the continuance of an analysis. The burette is connected by rubber tubing to the level-bulb, or reservoir of mercury, H, with which the burette is charged; and, before and after each absorption, mercury is run into or out of the burette, until the level of the liquid is the same in the two limbs of the pressure-gauge F—showing that the contained gas is at atmospheric pressure. The volume of gas in the burette is then read off directly; no correction for either pressure or temperature being required. All this is more fully described and explained in Hempel's "Methods of Gas Analysis" (see p. 28), to which reference may be made for fuller details.

The modification to which attention is directed by this "Note" is in connection with the pressure-gauge F. In Hempel's book (and as ordinarily supplied), this is about 6 mm. wide, and is charged with the same liquid—water or mercury—which is employed as the containing fluid in the burette. As there is an appreciable space for gas in the pressure-gauge between the level of the liquid and the burette, directions are given for determining the size of this space, for which a correction must be made at each measurement of the gas in the burette. Furthermore, the gas therein contained must be drawn over into the burette before each absorption, to ensure its being acted upon. Thus the arrangement occasions very considerable trouble and inconvenience.

To obviate the need for any correction, and to facilitate the adjustment of the volume of gas in the burette, and thereby its correct measurement, the writer makes the pressure-gauge F of capillary tube, charged with water; while mercury is employed in the burette. (With this apparatus, mercury is as easy of manipulation as water; and the readings are obtained more quickly, as there is no waiting, as with water, for the liquid to settle down from the sides of the burette. A drop of water, introduced at the commencement of the analysis, ensures the gas being saturated with moisture; and besides, at each reading, the contents of the burette are put into communication with the water in the pressure-gauge.) By having water in the gauge and mercury in the burette, very accurate readings are obtained with great facility. Water is $13\frac{1}{2}$ times lighter than mercury; therefore, a difference of 1.16-inch in the levels of the liquid in the two limbs of the pressure-gauge, which is readily noticed by the eye, represents a very trifling—indeed, an inappreciable—amount measured by the mercury in the burette.

For the determination of the absorbable constituents of coal gas, the writer follows the lines laid down by Professor Lewes in a paper read before the London Section of the Society of Chemical Industry,* with the exception that, with mercury as the confining fluid, fuming sulphuric acid is conveniently employed, instead of bromine, to remove the unsaturated hydrocarbons.

In the explosion pipette, in which methane and hydrogen are burnt, the writer has found it of advantage to have a

stopcock above as well as below the bulb, as shown at A in fig. 2. Care should, however, be taken, before exploding, to have a little mercury in the capillary tube to protect the upper stopcock. The moveable bulb or reservoir of mercury B enables the pressure on the gas in the explosion bulb to be increased or diminished, according as a weak or a strongly explosive mixture is contained therein; thus ensuring more complete combustion, or reducing the liability to shatter the bulb, as the case requires.

For the correct determination of nitrogen, a check explosion of the original gas, with subsequent absorption of carbon dioxide and oxygen, should, as pointed out by Professor Lewes (*loc. cit.*), always be made.

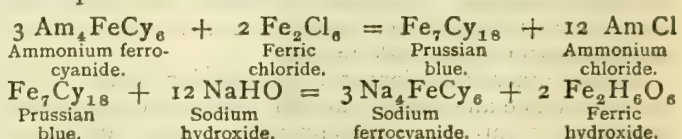
II.—On the Determination of Cyanogen in Ammoniacal Liquor.

Now that so much interest is being taken in cyanogen as a bye-product of gas manufacture, it may be of service to call attention to an error in the method given in the text-books for determining the amount of ferrocyanide contained in ammoniacal liquor. The error seems to have originated in a communication by Mr. S. Dyson to the Society of Chemical Industry, in 1883, on the examination of ammoniacal liquor, wherein the following directions are given:—

The residue obtained by evaporating 250 c.c. of liquor to dryness is dissolved in water, the solution filtered, and ferric chloride added to the filtrate. The precipitate of prussian blue is filtered off, washed, and decomposed with caustic soda. The ferric hydroxide thus obtained is, after filtering and washing, dissolved in dilute sulphuric acid, reduced, and the solution titrated with centinormal potassium permanganate. The iron (Fe) found $\times 5.07$ equals the equivalent amount of ammonium ferrocyanide (Am_4FeCy_6).

The scheme of analysis is in the main correct; but the factor for interpreting the result is incorrect, and yields a figure too high by 25 per cent. Yet these directions have been copied—apparently without examination—into every subsequent text-book treating of the subject.

It appears to be assumed that the iron precipitated as hydroxide is equivalent to the iron originally present in the ferrocyanide. But this is not the case. Three equivalents of iron, as ferrocyanide, combine with four equivalents of iron, as ferric salt, to form prussian blue; and when the blue is decomposed by an alkali, the ferrocyanide goes again into solution, and the iron precipitated as hydroxide is the equivalent of that taken up from the ferric salt. The two equations are as follows:—



Thus there are four equivalents of iron in the hydroxide whose value is determined, but only three equivalents in the ferrocyanide whose value it is the object of the analysis to determine; and the factor, instead of being 5.07, should be 3.80.

The following method of estimating sulphocyanide and ferrocyanide, in the same sample of ammoniacal liquor, is submitted as being, for technical purposes, superior to that of evaporating to dryness.

Boil the liquor until ammonia ceases to be liberated; then add sodium carbonate, and continue to boil until all the ammonia has been expelled. Filter off the precipitated sulphur, and add ferrous sulphate to the liquid while still hot. Filter, and wash the precipitate on the filter. The filtrate will now contain the sulphocyanide, and the precipitate the ferrocyanide.

To the filtrate add copper sulphate and a few drops of sulphurous acid solution. Allow to stand until the precipitate of cuprous sulphocyanide comes down. Filter, wash, and dissolve the precipitate in nitric acid. From the nitric acid solution precipitate cupric hydrate with soda. Filter, wash, dry, ignite, and weigh as CuO . Then the weight found $\times 0.96$ = ammonium sulphocyanide (Am SCy).

Boil the precipitate, containing the ferrocyanide, with

* See "JOURNAL," Vol. LVII., p. 692.

soda. Filter and wash. Pour the filtrate into a solution of ferric chloride, acidified with hydrochloric acid. Add a little nitric acid, and boil for 20 minutes. The precipitate settles quickly. Filter, and wash until free from ferric salt. Boil the precipitate of prussian blue with soda. Filter, wash, and dissolve the ferric hydroxide in dilute sulphuric acid. Then reprecipitate with ammonia. Filter, wash, dry, ignite, and weigh as Fe_2O_3 . The weight found $\times 2.66 =$ ammonium ferrocyanide; or $\times 3.96 =$ the equivalent of yellow prussiate of potash (K_4FeCy_6 3 Aq.).

Liquid Hydrogen.—Professor Dewar has given the Chemical Society an account of his latest researches with liquid hydrogen. In the "Chemical News," he states that two of the physical constants of this truly extraordinary fluid have now been determined. Its boiling-point in air is -238°C ., or 35° of absolute temperature, determined by a platinum resistance thermometer. This value is higher by something like 17 per cent. than that obtained by Olszewski by adiabatic expansion. The whole range of liquid hydrogen is only about 50° from the absolute zero, because its critical point must be about 50° absolute. This value of the boiling-point enables us to predict with almost certainty that by no conceivable means at present at command shall we ever get nearer the absolute zero than -250°C ., or (say) 20° absolute—that is, the practical fall in temperature that liquid hydrogen will give under high exhaustion will never exceed 10° or 15° lower than its known boiling-point. The other physical constant that has been determined is the density of hydrogen. As already described, the substance appears as a transparent fluid, with a well-defined meniscus, and it easily drops from one vessel to another, and may be collected with considerable rapidity. The appearance of the fluid would suggest a density not dissimilar to that of liquid marsh gas, which has a density of 0.41 at its boiling-point in air, and is the least dense liquid known under such conditions. By allowing 10 c.c. of the liquid hydrogen to evaporate, collecting the gas, and measuring its volume, the approximate density can be accurately determined. As a result, the fluid is found to be about 1/14th of the density of water; thus bearing about the same relation to water that hydrogen gas does to air. Liquid hydrogen is in all respects the most extraordinary fluid chemists have ever had to deal with. No chemist could have anticipated that a liquid with a density of 1/14th that of water could be capable of collection and manipulation in vacuum vessels with the same ease, practically, as liquid air was manipulated ten years ago; and that by its aid we shall approach within 20° to 25° of the absolute zero of temperature, which has been apprehended only as a mathematical expression.

How Should Boiler-Heating Surface be Computed?—Mr. C. W. Baker, in a paper which he has presented to the American Society of Mechanical Engineers, criticizes the customary method of calculating the horse power of boilers from the heating surface. He declares that, in computing boiler heating surface, there is commonly an error of from 7 to 17 per cent., due to the practice of taking the surface in contact with the water, instead of that exposed to the fire or hot gases, as the heating surface. If the surface is flat, these areas will of course be the same; but boiler heating surface being mostly made up of tubes, there is a difference between the interior and exterior surface of 17 per cent. in the case of a 1-inch tube, and 7 per cent. with 4-inch tubes. The error arises in the first place from failure to appreciate the fact that the heating surface exposed to the fire is the heating surface of the boiler, on which its steaming capacity depends. The actual difference of temperature between the two sides of a boiler-plate—one side of which is exposed to the furnace and the other to the water—is never more than 1°Fahr . with clean metal. It is Lord Kelvin who has observed that, for all practical purposes, we may consider that the heating surfaces of boilers conduct heat as if they were no thicker than paper, or as if the metal were of infinite conductivity. From this consideration it would seem to follow that, if there is any advantage in copper fire-boxes or brass boiler-tubes, it is not by reason of their superior conductivity for heat. In short, the temperature of boiler heating surfaces is that of the wet side, and not that of the fire side of the plate. This fact is of common knowledge; yet Mr. Baker insists that it has been largely overlooked by most engineers and engineering writers, and that this is one reason why engineers have not always insisted on the fire side of tubes being considered the heating surface of steam-boilers. If this surface is increased, by forming ribs upon it, as in the Serve tube, the heat-absorbing capacity of the tube is thereby increased; but ribs on the wet side would have no such effect. Again, a thin coating of scale on the wet side of the boiler plate or tube does not affect the steaming capacity so much as a furring of soot on the fire side. Another deduction made by Mr. Baker is that the circulation of water in boilers is of much less consequence than is commonly supposed. Good circulation is desirable, so as to prevent unequal heating of the boiler and consequent straining; but it has no effect upon economy or capacity.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 62.)

LAST week brought about a great change in the position of things on the Stock Exchange. We adverted to the probable improvement which might be expected in July; and the improvement set in strongly from the opening day. The advance was most conspicuous in Consols, which had long been languishing; and the rest of the gilt-edged class were not slow to follow suit. The plethora of money gradually forced activity into more speculative channels; so that the week finished showing strength all round. Prices almost everywhere display a more or less considerable advance; and the few exceptions are susceptible of explanation on special grounds. The Bank of England rate was lowered from 3 to $2\frac{1}{2}$ per cent. on Thursday—the higher rate having lasted for four weeks. Money is very cheap; but, cheap as it is, it is likely to be cheaper still this week. Increased supplies will be released, and will come into the market; and a further reduction in the Bank rate is quite on the cards. An improvement was visible in the tone of the Gas Market. Several moderate advances in quotation were effected; and only one retrograde move was made. Business, however, was very quiet all through, until the turn of the half year; and then it roused into activity. In Gaslights, the "A" was torpid until this change set in—marking as low as 290; but on Friday and Saturday, it was brisk and buoyant, and repeatedly marked 294, which was the closing figure. Cheap money made the secured issues unusually active, and sent the 10 per cents up three points, and made a fractional improvement in the debenture. South Metropolitan was lively and full of strength—closing at 144, the best of the week. The debenture also recovered a point. Commercially were hardly noticed. A few transactions took place in the Suburban and Provincial group, with an easier tendency in British. The Continental Companies were almost stagnant—business being of the lightest order; and prices closed unchanged. Union was put down on Wednesday, but was promptly restored the next day. Several of the minor undertakings had a moderate rise, the details of which are shown in the list. Business in the Water Companies was of the usual moderate proportions, and presented no remarkable feature. A large number of issues are quoted *ex div.* this week; and nearly all of them came out the better for it.

The daily operations were: Business in Gas on Monday was extremely quiet; and the only change was a rise of 1 in South Metropolitan debenture. A little more was done on Tuesday; but things still remained quiet below the average, and prices did not vary. Wednesday was another inactive day. Continental Union was lowered 2. On Thursday, there was more animation in many issues; and an improving tendency in prices began to manifest itself. South Metropolitan advanced 2; and Continental Union recovered 2. *Ex div.* changes in both Gas and Water were mainly favourable. Friday was a lively day, especially in Gaslights. The "A" rose $1\frac{1}{2}$; "C," "D," and "E," and "J," 3 each; 4 per cent. debenture, $\frac{1}{2}$; San Paulo, $\frac{1}{2}$; and Ottoman, $\frac{1}{2}$. But British fell $\frac{1}{2}$. Saturday's prices were very steady, without further change.

ELECTRIC LIGHTING MEMORANDA.

The Introduction of Electric Lighting into the City of London—The City of London Company—Mr. Braithwaite on Competition in Electricity Supply.

In the current issue of "London" an article appears with the attractive title "How the City Sold its Municipal Birthright," which, being interpreted, means a story of the formation of the City of London Electric Lighting Company. We are not surprised that it has come to this. Our readers are aware that the supply of electric lighting by local authorities on their own account, irrespective of the merits of the case, is a point of the Progressive "program," to the advocacy of which the paper above-named is committed without reserve. In its pursuit of this great cause, "London" has discussed, in the choicest Progressive language, the proceedings of several of the Metropolitan Vestries which happened to be halting between the alternative courses of undertaking electric lighting for themselves and agreeing with private companies for the work. The case of the City was sure to come into controversy sooner or later. Our readers who are able to carry their minds back a few years will remember how long the electric lighting of the City of London hung fire after the preparatory street lighting experiments in the early "eighties." The pages of the "JOURNAL" for years contained occasional references to the difficulty experienced by the Corporation in placing the proposed electric lighting contracts. At that period, anybody who should have proposed for the Corporation to do their own electric lighting would have been laughed at as a dreamer, if not scouted as a "jobber." Electric lighting was regarded as a highly speculative enterprise, as it notoriously was. Not a single Metropolitan Local Authority would touch it. The London County Council, that great and good authority which "London" worships—so long as it has a Progressive majority—has had a small job of electric lighting in

hand from the same period until now, and has done nothing in it." This is the matter of lighting the Embankment.

At least, the Corporation of London succeeded, after a fashion, in procuring a supply of electricity for lighting the City. This was effected by what our perfervid contemporary styles "a very discreditable transaction," in which were "combined the characteristics of Hooleyism and Tammanyism;" thus constituting "one of the worst jobs which tarnish the municipal history of the City of London." We, who have not awakened to-day or yesterday to a knowledge of the manner in which electric lighting has been pushed in some localities, are not disposed to repeat here the record of these proceedings, which we published at the time. The City of London Electric Lighting Company was the outcome of years of negotiation, and now carries on business with a capital of £1,300,000, which must be all expended. The Company until recently charged the highest price, 8d. per unit, and had the biggest revenue—£150,000 a year—of any Metropolitan undertaking. They do an enormous business, and pay an ordinary dividend of 7 per cent. A member of the Common Council, Mr. Brooke-Hitching, thinks the time has come when the City should start electric lighting on its own account; but there is a bar to this in the circumstance that the Company have a 21 years' contract with the Corporation for lighting the streets. The alternative to a competitive service is purchase of the Company's undertaking by the Corporation. It is only just to Mr. Brooke-Hitching to say that, though he is favoured with the patronage of "London" for his electric lighting policy, he has been at pains to dissociate himself from this periodical's attack upon the pioneers of electric lighting in the City. He says, like a wise man, "nothing is gained by going into the past." What he wants is to get the present monopoly bought out. There should be no great difficulty about this, if the Corporation think it worth while to anticipate the ordinary course of events. The electric light is supplied by the City of London Company under the provisions of the Electric Lighting Act; which is to say that there is no "monopoly," about it. There may be—indeed, there is—a contract in existence for the exclusive lighting of the streets by the Company; but what is street lighting worth alone? It is a fact that this same street lighting contract went begging for years, and would be worthless to-morrow if separated from the concurrent statutory privilege of private lighting. By pretending to set so much store by it now, the callow newspaper advocates of "municipalizing" the service are only helping to raise the cost of the operation against the public. Since the above was written, we learn that Sir Joseph Savory, M.P., who was Lord Mayor of London at the time of the inception of the City of London Company, has commenced proceedings for libel against "London" in respect of the attack made upon him for his share in this transaction.

Notice must be taken of the temperately-worded letter of Mr. J. B. Braithwaite, jun., to "The Times" and other newspapers on the subject of the Marylebone and Bermondsey Orders. The writer's firm have acted as brokers to many important electric lighting capital issues; and he draws attention to the gravity of the situation that will be created by the carrying into effect of these Orders. His point is that the capital actually employed by the Metropolitan Electric Lighting Companies was raised on the faith that the local authorities, having had their opportunity of going into the business themselves or supporting a company, would be held to their choice if they once elected for the latter course. "Thus, with the consent of the local authorities in various parts of the Metropolis, electricity supply companies are now engaged in supplying the public; and now that the shareholders have risked their capital, and through their enterprise the industry has been proved to be a profitable one, it would seem unreasonable that the local authority should be allowed to turn round and reverse its former decision, and undertake the supply of electricity itself in competition with the company, whose undertaking it has the right to purchase at the end of a period of years." This is reasonable enough; but, unhappily for the writer's case, there is no getting over the clear language of the Act. If the purchasers of electric lighting shares have ignored the contingency of competition, that is their affair. The proceedings of the Board of Trade in regard to Marylebone and Bermondsey have not created any novel condition; but the circumstances of the cases have served to draw attention to the conditions that previously existed. Hence it is not surprising that financial opinion in "the City" has been veering round to the view that electric lighting shares are not really worth the money that has of late been paid for them. In some instances competition has already done its worst. Where two statutory undertakings are in effective occupation of a district, neither the local authority nor anybody else would be permitted to break up the streets in the interest of a third venture; and with this consolation the proprietors of electric light shares must rest content.

Prizes Offered by the Industrial Society of Mulhouse.—According to the new programme of prizes to be awarded by the above-named Society, a silver medal will be given for a gas-engine of 100-horse power erected in a local factory, and showing advantages over a steam-engine of equal power. The engine must have been at work for at least six months. A silver medal and premium of 500 frs. will be given for a registering pyrometer accurate within 5 per cent. between a range of 300° and 800° C.

THE LESSON OF PHILADELPHIA.

IN last week's "JOURNAL" a letter appeared from Mr. R. N. M'Dougall, of the Liberty and Property Defence League, respecting the leasing of the Philadelphia municipal gas-works to a private Company. The purpose of the writer was evidently to advance this most remarkable transaction as evidence of the failure of municipalization in the instance of the gas supply of the third largest city in the United States; and incidentally he observes that the Corporation of Philadelphia paid too much for their labour and coal—the suggestion being that this was done from corrupt motives. His conclusion is that "the Philadelphians seem to have learnt that the most effective way of eliminating corruption is to reduce to a minimum the functions of their Municipality." Never was the customary editorial disclaimer of responsibility for the opinions of correspondents better justified than in regard to this letter. If the Liberty and Property Defence League have set themselves the task of making out a case for the reduction to a minimum of the functions of municipalities, with the object of curing or preventing corruption in this political institution, they are courting discredit and failure. Well may Mr. M'Dougall remark, as it were apologetically, that in England "as yet, there is no disposition to relinquish the municipal supply of gas to private companies, but rather a tendency in the other direction." It does not require one to be a partisan of the idea of municipalizing everything, in order to entertain the feeling that any such "disposition" of a British Municipality as that indicated by Mr. M'Dougall would be a sign of decadence to be heavily deplored. The attempt to cite the example of Philadelphia as something analogous to the case of British Municipalities, in respect of gas supply, is an insult to the latter. We can say this without fearing to anger a single honest American citizen who may read this article. For reasons which need not be gone into here, it has come to pass that a United States Municipality is usually—in the larger cities almost invariably—a thing apart from the community. What it does or neglects to do is no concern of the people, except that they have to pay for it. It is unnecessary to say anything here concerning the relations commonly subsisting between British Local Authorities and the communities they represent. Suffice it to observe that there is no similarity whatever, except in name, between a British Municipal Corporation and a United States Municipality. Our Municipal Corporations are not impeccable, and they have a history which is far from creditable in all respects. It may be pointed out, however, that the period of their history when these institutions were most corrupt and inefficient was precisely that in which they had the least amount of work to do, and were organized on the most restricted bases.

The Local Authorities of Great Britain for many years past have manifested a growing desire to undertake local public services, of which gas supply is one. During the last year or two, this particular movement has gained strength. So strong has it become, indeed—and this under the guidance and by the inspiration of some of the most prominent leaders of the industry concerned—that any gas company not already safeguarded by legislation of the most modern type can hardly go to Parliament nowadays for fresh powers without being compelled to sell the property to the local authority. How is it, then, that the experience of Philadelphia, even taken with all its qualifications and explanations, should point to such a contrary solution of the problem of economical gas supply as being proper for the United States? Is it a step forward, or a falling back in obedience to a counsel of despair? In other words, are British Municipalities actually on their way to realizing the experience of Philadelphia; or is the latter a failure—perhaps temporary, perhaps permanent—to live up to the standard of municipal probity and efficiency that obtains here and elsewhere?

Mr. M'Dougall quotes from an essay by Dr. Rowe, of the Pennsylvania University. For the benefit of our readers we may say that Dr. Rowe's essay forms No. 229 of the publications of the American Academy of Political and Social Science. Dr. Rowe is described as Assistant Professor of Municipal Government at the University of Pennsylvania. How backward we are in this country in such matters as University "Chairs"! In the United States, the subject of Municipal Government is "professed" at the University of Philadelphia, and possibly at other State Universities. What a pity it is that the practice of the thing should be so defective in the same localities! This fact goes to discredit the whole modern scheme of technical education that one hears so much about at home and abroad. We have had Dr. Rowe's essay on "The Municipality and the Gas Supply, as Illustrated by the Experience of Philadelphia," before us for a week or two; and its mention by Mr. M'Dougall reinforces our original intention of discussing it as a contribution to the literature of an interesting and important branch of gas-supply politics. The same matter is dealt with by Professor Edward W. Bemis in the March number of the "Forum;" but we will take Dr. Rowe first.

This competent critic declares justly that "the recent decision of the Mayor and Council of Philadelphia to lease the gas-works to a private Company marks a change of policy of more than local importance. That the third largest city in the United States should decide to relinquish the control of one of its public works, after forty years of quasi-municipal management

and some ten years of complete municipal ownership and operation, will naturally be construed as a confession of the inability of public authorities to administer public works successfully, or at least as an acknowledgment of the superiority of private over public management." This is, in fact, Mr. M'Dougal's use of the example. Of the facts of the particular instance, there is no question. The friends as well as the opponents of the Philadelphia Gas-Works lease were generally agreed that the results of municipal management were not encouraging. It appears to be Dr. Rowe's view that the facts, such as they were, did not warrant the particular remedy jumped at by the people of Philadelphia, and still less justify the general conclusion already enunciated. So far as Philadelphia was concerned, the people wanted cheap and good gas, which their Municipality had failed to provide. The private Company came along with an offer full of immediate advantages. The average citizen thought he had no time or skill to consider the question of leasing the gas-works on other grounds than the shortcomings of the management; and the transaction was hurried through before the public could awake to the magnitude of the ulterior interests involved. Within a week of the signing of the lease, the public had forgotten all about it.

As Dr. Rowe tells the story, the history of the gas supply of Philadelphia is of the essence of the question whether the period of municipal management was really characterized by failure. When the gas-works were started, in 1835, the undertaking was in the form of a combination of public and private ownership and management. In 1841, the City became sole owner; but the management of the property was entrusted to a Board of Trustees elected by the City Councils, and known as the Gas Trust. This body seems to have been analogous to the Scotch Gas Commissions; but its operations were characterized by shameless corruption, fraud, and mismanagement, for which a parallel would elsewhere be sought in vain. "During the closing years of this irresponsible body, especially between 1875 and 1885, the plant was permitted to deteriorate, improved methods of production were ignored, mains and service-pipes were allowed to rust and rot, and no attempt was made to adapt the plan of distribution to the increase in production and consumption. The works had gradually become filled and over-filled with the political subordinates and henchmen of the Board. It was shown by the attorneys of the Committee of One Hundred—a body which aided the City in the prosecution of the Trustees—that the superficial area of the property of the works was not sufficient to accommodate those on the pay-rolls, even when placed shoulder to shoulder." The City, it appears, came into possession of this condemned heritage in 1887, when the Bureau of Gas was organized as a part of the Department of Public Works, and placed under the control of an official directly responsible to, and removable by, the Mayor. Dr. Rowe maintains that the new arrangement worked reasonably well, having regard to the circumstances. Thus, in 1870 the charge for salaries and wages in gas manufacture was nearly 3s. 2d. per 1000 cubic feet of gas made; and this was reduced to 11d. in 1896. But the weaknesses characteristic of United States municipal management remain. The City Council continued to direct the financial and other operations of the Bureau of Gas, with disastrous results.

Let Municipalities everywhere take notice. The evil of using the gas-works as a political engine, though a most serious obstacle to efficiency, was, in Dr. Rowe's opinion, a small trouble compared with the short-sighted financial policy of the City Councils. Council after Council appropriated the gross profits of the gas undertaking to relieve the rates, regardless of the needs of the works. "Between 1887 and 1897, nearly \$8,000,000 would have been available for the improvement of the plant. Hardly a sixth was used for this purpose. Year after year, the Director of Public Works urged upon Councils the necessity of improved methods of production and distribution. With equal regularity, Councils continued to use the profits from gas making to defray general city expenses." Consequently, the manufacturing and distributing plant grew obsolete, and costly in operation. "The former showed an unusually high cost of production; the latter an inordinately high percentage of leakage." It cost nearly 2s. per 1000 cubic feet to put gas into the holders. Hence it was easy for private companies to offer to supply the city with gas at a cheaper rate. The opportunity was seized by a private Company, who offered to furnish the Gas Bureau with an auxiliary supply of carburetted water gas for 37c. per 1000 cubic feet. The Bureau imagined they were doing a good stroke of business by accepting this offer, especially as they could not get the money required for extensions of their own plant. But the result was that the City became more and more dependent upon the accessory undertakers, until the psychological moment came for the latter to "scoop Philadelphia in." And not before it was time; for the unaccounted-for gas had in 1896 risen to nearly 25 per cent.

Everything else was as bad. Though the worst of the abuse of over-payment of salaries and wages was being cured, much still remained to be remedied. In the first place, the City had a fixed rate of wages far above the market rate for similar labour. The Director of Public Works published a statement declaring that instead of paying the 1700 labourers \$1.75 per day, he could get equally competent men for \$1.25 per day. This is all recounted by Mr. M'Dougal. Dr. Rowe's pungent comment upon the statement is that, "whatever may be said in favour of

'trade union wages' in city employment, it must be remembered that this excess of 50c. per day above the market rate involved an additional annual outlay of nearly \$275,000." There were other drains upon the resources of the Department. For some reason, the tenders of the firms offering coals at the lowest prices were invariably ignored. With regard to the returns from residuals, also, it was ascertained that certain persons had the monopoly of purchasing these products at less than the market rates. From all this Dr. Rowe argues that "the most serious defects connected with city management are traceable to evils inherited from a period which cannot give us a fair test of municipal efficiency. During the decade of responsible city control, we find abundant indication of improvement in every direction. That such improvement has not been more rapid is to be attributed to the short-sighted policy of Councils rather than to defects in the administration of the Gas Department."

In view of the importance of what Mr. M'Dougall calls this "Object-Lesson in Municipal Gas Supply," we shall defer the conclusion of this article to another issue of the "JOURNAL."

THE SUPPLY OF ELECTRICITY IN BULK.

THE report of the Joint Select Committee of the House of Lords and House of Commons on Electrical Energy (Generating Stations and Supply), with the Proceedings of the Committee, has now been issued as a Parliamentary Paper. It should be filed for reference by all those who are interested in the extremely important matters of which it treats, which are by no means restricted to the electrical industry. The subject of the report has been discussed in our "Electric Lighting Memoranda," and we engaged when mentioning it last to return to it again. The present article is the fulfilment of this engagement. It is unnecessary to repeat the information respecting the terms of the reference to the Committee, which were given in the "JOURNAL" for May 31. The report, however, the text of which will be found in another column, sets out in form the questions put to the Committee, and gives their answers, of which only the general purport was known at that date.

The questions themselves appear to be simple enough in the main, and to fall into two categories—as to whether powers for compulsorily acquiring land for central stations should be given to undertakers of electricity supply, and as to whether powers should be granted for the supply of electricity in bulk over large areas. Behind these questions lay the consideration that upon the tenour of the Committee's answers to them depended the immediate future of a proposed new development of the electricity supply industry. The questions concerning the compulsory purchase of land for generating stations admitted of direct answers, of which there was no possibility of consequential development. There is nothing in the facility in question contrary to the spirit of the Electric Lighting Acts, or otherwise than in harmony with the general character of statutory electricity supply enterprise dealt with by those Acts. Consequently, the Committee, recognizing the fact that electricity supply from central stations has passed the experimental stage, and is of advantage to the public, have agreed that undertakers of such supplies, whether local authorities or companies, should have "compulsory powers for acquiring sites for generating stations, and lands or easements for pipes and mains therefrom, and other works." This is one point. The next is the declaration that, in the opinion of the Committee, "provision should be made for the granting of these powers in the Provisional Orders of the Board of Trade, subject to confirmation by Parliament."

Let us pause here in order to draw our readers attention to the circumstance that, if this recommendation is acted upon, the Board of Trade will be in a position to grant greater facilities to undertakers of electricity supply than the same Department, or the Local Government Board, can bestow upon undertakers of gas or water supply. We do not begrudge the electricians or the Board of Trade these superior advantages, but only venture to suggest that a similar privilege should be extended to applicants for Provisional Orders under the Gas and Water Works Facilities Act.

With regard to the liability of undertakers of electricity supply to proceedings for nuisance, the Committee are of opinion that where the site for a generating station is acquired under compulsory powers, and is specified in the Provisional Order or Special Act, "the undertakers should not be subjected to any further liability than that which, according to Lord Blackburn (*Geddis v. Bann Reservoir*, 3 App. Cases, 455), is imposed by common law in the case of persons exercising statutory powers and duties." The opinion of Lord Blackburn is repeated as follows: "It is now thoroughly well established that no action will lie for doing that which the Legislature has authorized, if it be done without negligence, although it does occasion damage to anyone. But an action does lie for doing that which the Legislature has authorized, if it be done negligently. And I think that if, by a reasonable exercise of the powers either given by statute to the promoters or which they have at common law, the damage could be prevented, it is, within this rule, negligence not to make such reasonable use of their powers." Those who

are accustomed to advise gas and water companies upon such matters know that the so-called monopoly, or statutory guarantee of gas and water supply undertakers against competition, depends upon nothing more substantial than this principle. It is no nuisance for a statutory gas company to break open the public roads for the purpose of laying mains, or of attending to them when laid, provided that the work is properly done. It is a nuisance for another party to do the same thing, without statutory powers. In regard to recent prosecutions of gas companies for creating nuisances of other kinds, it might be argued that the principle enunciated by Lord Blackburn was not adequately exercised by the defence.

In respect of the questions put to the Committee regarding the expediency of granting powers "for the supply of electrical energy over an area including districts of numerous local authorities, and involving plant of exceptional dimensions and high voltage," the ulterior effect of the answers is of serious import. Here we come to a development of electricity generation and supply which was not contemplated when the existing Electric Lighting Acts were passed, and is, in point of fact, incompatible with some of the leading provisions of these Acts. The most serious of the discrepancies between the law and the proposed practice arises in respect of the intention of the former to make the supply of electricity a perquisite of the local authority. This motive was based upon the presumption that there was nothing in electricity generation or supply which the local authority could not do; but, as the Committee find, the presumption does not hold good of the new development under notice. The Committee had to decide whether the principle of the existing Acts should prevail, or the new development be encouraged. They chose the latter alternative; deciding that undertakings of the new order "may properly be authorized on conditions differing in some respects from those imposed by and under the existing Acts." This notable declaration throws open the electrical industry to a wider future than was possible for it under the cramping condition of paramount municipalism.

In arriving at this decision, the Committee were helped by the several Bills now pending in Parliament which propose to give effect to new developments of the electrical industry. We report elsewhere the proceedings of Parliament with respect to one of these Bills. Obviously, the privilege of municipalism (which was the burden of the electric lighting legislation of the past decade) must go if these large schemes are to be carried out. The Committee are conscious of the gravity of the position created by the introduction of projects of this kind; but they decline to put a bar to electrical progress in the interest either of municipalism or of conformity with the existing law. It is declared, however, that every instance of the kind should be dealt with strictly upon its merits, whether as regards grant of powers, exemption from liability to purchase by a particular local authority, or any other consideration.

As an alternative to liability to compulsory purchase, the Committee suggest that "it would be specially expedient, in the interest of the consumers, that some kind of sliding-scale, as in the case of gas undertakings, should be imposed. This is a most remarkable observation, not only on the score of its being so strong a testimonial to the high opinion of the sliding-scale principle entertained by the Committee, but even more by reason of the place assigned to the principle as an equivalent alternative to purchase by the local authority. It appears almost impossible to overrate the significance of this passage of the report. In the draft report proposed by the Chairman (Viscount Cross), after the specific questions had been answered, there appeared a paragraph which ran as follows: "We consider that the time has now come when electric lighting undertakers should be subjected to provisions enforcing a sliding-scale similar to that which obtains in the case of gas companies." The amended form of the paragraph, however, was adopted by a majority. A motion to apply the auction clauses to electricity supply companies was rejected.

The only other passage of the report to which we need specially draw our readers' attention is the last paragraph but one, which is as follows: "The clauses [in Provisional Orders] which protect gas and water pipes have worked satisfactorily, and should be continued; but the Committee would direct attention to the observations of Mr. Preece as regards the difficulty arising from the working of tramways by trolley wires. His suggestion as to a strong 'control clause' should be carefully considered."

The report, as a whole, is a weighty pronouncement in favour of freeing the electrical industries from unnecessary restrictions, and granting them facilities for all legitimate natural development. It remains to be seen how the grand schemes for generating and distributing electricity in bulk, supposing them to take form and substance, will affect the gas business in the localities chosen for exploitation in this way, and also the local authorities having Electric Lighting Provisional Orders. Electrical power, distributed at the same price as gas power, will perhaps check in some degree the demand for gas-engines. The question of how and to what extent the same supply will operate upon municipal electric lighting is more abstruse. From certain considerations, it may be expected to prove a means for introducing electric lighting where it would otherwise not be available. The municipalities likely to be most affected by the new departure, however, will be those contemplating extensive schemes of electricity generation for tramway working.

Throughout all the different industrial regions to which the generic name of the Black Country is popularly applied, there are continuous lines of tramway which a quick electrical service would vastly improve. Different municipalities have had their eyes upon this improvement, which it has been thought would turn in handsome profits to the municipal treasury. In the case of Manchester, for instance, a Corporation monopoly of electricity supply might conceivably redress the balance of the Ship Canal, not to say anything about the pending main drainage business. Hence it is easy to understand why Manchester should strenuously oppose any company proposing to generate electricity cheaply just outside the city limits, and transmit it in bulk throughout the district.

English municipal law and practice has never favoured the idea of local authorities undertaking any public service being dependent upon outsiders for the supply of the necessary article, whatever it may be. True, such authorities buy both gas and water in bulk, and undertake to distribute these necessities; but in the case of the former there are not many perfectly satisfactory permanent arrangements of the kind in force. It may be taken that a local authority would have to show to the Board of Trade very good and sufficient reasons for carrying out an Electric Lighting Order by means of current purchased in bulk from a company, or for relying upon such a source of supply as an auxiliary, in preference to extending the local works. Meanwhile, interest shifts from the general to the particular, as exemplified in the cases of the new electricity supply companies whose Bills will be adjudicated upon by Parliament in the light of this report.

PERSONAL.

Mr. J. A. CARTER, of Ennis, has been appointed Gas Manager at Castlebar, where the gas-works have been entirely renovated, and a new holder erected.

Mr. WILLIAM OWEN, late Manager of the Horley District and Twyford Gas Companies, has secured the appointment of Manager of the Hatfield Gas Company.

Mr. FREDERICK KEY, of Darenth, Kent, has been appointed Gas and Water Manager to the Birstall District Council, in succession to the late Mr. John Graham. The vacancy was advertised in the "JOURNAL" for the 14th ult.

Mr. CHARLES POTTS has been appointed Manager and Secretary to the Hyde Gas Company, in succession to the late Mr. W. Smith. Mr. Potts has for some time filled the position of Chief Clerk; and he has been connected with the undertaking for over thirty years.

Mr. CHARLES LAWLER, J.P., has been selected by his colleagues on the Board of the Alliance and Dublin Consumers' Gas Company to succeed the late Mr. Edward Fottrell in the chairmanship. Mr. Lawler has for several years been a most active member of the Board, and is intimately acquainted with the Company's business in all its departments.

Mr. HUBERT RUSSELL, son of Mr. F. Russell, Engineer and Manager of the Bexhill Water and Gas Company, has been appointed Secretary and Manager of the Holmfirth Gas Company, in succession to Mr. S. Crossland. Applications for the position vacated by Mr. Crossland, who goes to Abingdon, were invited in the "JOURNAL" for the 14th ult.

Much sympathy has been expressed with Mr. GORDON WALKER, the Engineer and Manager of the Wantage Gas-Works, on the death of his wife, which took place last Tuesday evening. Mrs. Walker had been unwell for the previous fortnight; but yesterday week she was suddenly taken worse, and rapidly declined. The cause of death was internal inflammation, pneumonia, and failure of the heart's action. Mrs. Walker leaves a family of five young children; and deep sympathy is felt for them and for Mr. Walker in his great trial.

On the 9th ult., at Ceará, North Brazil, Mr. THOMAS M'MAKING, Engineer and Manager of the Ceará Gas Company, Limited, was presented, on behalf of the staff and employees of the Company, by Mr. John Reid, the newly-appointed Engineer and Manager, with a case containing a silver inkstand, &c. Mrs. M'Making was on the same occasion the recipient of a silver egg-cruet. Mr. M'Making has been for the past twelve years Engineer and Manager of the Company, and was highly respected by the staff and employees. Mr. Reid served his apprenticeship with Mr. Sharman, at Wisbech, and has been eight years with Mr. M'Making in Ceará. After the presentation, a very pleasant evening was spent.

A Long Jointed Steel Water-Main.—The new steel main now being laid for the water-works of Adelaide, South Australia, is of interest, from the fact that, though riveted pipe was originally specified, the authorities found a joint suggested as a substitute so satisfactory that they adopted it. The pipe is 8½ miles long; and the pipes used are 15 to 26 inches in diameter. The pipes are formed in 26-foot lengths, and are made up of two ½-inch plates and two locking-bars serving to connect them. The plates are slightly dovetailed at their edges, and the dovetails fit into grooves in the locking-bars; the sides of the grooves being finally closed down on the plate by hydraulic pressure. The joints are stated to be perfectly tight, and to be cheaper than riveted ones.

COMMUNICATED ARTICLES.

THE GASHOLDER TANK AT SUTTON.

By F. S. CRIPPS, Assoc.M.Inst.C.E.

Drawing No. 6 (given last week) is the general drawing for the tank; and Drawing No. 7, appearing to-day, is that of the details, showing the ironwork to be built in or partly fixed by the contractor for the tank.

Embankment.—To reduce the depth and amount of excavation, and so save not only its cost, but also the cost of carting away the material, the tank was designed to stand 5 feet above the level of the ordinary ground-line of the works. The tank is banked up all round to this extra height; thus saving still more of the excavated material, including all the top soil.

Foundations.—It will be seen from the drawings that the wall of the tank rests upon a foundation of natural clay, which has first been cut, watered, turned, trodden, and punned into a plastic and water-tight mass. The cone or dumping was similarly treated; the coating of concrete being simply to preserve it in true form, and to make a firm foothold for the men when erecting the gasholder. The concrete cover to the cone thrusts hard against the toe of the apron at the bottom, and is thickened up somewhat as it approaches it. The steepest angle at which the clay is found to stand safely is 30° .

Concrete Wall.—The thickness of the wall at the foot is 4 feet, which is about 6 inches thicker than it might have been if ordinary Thames ballast had been used. This extra thickness was allowed in case the burnt-ballast should not prove as good a material as expected.

To assist in binding the wall together, and preserving it in true form, hoops of $1\frac{1}{2}$ inch by $\frac{1}{2}$ inch flat iron (tarred and sanded) were laid in the wall at intervals of about 5 feet in the height, as shown on Drawing No. 7.

The clay was burnt into ballast as it came from the trench. It required no breaking up, but cracked of its own accord (in the burning) into pieces which would pass through a ring about 2 inches or $2\frac{1}{2}$ inches diameter or less. No sand whatever was used—only burnt-ballast and cement in the proportions of 6 to 1. It was found that the ballast was very thirsty; and therefore it was kept well watered in the heap before mixing.

In making concrete of this kind, it should be noted that it is most important that the clay shall be thoroughly well burnt. It can be done with coke breeze, or partly breeze and partly coal; but coal dust is perhaps the most satisfactory fuel. After first starting a comparatively small heap over a wood fire with air inlets below, the clay and coal are piled up in a mound in alternate layers—i.e., a thick layer of clay followed by a mere sprinkling of coal dust. When the heap has attained considerable dimensions (about 15 feet in height), it is fed so that the burnt ballast may be taken from one side while the clay is burning on the other—the mound growing in one direction only. It must not be used hot, but must be thoroughly cooled and saturated with water. Some experience is required in knowing when to feed the heap with coal and clay, so that it shall be properly burnt and without waste of fuel.

The concrete did not set quite so quickly as when made with ordinary ballast; but it is now "like a rock." The face is also somewhat rougher, probably due to the absence of sand.

The concrete was shot down vertical shoots at intervals of about 12 feet round the circle, and immediately spread to form the wall. In doing this, care was taken not to throw it violently. It was lifted with the spade and deposited in position, in bulk as much as possible, or pushed into place. The whole circle was brought up regularly—that is, no part gaining more than 3 feet in height on another. Every 3 feet stage was made good for the entire circle before proceeding with the next. Each layer was keyed with the one above, by leaving blocks of timber in so as to form a chase or V groove round the circle. They were then extracted before putting in the next layer of concrete.

Excavation and Timbering.—The excavation was carried out as follows: After removing the top soil down to the clay and the whole surface had been levelled right across, a central pier of concrete was put in, having its foundations somewhat below the top of the dumping. Into this was fixed the iron centre pin for the trammel. The inside and outside circles of the trench were then trammelled out, and the excavation of the trench was commenced.

The width of the trench in the clear was 8 feet for the full depth; the outer circle being 18 inches clear of the wall at the base (i.e., equal to the thickness of the puddle backing), and perfectly upright back and front.

No provision was made for the fourteen piers under the standards. The ground for these was excavated 3 feet at a time—that is, as each frame of timber was withdrawn, the clay was dug out behind to a sufficient width for the puddle behind the piers; the timbering on the outer circle of the trench was, therefore, a complete circle and of the simplest character. It was in 3 feet stages or frames in both circles.

Forming Wall and Shuttering.—After making the clay bottom of the trench into a plastic and water-tight condition, the puddle was put in at the back, and the apron concreted in right across. Then, instead of using timber shuttering for the back of the concrete wall, the clay puddle was made to do the duty of shuttering.

The front face of the wall, however—as it was required to be perfectly true in form—demanded very careful moulding. Twenty-eight strong timber uprights, to act as guides for the shutters, were rigidly fixed (and strutted from the side of the trench) at equal distances apart round the circle. The faces of these posts were planed, and were perfectly erect, and fixed so as to be flush with the inside face of the wall. Sufficient moulding shutters were then made, 3 feet deep, of the correct sweep, and extending from one post to the next all round the tank. These were quite free, and were simply wedged up flush with the face from fillets fixed on the sides of the timber uprights or guide posts. The shutters were struck as soon as the 3 feet ring of concrete had sufficiently set. They were then raised another 3 feet, and so on, for the whole height of the wall.

As before stated, the back of the wall was formed by putting the puddle in first to the required thickness (after withdrawing the 3 feet of timber framing), and then filling in the concrete between the puddle behind and the wood shutter in front.

Puddle.—All puddle was mixed in a pug-mill and was thrown into position from the top of the trench. It was then punned, and trimmed to the true circle before filling in the concrete. To keep the top face of the last layer of concrete clean, it was covered with sacking before raising the puddle backing.

The undercutting for the puddle behind the piers was easily accomplished as the wall rose. The pier itself was 6 inches in advance of the timbering, so that there was no difficulty in throwing the puddle in and making it sound behind the pier, because as each tier of timbering was removed, and the clay cut back, the puddle below was well trodden and made good.

Inlet and Outlet Pipes.—The excavation, &c., for the inlet and outlet pipes, being kept snug against the tank wall and in the corner next a pier, did not necessitate much extra work. It will be observed that they are embedded in concrete where they pass under the wall and enter the inner circle of the tank; and they are thoroughly surrounded by puddle on the outside for the full height.

Tank Guide Stones.—The stones for the tank-guides were laid in position as the wall was brought up, in the usual way.

Holding-Down Bolts.—The holding-down bolts were fixed quite loose; a short wood box being placed round each when filling in the concrete; and this, being tapered, was easily raised higher and higher as the pier was brought up in 3-foot stages.

Rest Blocks.—The twenty-eight rest blocks upon which the gasholder lands, were formed in concrete and set perfectly true and level.

Standard Stones.—Stones are fixed under the standards in the usual way.

Coping.—The coping was made in rough concrete blocks; and after fixing in position it was rendered perfectly smooth on the exposed faces. A 3-inch overflow is provided, 6 inches below the top of the coping, and a 3-inch pipe for filling the tank with water. These are both cast in the coping blocks.

Pump-Well.—The pump-well already alluded to in the description of the gasholder is watertight; and an iron ladder is fixed so that there is convenient access to the pump at any time.

Finishing-up.—In order to give the whole structure a good appearance, it will be surrounded by a hard burnt-ballast path, having a clinker border, and the embankment trimmed up and turfed to a true form. The gasholder itself is painted light red; the guide-framing, roller carriages, and hand-railing white.

The contractors for the gasholder tank were Messrs. B. Cooke and Co., of London; and those for the holder, Messrs. C. & W. Walker, of Donnington. The gasholder was erected by the well-known gasholder erector Mr. John Monk; and it is gratifying to be able to record that the whole of the work, both on the tank and holder, has so far been executed without any accident.

PHOTOMETRIC STANDARDS.

By W. GRAFTON, F.C.S., of Beckton.

(Continued from Vol. LXXI., p. 1574.)

Analysis of Flame.

The standard was now carefully set at one end of a 60-inch open bar with a carriage, carrying a disc-box and a Methven standard working thereon. The disc and screen were $15\frac{1}{8}$ inches apart. The Methven screen was supplied with pentanized coal gas; the carburetter being in a bath of water at 60° Fahr. The results were calculated by squaring the distances. To the Dibdin standard was attached an appliance to allow light from 5 mm. sections of flame to pass through. Analyses of five flames were made. Diagrams B, C, D, E, and F (p. 48) represent the average results of the experiments.

In these we see a falling off in light value of the $2\cdot15$ -inch portion as the flame is more or less than 3 inches, and also that the light of each flame varies most above and below (40 and 20 mm.) the zone of maximum intensity. From 25 to 40 mm. the light is practically constant for all flames experimented upon. Referring to these results, they tell us that, to make the Dibdin standard right, we must reduce the aperture by $3\frac{1}{2}$ mm. Comparing the reduced standard and a Methven screen in a Letheby

DIAGRAM B.

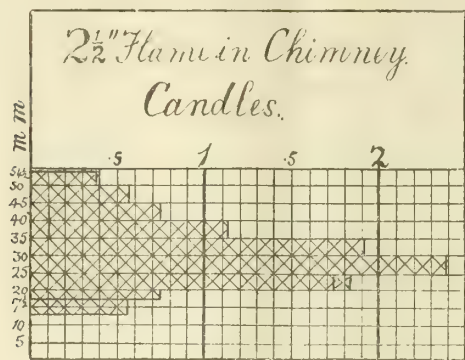


DIAGRAM C.

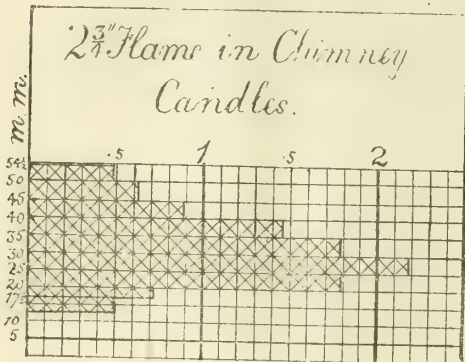


DIAGRAM D.



DIAGRAM E.

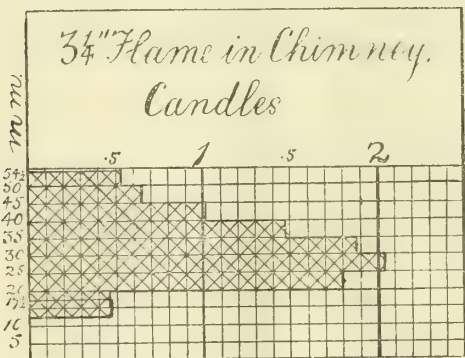
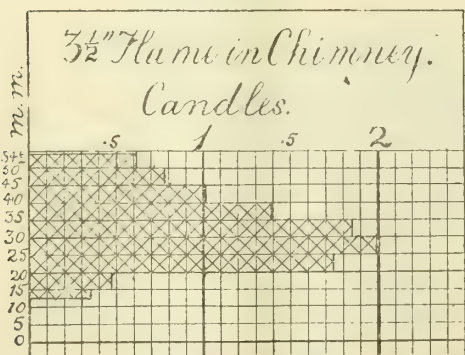


DIAGRAM F.



photometer, the Dibdin standard is equal to 10.012 candles; and this agrees with candles.

Analyses of Dibdin flames at temperatures of (the room) 57°

and 82° were made, taking 1/4-inch sections of the standard flame. The percentage of light from steatite is as follows:—

At 57°.	At 82°.	Sections. Inch.
3.47 p. ct.	4.66 p. ct.	0 to 1/4
11.63 "	16.10 "	1/4 " 1
25.13 "	26.44 "	1 " 1 1/4
22.97 "	20.72 "	1 1/4 " 1 1/2
16.84 "	17.16 "	1 1/2 " 1 3/4
10.75 "	11.49 "	1 3/4 " 2
9.17 "	3.41 "	2 " 2 1/5
59.96	99.98	

The Dibdin standard is greatly altered by an increased or a decreased temperature, apart from pentane vapour. This result is not only found to attach itself to the Dibdin flame, but similar conditions affect the candle, and, in fact, all flames. No matter what flame is chosen as the standard, it will be subject more or less to the influence of temperature. It is not the increased heat that makes a change in the power of the standard so much as the accompanying increase of moisture and often carbon dioxide. The pentane flame is more sensitive to the influence of moisture than a coal-gas flame. A few experiments were made with the 3-inch pentane flame supplied with air at different temperatures, and the light found is expressed in percentages in the following table:—

TABLE VII.—Effect of Moisture on the Dibdin Flame.

Temperature of Room, 60° Fahr.; Bar., 30.53; Feb. 10, 1896.			
Ordinary Air.	Dried Air.	Saturated Air.	Humidity of Ordinary Air.
Natural Supply.	Natural Supply.	Natural Supply.	Per Cent.
Light per Cent.	Light per Cent.	Light per Cent.	Per Cent.
100	106.12	96.58	67
Apparatus Placed in a Bath at 80° Fahr.			
100	107.15	87.60	not taken.
Temperature of Room, 74° Fahr.; Bar., 29.86; June 17, 1896.			
100	106.83	93.99	71

The air was dried by passing that used for combustion over concentrated sulphuric acid; and the small quantity used to carry the pentane vapour, by calcic chloride. By substituting clean water for the acid, the air was saturated by passing it over the water in the vicinity of the burner.

Mr. Methven found that the "London" argand, when supplied with saturated air, suffered a loss of 10 per cent. of light value by increasing the temperature 25°. The writer finds that the pentane 3-inch flame suffers a loss of 12.4 per cent. of light value for only 20°. But the most remarkable feature of these experiments is that, by saturating the air at 60° and 74°, there was a loss of 3.42 and 6 per cent. of light; while by drying all the air used at the same temperatures, a gain of 6.12 and 6.83 per cent. of light was found respectively. The degree of saturation may vary between 4.9 and 12.4 grains of moisture per cubic foot of air; but, in practice, inside a room it is found by the wet and dry thermometers to vary at least between 2.7 and 7.1 grains of moisture. These figures then show that the Dibdin standard is subject to at least a variation equal to the action produced by 4.4 grains of aqueous vapour. These results prove that it will be necessary to correct for moisture, if the standard recommended is composed of so large a flame. This, however, would not be necessary if a small portion of the flame be taken to form the standard as is the case with the Methven, since the zone of intensity is least affected.

The experiments with carbon dioxide were not determinate, being much more difficult to carry out; but they indicate a very large reduction, and show that the loss of light is greater; and not a multiple for each 1 per cent. added to the air.

Two Dibdin standards were compared in a Letheby photometer—one supplied with pentanized air, and the other successively with gas only, pentanized gas, and pentanized air. All gases were pentanized in the carburetter attached to the burner, and the latter was detached when supplied with coal gas only. The following harmonious results were obtained with a temperature of 61° Fahr., and the barometer at 30.95, from Jan. 15 to 31, 1896:—

Coal Gas Only.	Rate Corrected. Cubic Feet.	True Quality of Gas Used.	Pentanized Gas.	Pentanized Air.
10.942*	4.19	16.92	10.08*	10.10*

These experiments show that, at the temperature employed, there is but little difference whether air or gas is used as the carrier of the pentane. They show also that, if the flame be made up of only coal gas, the power of the standard is augmented by 8.4 per cent. When comparing the standards in this way, great care is necessary to see that the carburetters are equally filled with pentane, and that the burners have been burning half an hour, in order to equalize the temperature of the carburetters. Some time must be allowed when changing from gas to air and vice versa.

Both standards were fed with air from the same holder, the flames adjusted to 3 inches, and observations made. In changing the position of the standards, no taps were touched; the burners were simply lifted off each carburetter, and put on the carburetters in the reverse ends of the photometer—i.e., A burner on B carburetter, B burner on A carburetter—the terminals of the photometer coinciding with the centre of burner. In this way—with these particular standards—the flames required no

* These results are not corrected for the high power of the Dibdin standard.

adjustment, but were allowed to burn a few minutes before making observations. Repeated trials backwards and forwards resulted in a difference of 0.42 per cent. by altering the position practically nothing. However, if the precautions mentioned above are not strictly carried out, then discrepancies do arise. The disc should be moved, and not the standard, when making a comparison of this kind.

The burners are not all alike, for 2½ per cent. has been found, independent of the ends of the photometer. This difference was traced to the air-directing cone under the burner not having the same angle or shape. These cones, according to the specification, should be pointed; and the writer also affirms that the cone should have a definite height from base to apex. The angles found in some of those recently examined are—

Burner.	Angle. Degrees.	Height of Cone. Inch.	Apex.
Specification . . .	57°50	0.480	Pointed.
DB	56°75	0.400	Not pointed.
ZZZ	56°75	0.375	..
586 Certified . . .	53°75	0.350	..
587 "	46°30	0.280	..
BB	58°00	—	..
A	44°30	—	..
SP	57°75	0.340	0.12 dia.
No title	Cone curved, and enters central air passage.	..	..
WG	58°50	0.370	0.12 dia.

The SP standard was quite 0.5 candle less than any other; and the top of the cone was quite flat, as indicated by the diameter given. A cone having an angle varying half a degree or so would not matter; but there certainly ought not to be such wide differences as those indicated above. The shortness or flatness of the cone interferes with the inner air supply—this being the principal air current to an argand burner.

Experiments to Ascertain the Amount of Light Hidden by the "Cut-off" when Different Lengths of Flame are Used in Chimney.

2½-inch Flame ..	3-inch Flame ..	3½-inch Flame ..	{ Bar., 29.98.
0.3644 candle ..	0.7840 candle ..	1.7395 candles ..	{ Temp. 73° Fahr.

These average results are useful when studying the effect of parallax in relation to the position of the 10-candle standard in the photometer. According to the figures under the 3-inch heading and proved by trial, there would be an inappreciable effect on the disc, no matter whether the standard were set with the bottom of the "cut off" or the centre of the aperture central with the disc.

The result of having a heavy or a light atmosphere—commonly referred to as a high and low barometer, and one which is likely to occur over the British Isles—upon the standards of light is somewhat indefinite; but having had a barometer of 30.99 inches (Jan. 30, 1896) of mercury continuing for 7½ hours, and one of 28.91 inches (March 4, 1896) continuing for 5½ hours, experiments were made with the 10-candle standard under this range of 2.08 inches of atmospheric pressure, and no difference could be detected. So that the question of pressure does not enter as a difficulty to be overcome.

The Dibdin standard has been in daily use in a modern Letheby photometer for twenty months (from July 8, 1896, to March 31, 1898), to see what value it would accord to the outgoing gas as compared with candles and a Methven screen, with the following results:—

Bar. Inch.	Temp. of Meter.	Time Alight before Testing. Mins.	BY CANDLES.		BY METHVEN STANDARD.		BY DIBDIN STANDARD.	
			Consumption of Sperm. Grs.	Ill. Power Accorded to Gas.	Short Slot- Ill. Power.	20 min. Burning. Ill. Power.		
30.15	65.0°	21.54	41.05	16.57	16.62	15.65		
No. of tests				3625	3628	3629		

These experiments show that the Dibdin standard makes the gas going to London 0.92 candle, or 5.55 per cent., too low as compared with the return by the use of candles; while at the same time the Methven screen agrees with the candles.

Furnace Management.—In the course of a paper on the part played by chemistry in the management of furnaces, read at the second International Congress of Applied Chemistry, in Paris, by M. Damour, Chief of the Chemical Department at the Paris School of Mines, he observed, according to an abstract which appears in the "Engineer," that one of the consequences, and not the least important, of the continual progress of industrial firing, which daily gives rise to fresh applications of gas-producer and regenerative furnaces, is the possibility of regulating the combustion methodically and rationally. After dealing with the measurement of temperatures, analysis of the gases, calorific power of fuel, and pressure and speed of the gases, M. Damour observed that, for keeping a regular check upon furnaces, the first matter to be attended to is the temperature, not only in the furnace itself, but also in the regeneration chambers. The next point is the composition of the smoke, as it often happens that the excess of air attains 15 and even 20 per cent. of oxygen, which may lower the combustion point by 100° or 200° C. The proper management of gas-producers is the most effective element in regularity, while at the same time it is that wherein supervision is most necessary, because with a little negligence the gas may burn into carbon monoxide in the producer, and become very poor in heat-units.

TECHNICAL RECORD.

SOCIETE TECHNIQUE DU GAZ EN FRANCE.

Papers Read at the Annual Congress.

A recent issue of the "Journal des Usines à Gaz" contained abstracts of the papers presented at the annual congress of the above-named Society at Nice, general particulars of which have already been given in the "JOURNAL."

The subject of increasing the yield of ammoniacal liquor in gas-works was dealt with by M. Brunet. When tar is removed from the well, it is found to contain liquor in suspension in a finely-divided state. In most cases this liquor is lost. It, however, has in it an appreciable quantity of ammonia, which is allowed to go the buyers of the tar. The author endeavoured to minimize this loss by proceeding as follows: The classic experiment which serves to demonstrate the solubility of ammonia in water gave him the idea of removing by a similar operation the greater portion of the ammonia held in suspension in the tar; the process adopted being to keep constantly upon the surface of the tar a layer of pure water to a height of at least 3 ft. 3 in. In this way there is a continual aspiration of the ammoniacal gases through the tar in contact with the water; and every time there is motion in the mass, the "pockets" of liquor, whether large or small, have a tendency to rise to the surface, carrying the ammonia with them. In order to keep a constant layer of pure water upon the tar, the superincumbent liquid is drawn off as soon as it is of 4 oz. to 5 oz. strength, and is replaced by a fresh supply. The water removed is run into a tank and used in the scrubbers. As the result of an experiment extending over more than two years, M. Brunet estimates at 132,000 gallons the quantity of pure water annually put into the wells direct, independently of that employed in the washing of the gas. The yield of ammonia was raised successively from 4 lbs. to 4½ lbs. and 4½ lbs. per ton of coal carbonized; no other process having been employed to augment the quantity of the product extracted. This result was obtained without the help of any special apparatus for the removal of the ammonia from the gas; but it is thought that the methodical use of a washer would increase still more the yield above mentioned.

M. Desmazes gave an account of the working of the prepayment meter system for nearly two years at Nîmes; these meters having been introduced there in June, 1896. From the outset the movement was a success; and with the adoption of the new meter there was a marked increase in the number of ordinary installations. The demands were so numerous, that the staff of fitters had to be very considerably augmented. The average monthly consumption of gas per consumer was lower than had been expected; and, contrary to all expectation, the maximum consumption occurred regularly during September, October, November, April, and May, whereas a marked reduction took place in December, January, and February. During the hot months, gas was used for cooking purposes; in the cold weather the kitchen coke-stove possessed the advantage of heating the apartments without additional expense. The first result of the adoption of prepayment meters was a considerable extension of cooking by gas; but the advantage was less marked in the case of lighting. Thanks to the new consumers, the reductions in the sales of gas consequent upon the adoption of Welsbach burners and of electric lighting have been compensated for. The paper was accompanied by several tables, showing the effect of the introduction of prepayment meters on different classes of the population, and their distribution per house.

An account was furnished by M. Vautier of some photometric tests carried out by him of two Welsbach burners—No. 3A and No. 3B. The quantity of gas supplied was regulated to 5½ cubic feet per hour with a pressure of 22.10ths; and the orifices for the admission of air were fully open. The height of the mantles was 4.8 and 5 inches respectively. The burners were compared directly with the carcel lamp by means of a Lummer and Brodhun photometer; and the consumption was measured by a meter of the kind usually employed for photometric purposes. The temperature of the laboratory ranged from 64° to 68° Fahr. The first test was made with the mantle in a certain position; the second, with it turned 90 degrees; the third, with another turn of 90 degrees. Each test was repeated three times, with the photometer in its normal position; then three times more after the instrument had been turned 180 degrees. The conclusion arrived at by the author was that the No. 3 burner can be placed in the front rank of incandescent burners, where the gas is supplied at a pressure between 16.10ths and 24.10ths. Its luminous intensity reached 12 carcels (115 candles) with a consumption of 0.50 to 0.53 cubic foot per carcel-hour. The maximum intensity was attained with pressures of 22.10ths to 24.10ths. The gas consumption per hour was found to increase regularly from 5.3 to 7 cubic feet when the pressure rose from 16.10ths to 28.10ths.

M. Ad. Bouvier described the illumination of a school by diffused light from the ceiling. Six round burners, having a total consumption of 42.4 cubic feet of gas per hour, were replaced by four Welsbachs (No. 2), with Jena chimneys, and electrically lighted. The cost of the alteration was £15 13s., of which £8 was for whitening the ceiling and walls, and the remainder for the burners, reflectors, electric lighter, and labour.

The author summed up his results as follows: The saving of gas was about 27 cubic feet per hour, exclusive of that effected by the lighting being done at the moment required; and the new burners gave off less heat. It was expected that the expenses of maintenance would be reduced to a minimum, owing to the relative elasticity of the suspension for the electric lighting. The inner sides of the reflectors, of course, had to be wiped from time to time. The light was distributed evenly, not only upon the horizontal plane, but upon the inclined planes of the desks; and there was, moreover, considerable improvement in the condition of the atmosphere.

M. Syssoeff gave some particulars as to the progress lately made in lighting incandescent gas-lamps from a distance. During the past few years, various self-lighters have been devised in which the action of the gas upon some material such as spongy platinum, platinum black, or palladium, causes a rise of temperature sufficient to produce ignition. In the present case, the upper part of a Welsbach mantle is impregnated with material which heats up when absorbing gas, becomes red hot, and lights the gas, without any more trouble than turning a tap and waiting a few seconds. The system can be applied to the lighting of all kinds of gas-burners, as well as to gas-stoves. To the author's mind, the question of lighting gas solely by means of a chemical reaction has been successfully solved. It is to be hoped that the results obtained up to now in the laboratory will be confirmed in practice.

A cognate subject to the foregoing was dealt with by MM. Soubiran and Giroud; but in their case the arrangement consisted of a street-lamp tap with a flash-light and an electric lighter. On raising the lever of the tap, the gas passes by the flash-light. Continuing the movement, the small jet is lighted electrically, and simultaneously the gas arrives beneath the mantle. Completing the movement closes the communication with the flash-light, and the burner is lit without loss of gas or explosion in the interior of the mantle. The lighter is furnished with a portable battery; and the circulation of the electric current is so arranged that the lighting spark is produced at the top of the flash-light.

Two communications dealt with acetylene. M. Bouvier recounted the various accidents which have been caused by the use of pure acetylene, whether liquid or gaseous, compressed or not compressed. He explained the reason for acetylene being dangerous, and discussed the method of using it in solution in acetone and in a state of dilution. Looking at all the facts he brought forward, he thought he was justified in concluding that the use of pure gaseous acetylene requires a great many precautions; that the new illuminant is more dangerous than coal gas, especially in small appliances; that certain difficulties, notably the purification of the gas (phosphuret of lime being in the carbide) and the form of burner, have not yet been overcome; that in certain cases the employment of acetylene diluted with an inert gas—carbonic acid, for example—appears to be serviceable; that a mixture of coal gas and acetylene is utilized for the lighting of railway carriages; and, finally, that it is the manufacture of the gas in the house which causes most of the accidents. The other paper on this subject was by M. Monnot, who, having had opportunities of studying closely certain accidents of which he gave particulars, insisted upon the necessity for taking steps to counteract the effect of the confident assertions of the partisans of acetylene on the subject of the security attending its employment.

Tapping Water-Mains under Pressure.—The tapping of large water-mains under pressure is an undertaking accomplished much more readily now than it was a few years ago. We learn from the "Engineering Record" that a 40-inch main in Baltimore was recently tapped for a 30-inch branch, under the direction of Major W. L. Kenly, Chief Engineer of the Water Department. The cutting of the hole was accomplished in about two hours by means of a machine driven by a portable motor furnished with steam from a fire-engine.

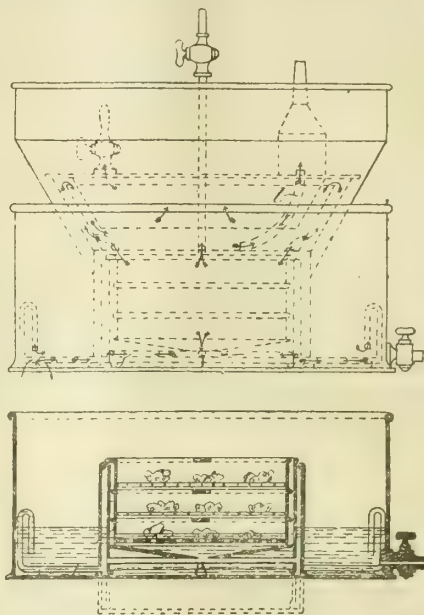
Gas Companies' Protection Association.—A meeting of the Preliminary Committee of this Association took place at the offices of Messrs. R. W. Cooper and Sons last Tuesday, when the draft rules which had been prepared were gone through and amended, and other matters of detail dealt with. A Sub-Committee, consisting of Mr. George Livesey, Mr. H. E. Jones, Mr. Shoubridge, and Mr. Helps, was appointed to finally revise and settle the rules. The first annual general meeting of the Association, of which Mr. F. E. Cooper is the Secretary (*pro tem.*), will be held in October next.

The Workmen's Compensation Rules, 1898.—Reference is made in our editorial columns to the issue by the Queen's Printers of the above-named Rules, which have been framed in accordance with the provisions of paragraph 10 of the second schedule to the Workmen's Compensation Act, 1897. It is therein specified that Rules of Court may be made generally for carrying the Act into effect so far as it affects the County Court, or an arbitrator nominated by the Judge of such Court, and proceedings in connection therewith. They are to be drawn up by the five Judges of the County Courts appointed for the making of rules under the County Courts Act, 1888; and, when allowed by the Lord Chancellor, they are to have full effect without any further consent. The Rules, with the appendix, occupy 56 pages.

REGISTER OF PATENTS.

Acetylene Gas-Generator.—Sutcliffe, H., of Halifax. No. 11,644; May 11, 1897.

This invention has for its object the construction of a stationary automatic acetylene gas-generator—preferably cylindrical in shape—within which is a perforated shelf or table. Beneath the shelf is a central tube communicating by other tubes or passages with the outside of the generating vessel. The cover is formed of a large dead-weight safety-valve, which has a discharge-pipe attached in the centre. The whole is inserted into a larger cylindrical cistern or vessel.



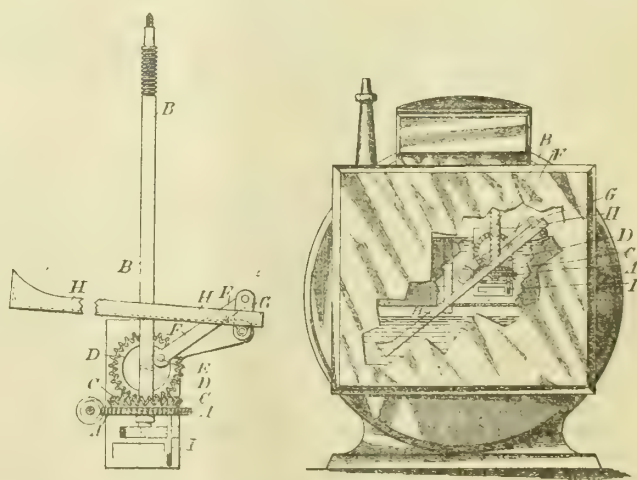
The engraving shows a complete apparatus (with the internal parts in dotted lines), and a section of the generator proper. By inserting the latter within the larger cylindrical cistern or vessel as described, "the least possible pressure is obtained automatically without leakage and with great safety." To charge the generating vessel, the cover or large dead-weight safety-valve is withdrawn; and after charging with suitable material, the outer vessel is filled to the required height with liquid, and the generator will then produce gas "automatically, either continuously or at intervals."

Cement for Repairing Gas-Retorts.—Crowther, A. W., of Huddersfield. No. 13,006; May 27, 1897.

This fire-cement is formed by the admixture, in about equal parts, of earths of a refractory nature—such as fire-clay, and gannister or silica. To these refractory earths is added about 25 per cent. of soda; and the whole is ground up and mixed in a mortar-pan or the like, and made into a paste by the addition of water. Barilla or other equivalent body may be added, if desired, for increasing the tenacity or adhering property of the cement for certain classes of work; or barilla may be substituted in some cases for soda.

Compensating Wet Gas-Meters.—Glover, R. T. & J. G., of St. John Street, Clerkenwell, E.C. No. 14,200; June 10, 1897.

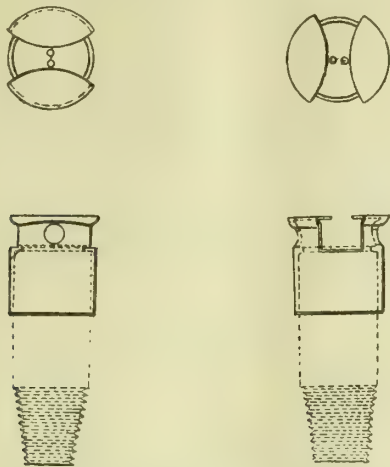
This invention relates to mechanism for operating the spoon from the main or index spindle of a wet gas-meter "in order to ensure great regularity and equal strain upon the drum during all parts of its revolution, and thus obviate any chance of the spoon sticking during, or on completion of, its movement while raising or lowering the spoon as is usual."



To the meter is fitted a crown or like wheel A upon the main or index spindle B; and in relation to it is arranged a bevel wheel C in gear with the wheel D, to which (by a pin or stud E) a link F leads, and is connected with a crank lever G of the pivoted spoon H, "for operating it steadily and continuously with the same amount of motion throughout its lifting and descending actions, whereby friction is reduced, and greater regularity of working ensured." I is a pawl to prevent any back-rotation of the pinion A.

Acetylene Gas Burner.—Kaestner, C., of Halle-on-Salle, Germany. No. 15,060; June 23, 1897.

The patentee proposes to provide a metal capsule placed on the burner so as to regulate automatically the admission of air in proportion to the



pressure of the gas; and thus secure complete combustion of the latter, whether the pressure increases or diminishes.

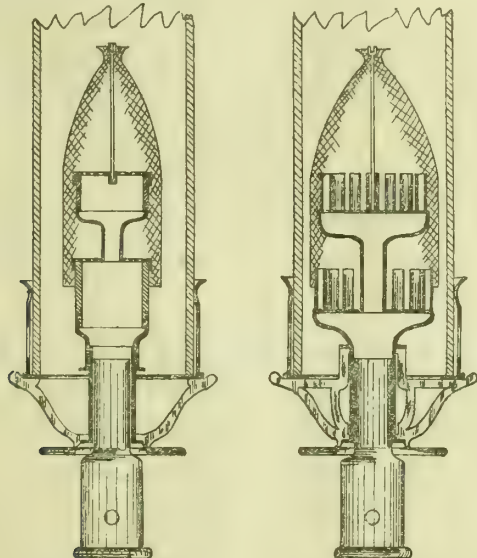
As shown, the capsule is composed of a cylindrical part furnished on its upper portion with a small internal shoulder, and having two extensions or circular cheeks extending upwards, and separated by a free space serving to disengage the flame. The cheeks are hollowed, and have openings at the sides, by which the air enters. When the burner is furnished with a capsule, the flame in filling the opening between the top cheeks at the sides produces a draught of air, more or less strong, through the circular openings and the chambers of the cheeks, according to the pressure. The amount of air introduced will thus be proportioned to the quantity of gas burned, and consequently "the combustion of it will be complete whatever the pressure."

Supporting Incandescent Gas-Mantles.—Silvester, M., of Brighton. No. 17,311; July 22, 1897.

The patentee proposes to combine with an incandescent gas-burner an adjustable clip or support for the lower end of the mantle, comprising a vertical arm or support adjustably or otherwise secured to the chimney gallery or other part of the burner, and vertically adjustable or other hinged or pivoted semi-circular arms, the free end of one of which arms is adapted to pass through a strap, loop, or socket on the other arm.

Incandescent Gas-Burner.—Schroedter, P., of Berlin. No. 16,727; July 14, 1897.

This invention refers to incandescent gas-burners formed of two or more complete burners placed one over the other, and to which the tube conducting the mixed gas is common. It serves the purpose of heating equally throughout their length hollow incandescence bodies of any shape and of any desired length.



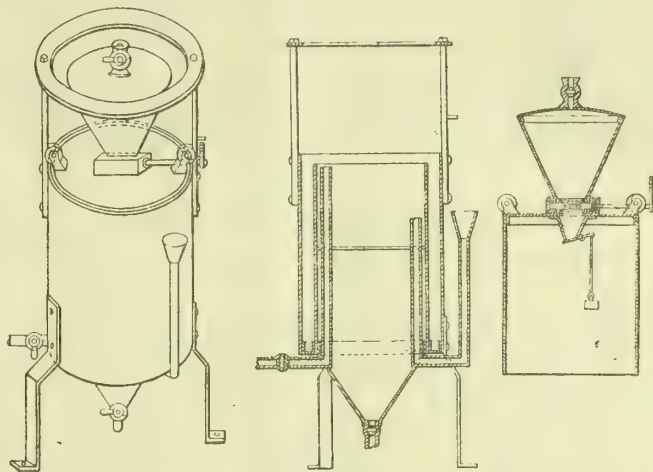
In one form of construction, above the burner rises a second burner with inlet tube, burner-head, and top covering plate; but corresponding to the upward contracting shape of the incandescence body, the top burner-head is of smaller diameter than the lower one. Each burner-head lies close to the mantle; and the heating effect of the lower burner-head extends to the outlet of the top burner-head, and the heating effect of the latter to the apex of the incandescence body. While a larger part of the upward flowing mixture of air and gas passes for combustion into the lower burner-top and heats the larger lower part of the incandescence mantle, a smaller portion of the mixture flows through the supply tube to the smaller burner and brings the top of the mantle to incandescence.

In a second form of construction, grouped tube-burners are used. On the bunsen tube is similarly fitted the uptake tube, which opens out trumpet-shaped, and thus forms the mixing chamber. The top closing plate of the latter is provided at its outer edge with a circle of holes, above which rise a circle of tubes; and above these tube-burners there is concentrically arranged a second smaller burner similarly formed.

In all forms of burners the separate burners may be either similar or different. Thus, for example, the first row may be a plate-burner, the second row a tube-burner, and the third row a circular slot-burner. For the top row also a tube-shaped incandescence body carrier may be used as the conductor for the gas and air mixture, and provided at a suitable height with side outlet openings and a burner-head surrounding it.

Manufacture of Acetylene.—Sigurdsson, O. V., of Hammersmith, W. No. 16,793; July 15, 1897.

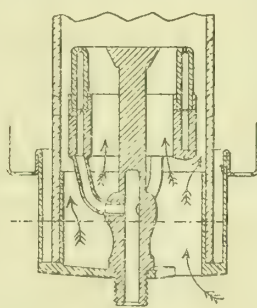
This invention relates to means employed in the manufacture of acetylene gas with a view to the delivery of the calcium carbide to the gas-generating chamber in proportion as the gas is consumed. The plant required in carrying it into effect is shown in the engraving: A perspective view of the complete apparatus, a vertical section of same with the bell or cover of the gasholder removed, and a vertical section of the bell or cover of the holder and parts carried thereby.



The calcium carbide (in powder or other convenient form) is placed in the hopper shown, at the bottom of which is a feeding chamber having an opening communicating with the supply chamber and another communicating with the gas-generating chamber. The feeding chamber has a valve of such construction as to be capable of communication with either the calcium carbide supply chamber or the gas-generating chamber separately, but cannot open communication to both chambers at the same time. The valve connections are also arranged in such manner that the bell or cover of the holder shall, on rising a given height, first shut off communication between the feeding chamber and the gas-generating chamber, and then open communication between the feeding chamber and the hopper; and, when the bell falls by the consumption of the gas, it shall first shut off communication between the feeding chamber and the supply chamber, and then open communication between the feeding chamber and the gas-generating chamber. It is also preferred to make the gas-generating chamber separate from the holder, to facilitate the removal of the lime refuse.

Gas-Burners.—Johnson, A. T. M., of Highbury, N. No. 19,601; Aug. 25, 1897.

This invention has for its object to obtain a circular or argand flame and to conduct to the inner and outer walls of the flame a supply of air so that "more perfect combustion, and therefore a more brilliant flame, will be obtained without any increase in the consumption of gas."



The cylindrical casing of the burner is fixed with a hollow stem or boss furnished with a threaded nipple adapted to screw into any existing gas-fitting, and provided at its upper end with a deflecting button. Around the upper part of the stem or boss is arranged an annular chamber supported upon the upper ends of pipes or conduits the lower ends of which are fixed with the tubular stem, and communicate with its bore. This annular chamber is formed with an enlargement or seat on which is dropped a hollow nipple, formed of steatite or other refractory material, which at its lower part is open, and at its upper part is formed with a ring of perforations, through which the gas issues. Beneath the nipple and within the seat there is arranged a gas distributor, consisting of a ring of wire gauze or perforated metal. The gas issuing from the perforations forms an annular belt of flame which creates a draught of air through the burner; and these currents pass through the length of the enclosed air-way formed by the cylinder (in the direction indicated by the arrows), and passing to the interior of the burner the air is, by the button head, caused to impinge upon the inner wall of the flame at or near the point of ignition.

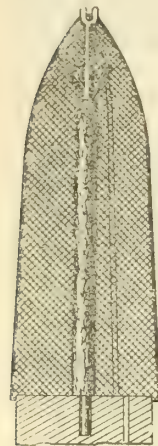
Gas-Producing Material.—Zimmerman, J., of Chicago. No. 25,750; Nov. 5, 1897.

This gas-producing substance is made by crushing carbide of calcium, then mixing with it a binding agent of greater imperviousness to water, and then forming the resulting paste into cakes, sticks, or other forms, under pressure. The binding agent is a solution of shellac and alcohol; and after forming the concrete bodies, they are exposed to heat to eliminate the alcohol. The object of binding the particles of carbide together to produce cakes, sticks, or other bodies of any desired form, is to retard the action of water or moisture on them, so that they "can be preserved with greater facility, and so that, when employed for the formation of gas, they will decompose slowly and only as necessary—thus prolonging and regulating their action and increasing their efficiency."

Self-Lighting Incandescent Gas-Burners.—Frölich, B., of Reudnitz, Germany. No. 1168; Jan. 15, 1898.

The patentee claims as his invention the combination with the crutch of an incandescent gas-burner of a covering of oxide of thorium impregnated with finely divided platinum. This may be effected by wrapping the crutch with a textile fabric saturated with the solution of oxide of thorium, and afterwards subjecting it to heat until all the textile material is burnt away and only a porous covering of oxide of thorium remains upon the crutch. This porous body is then treated with a solution of any salt of platinum, and dried or heated; the operation being repeated if desired. Platinum in the finest state of division thus remains in the porous oxide of thorium, and the fine particles are prevented from being fused together. A small receptacle made of asbestos or the like may be placed (as shown) upon the crutch, so as to contain a small amount of spongy platinum. As soon as the gas is turned on, therefore, the cover of the crutch becomes red-hot and ignites the gas.

The same result may be achieved by impregnating the mantle with finely divided platinum in a manner similar to that described with reference to the crutch, either in addition to, or in substitution for the crutch; or it may have fine platinum wires combined with it.



APPLICATIONS FOR LETTERS PATENT.

- 12,199.—GRAHAM, M., "Charging inclined gas-retorts." May 31.
 12,200.—MORRIS, J., jun., "Fittings for gas-lamps and the like." May 31.
 12,210.—THORP, T., "Production of acetylene." May 31.
 12,227.—PORTER, W. H., "Gas-burners." May 31.
 12,233.—BOULARD, G., "Manufacture of acetylene gas." May 31.
 12,245.—LAKE, H. H., "Gas or other engines." A communication from L. T. Gibbs. May 31.
 12,247.—COE, J. S., "Thermostatic gas-regulators." May 31.
 12,250.—THOMPSON, W. P., "Acetylene generator." A communication from The Gesellschaft für Heiz- und Beleuchtungs-wesen. May 31.
 12,253.—GENT, J. T., "Tap or cock for controlling gas-supply mains and branches." May 31.
 12,270.—TABBAR, J., and EVANS, J. A., "Taps for gas, water, and like purposes." May 31.
 12,295.—EVANS, E., "Generating and storing acetylene gas." June 1.
 12,356.—STEVERTS, W. H. A., "Forming incandescent bodies for gas-lighting." June 1.
 12,401.—SCARTH, J. E., "Generation of acetylene gas." June 2.
 12,424.—EILERS, H. J., and DE BRUYNE, C., "Pressure-regulators for incandescent gas-light burners." June 2.
 12,434.—BURDEN, E., "Gas or oil stoves." June 2.
 12,469.—LEVETUS, E. L., "Acetylene generators." June 3.
 12,487.—EDWARDES, E. J., "Acetylene gas-lamp." June 3.
 12,491.—BOULT, A. J., "Acetylene gas-generators." A communication from Societe Italiana Pel Carburio di Calcio acetylene ed altri gas. June 3.
 12,495.—ABEL, C. D., "Prepayment mechanism for gas and other fluid meters." A communication from T. T. Somerville. June 3.
 12,500.—SASSMANN, W., "Acetylene gas-generator." June 3.
 12,505.—CROWTHER, H. W., and HARRIS, H. G., "Pellets for igniting gas." June 3.
 12,510.—ERNST, O., and PHILIPS, A., "Producing acetylene gas." June 3.
 12,530.—HALLET, A., "Acetylene gas-generator." June 4.
 12,586.—ABEL, C. D., "Feeding gas-retorts." A communication from Societe Anonyme Continentale Pour la Fabrication des Compteurs a Gaz et Autres Appareils. June 4.
 12,588-9.—MAYER, C. P., "Automatic gas-vending apparatus." June 4.
 12,694.—PARKER, G. E., "Acetylene gas lamps and generators." June 7.
 12,698.—BOULT, A. J., "Acetylene gas-generators." A communication from J. Desforges. June 7.
 12,700.—SHERWOOD, L., junr., "Chimney for gas and other burners." June 7.
 12,725.—KUHNE, A., and MEEKS, J. C., "Gas regulator and economizer." June 7.
 12,772.—FRITZ, F., and the DAYLIGHT INCANDESCENT MANTLE COMPANY, LTD., "Burners for gas lighting by incandescence." June 7.
 12,998.—MAJOR, J., "Acetylene gas-lamps." June 10.
 13,029.—JACKSON, F. A., "Generating acetylene gas." June 10.
 13,055.—GLOVER, R. T. & J. G., "Burners for incandescent gas lighting." June 10.
 13,070.—FORBES, Sir C. S., "Generation and supply of acetylene gas." June 11.
 13,104.—BÖHNDEL, H. H., "Ignition body for gas-lights." June 11.
 13,129-30.—BENNETT, J. F., and MOORWOOD, H. S. & T. P., "Gas and oil engines." June 11.
 13,149.—LECCA, T. C., "Generating acetylene gas." June 11.
 7280A.—ROSIŃSKI, S., and DUCRUX, V. E., "Automatically lighting gas." June 15.
 13,164-5.—NAEF, P., and GARTON, R. S., "Producing coke, gas, and bye-products." June 13.
 13,185.—DONALDSON, W., "Vaporizing inflammable oils, and storing the gas produced at constant pressure for use in heating, lighting, and gas-motors." June 13.
 13,232.—THWAITE, B. H., and ALLEN, H., "Effecting the slow action of water upon calcic carbide." June 14.
 13,292.—THOMPSON, W. P., "Improved gas-motor." A communication from La Société Aubry and Morel and A. Blondeau. June 14.
 13,387.—ABEL, C. D., "Generating acetylene." A communication from P. Lipcke. June 15.
 13,474.—RICKARD, J. R., "Gas and like motors." June 16.
 13,487-8.—"CANNON" HOLLOW-WARE COMPANY, LTD., and WARD, T., "Gas cooking-stoves." June 17.

- 13,504.—KOCH, A., "Manufacturing durable incandescent illuminating bodies." June 17.
 13,559.—PLAISSETTY, A. M., "Atmospheric burners." June 17.
 13,567.—WOLLASTON, H. U., "Increasing the pressure of gas supplied to burners." June 17.
 13,573.—LA SOCIETE CHAUSSARD ET CIE., and VIGNES, C. E., "Portable acetylene gas-lamp." June 17.
 13,598.—HUTTON, E. K. & W., "Acetylene gas-generator." June 18.
 13,599.—PEEBLES, D. B., "Coin-prepayment mechanism for fluid meters." June 18.
 13,617.—TYLOR, J. J., "Rotary water-meters." June 18.
 13,636.—FORBES, Sir C. S., "Acetylene-generators." June 18.
 13,645.—SMITH, W. R., "Production of carbide of calcium." June 18.
 13,651.—YATES, H. J., and PRIOR, J. D., "Atmospheric burners for gas-fires." June 20.
 13,698.—SALES, G. DE R. DE, "Mixing gases." June 20.
 13,720.—MINSHALL, T. H., "Coin-freed meter mechanism." June 20.
 13,737.—RENOUF, P. L., "Gas-motors." June 21.
 13,830.—BOULT, A. J., "Producing acetylene gas." A communication from O. Payan. June 21.
 13,875.—PENNINGTON, E. J., "Manufacture of gas." June 22.
 13,968.—FORBES, Sir C. S., "Acetylene lamps." June 23.
 13,984.—SONDERMANN, E., "Gas-regulator." June 23.
 13,987.—EBERT, W. V., "Generating and burning acetylene gas." June 23.
 13,990.—WILTSHIRE, G., "Producing acetylene gas." June 24.
 14,035.—WINKLER, H., "Gas lamps or lanterns." June 24.
 14,037.—ZSCHOCKE, G., "Gas-scrubbers." June 24.
 14,040.—SHEDLOCK, J. J., "Gas-producing apparatus." June 24.
 14,049.—ROSENTHAL, K. E., "Generators for acetylene gas." June 24.
 14,050.—BILLWILLER, J., and ROSENTHAL, K. E., "Generators for the production of acetylene gas." June 24.
 14,075.—JEFFERIES, W. F., and CHAMPION, A., "Gas and other stoves." June 25.
 14,086.—LEES, W. & T. W., "Valves for steam, water, gas, and other liquids or fluids." June 25.
 14,132.—DURBAN, W. L., and GORE, J., "Production of calcium carbide." June 25.
 14,135.—DYMOND, J., "Burners suitable for use in incandescent gas lighting and for other purposes." June 25.
 14,139.—FORBES, Sir C. S., "Manufacture of acetylene gas." June 25.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

The Position and Prospects of Incandescent Gas Lighting.

SIR,—I think a perusal of the specification of patent No. 105 of 1893 [see "JOURNAL," Vol. XLII., p. 408] will satisfy your correspondent, "Technologist," that one of the rivals he refers to certainly has not a patent upon which a monopoly can be founded.

June 30, 1898.

A. CLARKE.

The Philadelphia Gas Undertaking.

SIR,—In your issue for the 28th ult., a letter headed "An Object-Lesson in Municipal Gas Supply" should rather have been called "An Anachronism in Supply," if viewed in the light of municipal progress the whole world over. That the City of Philadelphia paid \$3-14 for coal when they could get it for \$2-95 is a fact for Philadelphians to inquire into. However, I have to particularly notice the following statement of Mr. McDougall: "It is evidently unfair to the general public for employees of a Municipality to be paid more than the market rate of wages." As a broad principle, this is erroneous; for in many cases the market rate of wages is so low that workmen will not do justice to their work, neither can they be expected to do so. If a Municipality pay their workmen rather more than the market rate, they will attract better men to their employ, and get better work done, with the result that the whole community are benefited in consequence. It would be interesting to know the difference in the relation of wages to total expenses and the relation of salaries to total expenses in the Philadelphia gas undertaking.

July 2, 1898.

A STUDENT OF ECONOMICS.

West's Gas Improvement Company, Limited, have in hand a number of important orders for various special types of machinery and plant for gas-works. In connection with stoking machinery, the firm will, during the present year, fit up 54 charging and drawing machines, for fourteen retort-houses in various parts of the country, on the Continent, and at Buenos Ayres. They have also put up a number of coal-conveyors for coal-stores, and are making a speciality of plant for conveying hot and cold coke from the retort-house. For this and other purposes they have taken up the manufacture of the Hunt roller-chain, introduced and patented by Mr. Charles Hunt, which has been found to be exceptionally well fitted for dealing with materials of so gritty and cutting a nature as coke. The firm have just completed a West-Jenkins air-compressor, with double-stage compression and intermediate cooler, for the Crystal Palace District Gas-Works; and similar machines are being built for the Newcastle, Nottingham, and Sheffield works. The continued growth of their business has necessitated a considerable enlargement of the Company's works and plant; and they have now practically completed the extensions to which brief reference was made in these columns some time ago. In the machine shop they have made considerable additions to the plant—including three lathes and four drilling-machines of the most modern type; the pattern-shop has been enlarged to almost twice its previous capacity; and a new platers' shop has been opened. Perhaps the most important portion of the extensions is a separate department for the manufacture of retort mouthpieces—a branch of the Company's business which has grown considerably of late years. This shop, which is 33 feet wide and 150 feet long, is traversed by an overhead rope-driven crane; and in it is erected plant specially designed for this class of work.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Monday, June 27.

ROCHDALE CORPORATION WATER BILL.

On the motion for the third reading of this Bill,

The Earl of CREWE moved that the Bill be re-committed. He explained that by the Bill the Corporation of Rochdale proposed to take water from the Calder Valley in Yorkshire—a populous district, the centre of the woollen trade. This would injure the millowners and others in the district, as all the collecting areas were already well occupied. The West Riding County Council, which represented all the Local Authorities, objected to the Bill on general grounds; but the Committee of the House declined to hear them because they had no *locus standi*. He asked that the Bill should be re-committed so that the Council might be heard.

Lord HAWKESBURY (the Chairman of the Committee who considered the Bill) pointed out that the County Council were not a water authority. It was true they claimed to represent a large number of Local Authorities; but there was not one word to this effect in their petition. He trusted their Lordships would support the Committee.

The Earl of MORLEY said it was quite clear that the Standing Order under which the Committee acted was a purely discretionary one. It would, he thought, be very dangerous if their Lordships, without the assistance of all the arguments which the Committee heard, and of the maps which they had before them, reviewed the decision arrived at. It had not been alleged that this decision was contrary to any of the rules or precedents of the House, or that any injustice had been done. It seemed to him that such cases as that now referred to must be taken on their merits. In this particular one, it would be somewhat dangerous if the House were, on what must be an *ex parte* statement, to review the decision arrived at unanimously by the Committee after a full hearing.

After some further remarks, the motion was rejected.

Friday, July 1.

BOROUGH FUNDS BILL.

Earl BEAUCHAMP moved the second reading of this Bill, and explained that its object was to amend the Borough Funds Act, 1872, and the Borough Funds (Ireland) Act, 1888, in certain particulars, including that of limiting the power to take a poll, which had often caused great and unnecessary expense.

The Earl of MORLEY said he must object to some of the details of the Bill; but he had no desire whatever to stand in the way of its second reading. He wished the noble Lord to know, however, that there were certain points in it to which he would have to ask him to direct his attention.

After a few remarks from the Earl of WEMYSS,

The Bill was read a second time.

The following further progress has been made with Bills :—

Bill brought from the Commons, read the first time, and referred to the Examiners : Leyton Urban District Council Bill.

Bills read a second time and committed : Clacton-on-Sea Gas and Water Bill, Coventry Corporation Gas Bill, Cromer Gas Bill, Drogheda Gas Bill, Higham and Hundred of Hoo Water Bill, Leyton Urban District Council Bill, Local Government Provisional Orders (Gas) Bill, Maldon Water Bill, Middlesbrough Corporation (Gas) Bill, Mid-Kent Water Bill, Wey Valley Water Bill.

Bill reported : Norwich City Water Bill.

Bills reported, with amendments : Cranbrook District Water Bill, Crawley and District Water Bill, Gainsborough Gas Bill, Southwark and Vauxhall Water Bill, Tottenham and Edmonton Gas Bill, Wigan Corporation Bill, Wishaw Water Bill.

Opposition withdrawn : Southampton Gas Bill, Wigan Corporation Bill.

Bills read the third time and passed : Forres Water Bill, Gainsborough Gas Bill, Gas Orders Confirmation Bill (No. 2), Heywood Corporation Water Bill, Newcastle and Gateshead Water Bill, Northam Urban District Water Bill, North Warwickshire Water Bill, Norwich City Water Bill, Southend Water Bill, Southwark and Vauxhall Water Bill, Staines Reservoirs Joint Committee Bill.

Bills Royal Assented : Bakewell Gas Bill, Brompton, &c., Water Bill, Enfield Gas Bill, Gloucester Gas Bill, Ilkeston Corporation Bill, Market Harborough Gas Bill, St. Anne's-on-Sea Gas Bill, Southend Gas Bill, Thanet Gas Bill, York United Gas Bill.

The Gaslight and Coke Company Bill, the Matlock Urban District Council Bill, and the Rhymney and Aber Valleys Gas and Water Bill have been referred to a Select Committee, consisting of Lord Clinton (Chairman), Lord De Saumarez, Lord Raglan, Lord Hare, and Lord Amherst of Hackney; to meet on Tuesday, July 5.

HOUSE OF COMMONS.

The following further progress has been made with Bills :—

Bills read the first time, and referred to the Examiners : Forres Water Bill, Gas Orders Confirmation Bill (No. 2), Heywood Corporation Water Bill, Newcastle and Gateshead Water Bill, Rochdale Corporation Water Bill.

Bills read a second time and committed : Bury Corporation Bill, Carlisle Corporation Water Bill, Gas Orders Confirmation Bill (No. 1).

Bills reported : Bacup Corporation Water Bill, St. Helens Corporation Bill.

Bills read the third time and passed : Hamilton Water Bill, Leyton Urban District Council Bill, Kettering Water Bill, Market Harborough Gas Bill, Todmorden Corporation Water Bill.

Petitions have been presented against the Bury Corporation Bill, from the Bury Rural District Council, the Corporations of Rawtenstall and Haslingden, and the Urban District Councils of Little Lever, Radcliffe, Ramsbottom, and Whitefield.

HOUSE OF LORDS COMMITTEE.

(Before the Earl of NORTHBROOK, Chairman, the Marquis of LOTHIAN, the Earl of GLASGOW, Lord ABERDARE, and Lord SHEERBORNE.)

CENTRAL POWER DISTRIBUTING COMPANY BILL.

This Bill, the object of which is to enable the Company to supply electricity for lighting, traction, and other purposes to a district embracing an area of 2000 square miles, including the towns of Sheffield, Rotherham, Lincoln, Gainsborough, Newark, Nottingham, Ilkeston, and Worksop, came before the above-named Committee on the 21st ult. It is proposed to erect a central station at Warsop—a place midway between Worksop and Mansfield—in the midst of a colliery district; and the promoters state that, by the use of coal slack for generating purposes, which they will be able to procure at 2s. per ton, they will be able to produce electrical energy at an extremely cheap rate. In view of the large average demand which they hope to develop in the area of supply, they expect to be able to sell electricity at 1d. or 1½d. per unit; whereas the present charge in Nottingham, where the electric light works are in the hands of the Corporation, is 4d., having been reduced to this figure from 6d. since the Bill was introduced. Petitions against the Bill had been presented by the Corporations of Nottingham, Sheffield, Lincoln, Rotherham, Doncaster, Ilkeston, and Chesterfield; the Urban District Councils of Bakewell, Belper, Matlock Bath, Mexborough, Wombwell, Worksop, and Heanor; the Sheffield Electric Light and Power Company, and others. There were, however, upwards of seventy petitions in its favour.

The case for the promoters was opened by Mr. Pember, Q.C., who said that the scheme, which was a new departure, was to supply electricity for all purposes over a large area in the Midlands, comprising collieries and manufactories of all kinds. The share capital proposed by the Bill was £750,000, with borrowing powers to the extent of £250,000; and the promoters were such that there was no possible doubt of their financial ability—the first name being that of Colonel Thackeray, a partner in the firm of Messrs. Thackeray and Sons, one of the oldest and most important firms in Nottingham. By the Bill, Sir T. Thompson, Bart., Mr. W. A. McArthur, Mr. E. A. Lazarus, Mr. Arnold Lupton, Mr. R. Monks, Mr. J. W. Thackeray, and Mr. Markham were incorporated as a Company for carrying out the object in view. The learned Counsel explained the origin of the scheme. He said it became apparent last year to certain gentlemen with large industrial interests how great were the advantages enjoyed by manufacturers in America and on the Continent from the supply of electricity for power over a large area; and they thought that some effort should be made to obtain similar advantages for the trade of this country. The Board of Trade were far from discouraging such a project; but they did not see their way to making the scheme the subject of a Provisional Order, which in this instance would have dispensed with the necessity of obtaining the consent of about a hundred Local Authorities. Accordingly, the Board recommended procedure by Bill. Certain other Bills were before the authorities in the two Houses of Parliament, involving new departures in the same direction. It was perceived, in fact, that electrical enterprise was starting anew, and had outgrown parochial limits. The main obstacle to the application of the industry on a really beneficial scale had been the veto of the Local Authorities in certain important respects. A Joint Committee of Lords and Commons was appointed to consider the question—Lord Cross being the Chairman; and the Committee took a good deal of evidence concerning the compulsory acquisition of lands, the establishment of generating stations, and the veto of the Local Authorities. He (Mr. Pember) thought the Committee would agree with him that the old days of veto were over, and that it was now only a question of *locus standi*. He urged, with the greatest possible submission, that the present case must be judged on its merits, and that all questions of veto must be considered at an end; the only point being whether or not, on the merits, any particular Corporation could claim that special circumstances entitled them to ask to be left out of the operation of the Bill. The majority of the petitions against the Bill were from the Local Authorities over the area of supply, and were full of this topic. The promoters of the Bill, in common with those responsible for other measures, appeared before the Joint Committee and gave evidence as to the great utility of such schemes, and the cheapness with which electricity could be supplied by them. On that occasion, he argued that there was a danger of an undue tenderness for the principle of local self-government being allowed to work great commercial harm; and to some extent the Joint Committee appeared to have agreed with this opinion. Nothing was so important, from the point of view of securing a cheap supply, as a large and constant average demand. In the area comprised in the Bill, the necessary conditions of such a demand were unusually well developed. The generating station was to be established in a country district, and close to a large colliery, whence they would be able to obtain a particular class of coal—a kind of slack—at as low as 2s. a ton. The Bill proposed to supply electricity at 1½d., and in some cases at as low as 1d. per unit. They asked for no monopoly; and there was a clause distinctly saying so. He had a long list of petitions in favour of the Bill, including some from the Sheffield and Nottingham Chambers of Commerce, users of machinery, District Councils, and other influential bodies. On the other hand, there were petitions praying the House to reject the Bill on the ground that the promoters would have power to break up streets and interfere with traffic; and saying that the scheme was speculative, and that its adoption would unfairly interfere with existing powers. There were two scales of charges in the Bill; the lower one being for the supply of electric energy in large quantities.

The first witness called was Mr. Arnold Lupton, Professor of Coal Mining at the Yorkshire College, Leeds, who stated that, in his opinion, the scheme was in the interests of the localities intended to be served. The site of the generating station had been selected for geological reasons—being in the centre of one of the richest coalfields in Great Britain—and coal would be supplied under contract at the rate of 2s. a ton. The scheme would save the manufacturer spending his capital and energy in the production of power, and was therefore an important step in the division of labour. Asked by Mr. Balfour Browne, Q.C., who represented the Sheffield Corporation, whether he thought that, as a matter of principle, a Company ought to be allowed to come in and compete with a

Corporation like Sheffield, who, were there a demand, could supply the whole town, witness said he considered that it was absolutely essential for the progress of the country that companies should be allowed to compete. He believed they could do so successfully. The scheme before the Committee would really allow of the sale of energy at wholesale instead of retail prices. If such places as Sheffield, Rotherham, Newark, and Nottingham were excluded, he doubted whether the scheme would be successful. Mr. Bainbridge, M.P., followed, and expressed the opinion that the scheme was one of the most progressive ever put forward in the interests of a large district and a vast population.

On the following day, further evidence was given in support of the Bill; among the witnesses being the Duke of Newcastle, who expressed an opinion that the measure would confer great advantages on the mining districts included in his estates. If the scheme were carried out, he would employ electricity for the lighting of Clumber, and for other purposes. In cross-examination, the Duke admitted that the Corporation of Nottingham had lately laid down mains to supply his estate in that city with electricity under an agreement; but he said he would prefer to have two strings to his bow, so that his tenants might have the advantage of a cheap supply. Colonel Thackeray said his firm, who employ 500 hands, approved of the proposals of the Bill for such a supply of power as the promoters could afford. Moreover, it would be useful to individual workmen, and would, he anticipated, send manufacturing to a great extent back again to the villages. He thought that the class of men who used the handloom in the hosiery trade would, if such a supply as that proposed were available, again work in their own homes. Their families would be able to manage one or two machines. Mr. T. Bayley, M.P. for the Chesterfield Division, said he believed the scheme would be an advantage to the mining and agricultural parts of his constituency, because they would get cheap motive power, and there would be a greater amount of work for the women with the birth of small industries, for which in the villages there was great requirement. The distribution of electric power must, he thought, be a benefit to the large colliery villages. Mr. G. H. Davies, a surveyor and valuer, expressed the opinion that the "penny-in-the-slot" system of supplying electrical energy would be of advantage. This, of course, was only one of a hundred ways in which this scheme would be of service.

Next morning, other witnesses were called to support the Bill; several electrical experts, including Mr. James Swinburne, expressing the opinion that the scheme had every prospect of becoming a commercial success.

At the close of the promoters' case, Mr. Balfour Browne addressed the Committee on behalf of the Corporation of Sheffield, who, he declared, strongly objected to having to meet the competition in the supply of electricity of an outsider. If the new Company were to be allowed to carry on their operations at all in Sheffield, it ought to be at the risk of having to purchase the electric light undertaking now in existence there. The promoters, he contended, would not be able to furnish a cheaper supply than the Corporation, as the price of coal differed but little at Sheffield and Warsop. He thought they could hardly really intend to carry out the scheme; and he suggested that the Bill was being pushed forward with some ulterior motive. The Lord Mayor of Sheffield (the Right Hon. A. G. Franklin), in giving evidence against the Bill, said the Corporation were building an electricity generating station for the working of the tramways, and had entered into an agreement with the Sheffield Electric Light and Power Company to purchase their concern. They had thus involved themselves in an expenditure of about half-a-million of money, and were naturally opposed to an outside Company obtaining power to compete with them. The Sheffield Company had offered to supply large quantities of electricity at the rate of 1d. per unit; and he did not think this rate could be lowered by the proposed Company.

At the outset of the proceedings on the following day, the Chairman suggested that if the promoters of the Bill would take it that the Sheffield Corporation were willing to supply the city with electrical energy when they had possession of the undertaking of the Electric Light and Power Company, further evidence on this point might be dispensed with, and the proceedings shortened. Mr. Pember replied that, though he should like to grant all he could, he had no means of admitting anything as to price or quality, except through witnesses, whom he would like to cross-examine on these points. Further evidence was then called in opposition to the scheme. Sir Charles Skelton, ex-Mayor of Sheffield, expressed a strong opinion that the Corporation ought to have the monopoly of the supply of electricity within their area. Replying to the Marquis of Lothian, he said that if the new Company would be content to sell power wholesale in bulk to the Corporation, without attempting to supply direct to the consumers in the city, it would largely diminish opposition, as the Corporation objected chiefly to the disturbance of the streets which the scheme would entail. Mr. R. Hammond gave statistics of expenditure by corporations and companies in respect of electric light undertakings in the United Kingdom, with the object of showing that the capital of one million sterling proposed by the new Company was inadequate. Major-General Webber gave corroborative evidence. The objections to the scheme of a number of the smaller Urban District Councils in the proposed area having been stated by Mr. Wedderburn, Q.C., and those of the Corporations of Lincoln and Ilkeston by Mr. Lewis Coward and Mr. Lissett respectively, witnesses were called on behalf of the Rotherham Corporation against the Bill. Among these was Professor Kennedy, who stated that he was engaged in carrying out various electrical works at a cost of £1,500,000, and had compared the proposals of the Bill with what was actually done in two places with which he was concerned. In Oldham, which was not unlike the towns in the district proposed to be served by the Company, they were already supplying electricity, though on a small scale, on exactly the terms of the Bill—viz., a differential rate between 4d. and 2d. per unit; while in Edinburgh, where the Corporation also owned the electric lighting works, and where the output was very much larger, the charges to the public had been reduced to 3d. per unit for lighting and 1½d. for power. He cited these cases as showing that municipalities not only could, but did already, supply the current to general consumers at rates at least as low as, and in a number of cases lower than, those of the Bill. There were a number of other cases in which corporations were making terms with tramway companies to supply them with current for traction purposes at rates varying from 2d. to 1d. per unit; and they would realize a profit at these prices.

On the resumption of the proceedings on Monday last week, the opposition of Rotherham, Doncaster, and Chesterfield was proceeded with.

At the close of these cases, evidence was called in support of the petition of the Nottingham Corporation against the scheme. Among the witnesses examined was Dr. E. H. Fraser, the Mayor of that borough, who said that the Corporation had practically laid out a quarter of a million sterling on their electric lighting undertaking; and, as they proposed to work the tramways by electricity, they would probably before long spend another large sum. They viewed the proposal of the Company, as set forth in the Bill, with dismay, and were perfectly unanimous in asking the Committee to reject the scheme. Nottingham had acquired the gas and water undertakings, and also the tramways, largely in consequence of the incessant disputes which their possession by private authorities involved in regard to the opening of the roads. By the 1st of July, the price of electricity, both for light and power, charged by the Corporation would be less than that scheduled in the Bill. Witness declared that the Nottingham Chamber of Commerce, which had petitioned in favour of the Bill, was a very small and unimportant body. Sir J. Turney, the Chairman of the Electricity, the General Works, and the Highways Committees of the Nottingham Corporation, was also called. He said the electric light undertaking had been a thoroughly successful one. They had been supplying light at 6d. per unit, and power at 3d. per unit; and the price had recently been reduced. Owing to their success, the Council had decided to extend the central station. At the present time they had 3000-horse power; but they were going to more than double it—bringing it up to about 7000-horse power. They made £3500 profit last year, and placed it to a reserve fund. They had not fixed the present prices without due consideration; and they had no doubt about making a profit. He strongly objected to a Company coming in, because he believed the Corporation could supply electricity at as cheap a rate. The Corporation were going to sell at 2d. per unit for the first four hours, and at 1d. afterwards. Mr. H. Talbot, the Corporation Electrical Engineer, said he did not believe the proposed Company would be able to supply light or power cheaper than the Corporation. Dr. Hopkinson stated that, in his opinion, neither in the Bill nor in their evidence did the promoters give a clear idea as to carrying out the proposed scheme. So far as Nottingham was concerned, it was in an advantageous position; and he was convinced that the Corporation could supply electricity cheaper than the Company. He saw no reason whatever for disturbing the right of the Municipality; and he thought if an outside Company entered Nottingham it would be a loss to the city.

On the re-assembling of the Committee on Tuesday morning, they were addressed by Mr. Pope, Q.C., on behalf of Nottingham. He argued that, as in the cases of gas, water, and locomotion, the tendency of Parliament had been to vest all public commodities in the communities themselves; and they had decided that, where a municipal body was able to supply itself, no competitor should be allowed to come in. Nottingham was in such a position that there was no shadow of reason why the city should be subjected to inconvenience and cost in order simply to allow a speculating body to obtain the high load factor necessary to the success of their scheme. In reply, Mr. Pember denied the general proposition set up by Mr. Pope in regard to parliamentary opinion. He contended that the Joint Committee had recognized the development that was to ensue in regard to electricity as a motive power, and that their recommendations were distinctly in favour of granting powers to such bodies, and under such conditions, as those embodied in the Bill.

At the close of Counsel's addresses, the Chairman announced that the Committee found the preamble of the Bill proved. They intimated, however, that they were prepared to consider any clause which Corporations within the Company's proposed area of supply might suggest for the purpose of giving to them greater power than they now possessed in respect of the laying of the Company's mains through their thoroughfares. They also decided that a clause must be inserted to enable Corporations to take from the Company electrical energy in bulk for the supply of their respective districts. With regard to the construction of the Company's central generating station at Warsop, the Committee held that some limit of time must be inserted in the Bill. On hearing this announcement, the Counsel representing the Corporations of Nottingham, Sheffield, Doncaster, Chesterfield, Lincoln, Ilkeston, and Rotherham intimated that they would take no further part in the proceedings before the Committee. The general consideration of clauses was postponed; but one giving Corporations power to purchase electricity in bulk, but reserving to the Company the right to serve consumers of 10,000 volts and upwards, was accepted, and some other conditions were imposed.

The Committee met again on Thursday for the purpose of considering the clauses of the Bill. In accordance with the intimation given at the previous sitting by the Counsel for the leading opponents of the measure, the promoters alone were represented. Among the alterations and amendments made in the Bill was the insertion of a clause providing that, if the Company should not, within five years after the passing of the Bill, have proved to the satisfaction of the Board of Trade that they had expended upon their undertaking the sum of £50,000, the powers granted to them should cease and determine. With regard to supplying electricity in bulk, the clause submitted to the Committee on Tuesday was reconstructed and passed in the following form:—

The following provisions shall not apply, except so far as may be agreed to the contrary between the Company and the Corporation of any borough which at the time of the passing of this Act shall be supplying electrical energy, or have obtained an Order or Act empowering such Corporation to supply electrical energy:—

1.—The Company shall, six calendar months before commencing to distribute electrical energy within any such borough, give notice in writing of their desire so to do to the Corporation; and the Corporation shall, within three months after receiving such notice, be entitled to serve upon the Company a counter-notice indicating their desire to undertake such distribution themselves, and to purchase from the Company a supply in bulk. The terms of such supply in bulk, as to price, minimum amount, and all other details, shall, failing agreement between the Company and the Corporation, be determined by an arbitrator, and the Corporation shall be at liberty to enter into an undertaking to take from the Company a supply in bulk according to the terms so agreed or settled by arbitration as aforesaid, for a period of three years at the least; and thereupon the Company shall, save as hereinafter mentioned, be restrained for such period from distributing electrical energy under the power of this Act within the said borough.

2.—In the event of the Corporation failing to give such counter-notice, or, having given the same, failing to enter into such undertaking to take a supply in bulk, the Company's powers to supply within such borough shall be unaffected by the provisions of this section.

3.—Provided that if at the end of the said period of three years and any subsequent period of three years the Corporation shall give notice of their desire to continue the taking of a supply in bulk, the Company shall continue to give such a supply, at a price and minimum amount to be agreed between the parties, or, failing agreement, to be determined by arbitration in the manner hereinbefore provided; and thereupon the provisions of this section shall apply to the extended period.

4.—Whenever the Company make default in supplying in bulk to the Corporation as aforesaid, the Company shall be liable to pay and shall pay to the Corporation, in addition to the penalties for failures to supply by this Act provided in the case of any owner or occupier, all damages, costs, charges, and expenses which the Corporation may be under liability to pay, or shall have paid, in respect of failure of supply or pressure, which liability shall have arisen by reason of the default of the Company as aforesaid, and the amount of such penalties shall not be limited by anything contained in the section of this Act the marginal note whereof is "Penalty for Failure to Supply."

Provided that, in any event, the Company shall be at liberty to supply to any person within such area, for trade purposes, who is willing to undertake to receive a supply of not less than 10,000 Board of Trade units per annum.

On the question of maximum price, the Committee decided that this should be 4d. per unit for small, and 2d. per unit for large, consumers, with the proviso that if the average charge in any one year is not more than 3½d. per unit, the Company may divide 10 per cent., if they earn it, and an increased dividend with any lowering of that average.

HOUSE OF COMMONS COMMITTEE.

(Before Colonel GUNTER, Chairman, Sir C. PALMER, Major WYNDHAM-QUIN, and Mr. J. HOWARD.)

STIRLING GAS BILL.

This Bill, which has already passed the House of Lords, was under the consideration of the above-named Committee from the 21st to the 23rd ult. Its object, it may be remembered, is the conversion of the Company into a statutory undertaking, with additional capital and other powers; and it was opposed by the Corporation of Stirling.

The promoters' case was conducted by Mr. Pembroke Stephens, Q.C., Mr. D. Dundas, Q.C., Mr. J. D. Fitzgerald, Q.C., and Mr. Nelson; the opponents being represented by Mr. Balfour Browne, Q.C., Mr. Blennerhassett, Q.C., and Mr. Rigg.

In opening the case, Mr. Pembroke Stephens said the Bill was promoted by the Stirling Gas Company with the object of being constituted a statutory Company. It had come from a Committee of the House of Lords, presided over by the Duke of Richmond; and the only opposition was from the Corporation of Stirling. This was the second Bill on the subject of gas legislation for Stirling which had occupied the attention of Parliament. The first was introduced by the Corporation to acquire the gas undertaking under an agreement with the Company. The scheme was strongly opposed by certain ratepayers; and the Bill did not pass. The question of purchase being disposed of in that way, the Company had now come to place themselves under parliamentary control; and the opposition was solely from the Corporation, who were in the position of rival traders, as they had taken up and were pushing the electric light. The existing capital was taken for the purposes of the Bill at £40,000. On this amount, £30,000 was taken as bearing 10 per cent. dividend, and the balance 5 per cent. The opponents wished that all the capital should be put at 5 per cent., which would be unreasonable. Power was asked to raise £10,000 additional working capital, which would also carry only 5 per cent. The advantages to the public under the Bill were that they would secure gas of not less than 22-candle illuminating power; while as to the price, it had been brought down to 3s. 4d. per 1000 cubic feet. From this the Company did not propose to depart. It was originally suggested to fix the standard price at 3s. 8d.; but, in the other House, as the result of the evidence of one of the witnesses, they agreed to reduce it to 3s. 6d. There would also be a sliding-scale, which gave the public an interest with the Company in the success of the undertaking. Yet, notwithstanding this, the Corporation were asking Parliament to throw out the Bill.

Mr. Blennerhassett (interposing) said the Corporation were not there to throw out the Bill, but to amend it in certain necessary particulars. If it were not so amended, they said it should be thrown out. The Bill should be altered in three particulars. In the first place, the petitioners said the capital was excessive, and imposed a heavy burden on the ratepayers; secondly, the standard price should be reduced; and, thirdly, the Corporation were anxious to preserve the rights of the ratepayers under the Burghs Gas Supply (Scotland) Act until next November, so that, if they wished to do so, they might decide as to putting the Act into force and buying out the Company, or, if the latter refused to be bought out, of starting a gas undertaking themselves. If the conditions as to capital, price, and ratepayers' rights were complied with, the petitioners did not object to the Bill going on. Of course, he could not give a pledge that in November the ratepayers would be in favour of purchase.

Mr. Balfour Browne having reiterated the conditions set forth by Mr. Blennerhassett, a suggestion was offered by the Chairman that there should be an adjournment, to afford an opportunity to the parties to settle their differences. Mr. Pembroke Stephens, however, said he thought it would be better for the Committee to hear the first witness, so that they might see how the case shaped.

Mr. D. Chrystal, the Company's Agent, then gave evidence on similar lines to that adduced before the Committee of the other House. In cross-examination thereon, he said the Company were willing to put into the Bill a clause providing that the dilapidations in their works should be made good by money taken from funds available for dividend. There were 7442 shares, on each of which £2 had been paid. The additions to the capital were got out of dividends; and in 1878 the £2 shares were changed into £4 shares, and so the nominal capital was increased in round numbers about £15,000. The witness was cross-examined at great length with reference to the negotiations which had taken place between the Corporation and the Company as to the acquisition of the gas undertaking, and as to the arbitration before Sheriff Lees, where the question was restricted as between a minimum sum to be paid of about £61,000

for the works, and a maximum sum of £69,000, which was the valuation put upon them by the Company's valuer. As the result of the arbitration, Sheriff Lees fixed the figure at £62,000 odd; and the then Corporation promoted a Bill to purchase the works for this sum. The Company stood aside, and left the Corporation to fight for the Bill as against the objecting ratepayers.

The Chairman intimated that the two points about which the Committee were anxious to agree were the price of gas and the amount of capital. After some consultation between the parties, it was agreed that the standard price should be fixed at 3s. 4d. per 1000 cubic feet, and the illuminating power of the gas at 25 candles.

The first point having been settled, Mr. J. A. Robertson was called to give evidence with respect to the second. He said he had gone through the books of the Company for the last 25 years, and had found that up to 1897 the capital expended had been a little over £30,000. Certain additions which had to be made in connection with the remodelling of the works brought the expenditure up to £39,678. The average dividend for the past ten years had been 8½ per cent. On the 15th of May this year, after allowing for certain necessary outlays, the clear profit of the Company available for division was £3564. This showed an increase of profit on the sale of gas during the last few years; and he attributed it to better management and improved manufacturing processes. He thought the doubling of the capital was quite legitimate and justifiable.

Mr. J. Hepworth was the next witness. He said the Company's works could not possibly be better situated, being close to the railway station and in the centre of the town. The area of the site was 2½ acres; and it was large enough to enable the Company to double the quantity of gas now being manufactured. The present production was 389,000 cubic feet per day. The extension of the works now in progress would enable the Company to manufacture 700,000 cubic feet per 24 hours; but a retort-house was being constructed of sufficient size to permit of an increased production of a million cubic feet daily. The works were being extended in anticipation of an increasing consumption of gas in the district; and at the present rate of progress, the consumption would be doubled in 14 years. The additional expenditure of £5000 was being met entirely out of revenue; and when the improvements and extensions were completed, the whole of the plant and apparatus would be in first-rate condition. He estimated the structural value of the works at £41,474. It was proposed to fix the original capital of the Company at £40,000, which, in his opinion, was eminently fair and reasonable.

Mr. Corbet Woodall followed, and generally corroborated Mr. Hepworth's evidence; saying the proposals of the Bill were fair.

Mr. Balfour Browne then addressed the Committee on behalf of the Corporation.

When the Committee re-assembled on the morning of the 23rd ult., Mr. Pembroke Stephens, on behalf of the promoters, stated that he was authorized to say that the points in disagreement between the parties had been all settled with one exception, upon which he was to take the Committee's opinion. The promoters had believed on the preceding day that they had made good their case for a £30,000 10 per cent., and a £10,000 5 per cent. capital; but it had been arranged that morning that the capital should be £25,000 at 10 per cent., and £15,000 at 5 per cent. The matter still in dispute was whether the sum of £5000 paid for renewals of the works should be put to revenue or capital. Counsel submitted a clause on this subject; but the Corporation brought up an alternative proposal. Discussion ensued; but the Committee interfered, and decided to pass the Bill on the understanding that the 10 per cent. capital should be stated at £24,000, that the 5 per cent. capital should amount to £16,000, that the expenditure on repairs should come out of revenue, that the standard price of gas should be 3s. 4d. per 1000 cubic feet with the sliding-scale, and that the illuminating power should be 25 candles.

Thanet Gas Bill.—In the "Parliamentary Intelligence" in the two last issues of the "JOURNAL" further progress of this Bill was recorded. It will be remembered that, after passing the House of Commons, it was adversely reported upon by a Committee of the House of Lords. The Bill was, however, referred back, and was again considered by the Committee on the 10th ult. We learn that the Corporation of Margate, on whose opposition the Committee had decided that the Bill should not pass, agreed to the re-committal, on the understanding that the promoters would strike out the schedule as to lands, and practically abandon the clauses for the compulsory acquisition of land; this being in accordance with the representations they made at the first hearing as to possible contamination of the water supply by impurities percolating from the gas-works. Part of the arrangement between the promoters and the Corporation was that they should agree regarding another site for the erection of the works. No Counsel were engaged; the promoters being represented by their Parliamentary Agents (Messrs. R. W. Cooper and Sons) while Messrs. Sharpe and Sons, Parliamentary Agents, appeared on behalf of the Corporation. In addition to striking out the schedule as to land and the clauses as to the compulsory acquisition, the two following clauses were inserted: (31) "As from the 1st day of January, 1899, section 28 of the Act of 1877 shall be hereby repealed, and the prescribed number of candles shall be 15." (32) "The price charged for gas supplied to public lamps shall, as from the 1st day of September, 1898, be 5 per cent. less than the lowest price charged for the time being for gas supplied to private consumers." The Bill, as amended, was duly reported to the House, and read the third time; and, as notified to-day, it has now received the Royal Assent.

Reductions in Price.—The Muirkirk Gas Company have reduced the price of gas from 5s. to 4s. 7d., and the Galston Gas Company from 4s. 2d. to 3s. 9d. per 1000 cubic feet.

The Transfer of the Bakewell Gas-Works.—Last Friday, the Bakewell District Council took possession of the undertaking of the Gas Company, which they purchased at a cost of £11,522, of which sum £1200 was paid to the Duke of Rutland for his reversionary interest and freehold. At a special meeting of the Council on Thursday, a cheque was signed for £10,350. The money will be obtained from the Leeds Corporation on a 45 years' loan, repayable by half-yearly instalments of principal and interest at £3 2s. 6d. per cent.

LEGAL INTELLIGENCE.

COURT OF SESSION—FIRST DIVISION.

Saturday, June 25.

(Before the LORD PRESIDENT and Lords ADAM, M'LAREN, and KINNEAR).

Infringers of the Incandescent Gas Company's Patents Sent to Prison.

To-day judgment was given on a complaint presented by the Incandescent Gas-Light Company, Limited, of Palmer Street, Westminster, of breach of interdict against George Roberts, or Terry, of 97, Sauchiehall Street, and 19, Howard Street, Glasgow, and against Duncan M'Culloch, of 21, Gibson Street, Glasgow, in respect of the sale of infringing mantles. This matter was referred to in the "JOURNAL" for the 16th of November last (p. 1070), when application was made in the Bill Chamber of the Court of Session for an interim interdict against the above-named parties, and two others, named Felix and Munro. Lord Pearson granted it, and sent the case into the Court for trial. No appearances were made on behalf of the respondents; and the interdict was made perpetual. In January last the Company presented a note to the First Division of the Court, alleging that the parties had been guilty of a breach of the interdict by continuing the sale of the mantles complained of. When the case was called in February, interdict was made against Munro, with £7 7s. expenses; and Mr. Clyde, for the complainers, moved that proof be allowed as regarded the other respondents. Proof was led before Lord M'Laren on the 10th and 11th of May; and Counsel were heard upon the evidence on the 21st and 22nd ult. The respondents appeared for themselves, and denied that they had been guilty of infringement.

The LORD PRESIDENT, in giving the judgment of the Court, said: The question in the case of either respondent is whether, in knowledge that he had been interdicted from using the complainers' invention, he did nevertheless use it. There is no question as to the dates of service of the interdict. In the case of the respondent Terry, the service was personal; and it is impossible to avoid noticing that the circumstances of the service were such as did not augur well for the loyal observance of the interdict. In the case of M'Culloch, it has been maintained that he was absent from home when the interdict was served; that he was in Ireland; that the interdict only came to his knowledge after his return; and that one of the sales complained of took place in his absence. We do not think that this has been established. The contrary is *prima facie* shown under his own handwriting; and the contrary was stated to the officer by those in charge of the house at the time of service, for the excuse then offered for his non-appearance was that he was ill and could not be seen. That, in the case of either respondent, the patented articles were sold after service of the interdict, at premises under his control and management, is clearly proved. The fact of the individual sales specifically spoken to by the witnesses, at the places named by them, cannot be doubted; and it is equally certain that the articles sold were of the kind to which the patent and the interdict related. The only question is as to the complicity of the respondents in those sales. Now, the evidence satisfies us that those sales were not isolated, casual, or inadvertent, but were parts and specimens of a system of dealing in the prohibited articles, at the several places named by the witnesses. It is true that the evidence is not copious; but this is not to be expected in a clandestine and illegal trade. The fact that after, as before, the interdict, the conductors of that trade have chosen to surround themselves and their business with a cloud of mystification and aliases is, of itself, evidence of dishonest trading. But the direct evidence reveals, with sufficient distinctness, the respondent Terry as controlling the business with which the witnesses associate him. And the fact that his saleswoman has not been produced as a witness is corroboration of that evidence. In like manner, the true relation of M'Culloch to the business which he now disclaims is adequately established, not only by the evidence adduced by the complainers, but also by that led by himself. While bound to take into account each part of the evidence, we have been careful, as the respondents were not represented by Counsel, not to rely on omissions or what might be mistakes. But we are unable to arrive at any other conclusion than that both and each of the respondents have, by themselves and through their employees, knowingly, intentionally, and systematically used this patent, after being interdicted from doing so. These violations of the specific orders of the Court call for effective punishment, and both respondents must go to prison for a month.

The case of Felix is still to be dealt with. A fresh interdict was applied for against Munro on the 22nd ult., and the Court ordered it to be served upon him, and ordered him eight days to lodge answers.

Manchester Corporation and their Gas Residual Products.—

At the last meeting of the Committee of the Manchester and Salford Sanitary Association, Mr. W. Thomson, F.R.S. (Edin.) was requested to introduce at the next meeting of the Committee the subject of the manufacture of gas residual products, with a view to urging upon the Manchester Corporation the importance of undertaking this work themselves, both on financial grounds and with a view to having the operations conducted with up-to-date appliances, which would prevent the serious nuisances now the cause of so much complaint in Ancoats.

Tunbridge Wells Water-Works Extensions.—The Tunbridge Wells Town Council recently held a special meeting for the purpose of considering a report from the Water Committee recommending an application to the Local Government Board for a sum of £24,000 for filtration and other works in connection with the water supply. The Water Engineer (Mr. Mellor) had prepared a scheme for the filtration of the whole of the water supplied to the towns from the springs and boreholes at Pembury, and estimated the cost at £16,000, including the cost of the land. The Committee had submitted the scheme and estimate to Mr. J. Mansergh, who reported satisfactorily thereon. The Committee therefore recommended the Council to carry out the filtration scheme and incidental works—the latter at a cost of £8000; and to ask for sanction to borrow £24,000. Considerable discussion took place on the matter; but in the result the report was adopted.

MISCELLANEOUS NEWS.

THE INSPECTION OF GAS LIQUOR AND OTHER WORKS UNDER THE ALKALI ACTS.

The Sub-Inspectors' Reports.

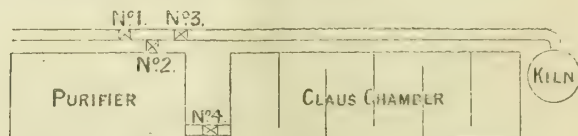
In the "JOURNAL" for the 7th ult., we noticed the report of the Chief Inspector under the Alkali, &c., Works Regulation Act (Mr. R. Forbes Carpenter) for the past year. We now give some extracts from the reports of the Sub-Inspectors.

Reporting upon Ireland, Mr. E. G. Ballard states that there was no addition to the number of sulphate of ammonia works to report. On the contrary, two ceased operations, and have not been again registered. The works were all carefully conducted; and no complaints arose. Taking all the places where sulphate of ammonia is manufactured in Ireland, the number of works absorbing the sulphuretted hydrogen in oxide of iron is 21; the number burning it, 5; the number working on the continuous system of distillation, 13; and the number working on the intermittent system, 13. There were 2740 tons of sulphate made in the district during the year. The works where tar is distilled were all carefully conducted; proper appliances for dealing with the noxious vapours evolved in the operations having been adopted. The works referred to in last year's report as needing more strict supervision on the part of the management have been much improved, and are now fairly well on a footing with others of this description.

Mr. Ballard also reports upon the district embracing Cheshire, North Wales, and part of Lancashire. He says there is not much change to report with regard to sulphate of ammonia works, except that one important place has abandoned burning the sulphuretted hydrogen in favour of absorbing it in oxide of iron; and for this purpose two good purifiers have been erected, with proper lute valves for changing the direction of the gases from one to the other as necessity requires. Taking all the works together, there are 18 working on the continuous system of distillation, and 5 on the intermittent system; 18 absorb the sulphuretted hydrogen in oxide of iron, 4 burn it either under the boiler fires or in the retort flues, and in one case it is converted into sulphur in a Claus kiln. The total quantity of sulphate manufactured in the district during the past year was 3285 tons.

Reporting upon the Widnes and Runcorn district, Dr. J. Affleck says the five plants belonging to sulphate and muriate of ammonia and gas liquor works remain almost exactly in the same condition as they were in a year ago. No extensions have taken place, but the existing apparatus has been well maintained, and is all in an efficient state. The sulphuretted hydrogen and other noxious gases evolved in these processes continue to be treated in the same way as described in previous reports, and have given no trouble. The joint production of ammonia salts in these works during 1897 was equivalent to about 900 tons of ammonium sulphate. Another sulphate of ammonia plant is at present in process of erection by the United Alkali Company, Limited, at Widnes, in connection with some new coking-ovens.

Mr. H. Porter, who has charge of the district comprising North and East Lancashire and part of Yorkshire, says there are now 12 liquor ammonia and 38 sulphate or muriate of ammonia works under his supervision. The total quantity of liquor distilled, equivalent to sulphate, last year was 15,220 tons; the proportion of distilled liquor ammonia being 1.45 per cent. The sulphuretted hydrogen evolved is dealt with by absorption in lime or oxide of iron (mostly by the latter) to the extent of 63 per cent. of the liquor distilled. Mention was made last year of the escape of the gases from the purifiers caused by the shrinking of the oxide from the sides or walls of these vessels. In two or three cases a projecting ledge has been built, in the case of brick purifiers, or a flange made with angle-iron in the case of iron ones, to baffle the gas; and since then no escapes have been noticed. Mr. Porter gives particulars of the death by suffocation of a man employed at the Colne Corporation Gas-Works while cleaning out the kiln of the Claus plant—a fatality which was noticed in the "JOURNAL" at the time. It appears that there was some obstruction to the passage of the sulphuretted hydrogen, and the Claus plant was stopped. The next day the gases from the saturator were turned into the oxide purifier attached to the Claus plant. Two men were told off to clean out the kiln, which was only 4 feet deep to the bars, and 2 ft. 9 in. in diameter. After the packing had been sufficiently removed, one of the men got into the kiln, and the other left the spot to fetch something—being absent only three or four minutes. On his return, he spoke to his mate. Receiving no answer, he went on to the top of the kiln, and found him insensible. All attempts to revive him were unavailing. At the inquest, no evidence was forthcoming to show how or what kind of gas had got into the kiln. The Engineer tested the kiln with lead-paper after the man had been removed, and found only a slight trace of sulphuretted hydrogen. In this case there was a weak point in the arrangement of the plant, on account of the number of valves to be handled and kept in order; and though in this instance the valves were afterwards found to be shut or opened in their proper order, Mr. Porter says there is always the risk that they are not properly shut. Being screw valves, any grit or dirt getting on the seating might prevent the valve from being perfectly closed, though it would appear to be so.



Mr. Porter gives the preceding sketch, and says: "To disconnect the Claus plant from the sulphate plant and connect the purifier, three of the four valves would have to be altered. No. 1 valve would remain open; No. 2, having been shut, would be opened; No. 3, having been open, would have to be shut; and No. 4, having been open, would also have to be shut. The change-valves that have been shown and explained in previous reports will safely fulfil the functions of all these four

valves by one movement; and being simply a water-joint, it can be seen at a glance if it is in proper condition or position. A drawing of one of these valves was sent to the Engineer, who replied that the valves in question should be altered."

Mr. Porter goes on to say that the value of having large and deep purifiers connected with the draught of a chimney in order to carry off the noxious gases while emptying, was strikingly shown lately at one works where such an arrangement exists. A purifier was being emptied, when two of the men employed were seriously inconvenienced by the presence of the gases. Investigation showed that the draught-pipe connecting the purifiers with the chimney had become blocked with fine dust—chiefly oxide—preventing the ventilation of the purifiers. At another works an additional purifier was fixed last year, and a three-way water-lute change-valve, of the kind mentioned above, attached, so as to be able to tell with certainty to which purifier the gas was going. At one or two works, the size of the purifiers being small in proportion to the plant, constant changing was necessary; and sometimes heating of the oxide and firing of the wooden grids was the result. Mr. Porter points out that purifier space would be cheaper in the long run. At the end of the year, there was a little more activity in the manufacture of sulphate; one or two works which had been making ammoniacal liquor having started producing the salt.

There was no addition to the tar works during last year. Unfortunately, there were three fatalities in connection with this class of works—two resulting from the explosion of a still, and one by gassing while cleaning out a still. The last occurred at the works of the Bury Corporation. Full particulars of these accidents are given. Mr. Porter says that a hard-and-fast rule ought to be made that no man should go into any still alone, or unwatched by someone ready to assist him at a moment's notice; and also that disconnection of the gas-pipe from other parts of the plant should be made to ensure that no gases can return.

The East Midland District is under the supervision of Mr. E. Morley Fletcher. It contains 27 works where sulphate or muriate of ammonia is made, and nine liquor ammonia works. The total quantity of ammoniacal products manufactured during the year amounted to 13,444 tons, calculated as sulphate of ammonia. The amount derived from coke-ovens was 945 tons. The manufacture was more active during the latter portion of the year, owing to the increase in the price of sulphate. There are 14 works where tar is distilled, and at all of them means have been adopted for dealing with the sulphuretted hydrogen and other uncondensable gases evolved during the process of distillation. The most general method in use is to draw off the gas from the oil receiver at the still-worm end, and to pass this through suitable condensers to the boiler fire, where the uncondensed gases are burnt. The greatest quantity of gas is evolved during the distillation over the anthracene; and tests were made in the chimneys and boiler flues at four of the larger works, in order to estimate the total amount of acid, calculated in terms of sulphur trioxide per cubic foot, escaping, and to determine whether any sulphuretted hydrogen passed away unburnt. None was found.

In the South Midland district, which is under the supervision of Mr. E. Jackson, the manufacture of sulphate, muriate, and carbonate of ammonia, as well as of anhydrous ammonia, and the concentration of gas liquor, are carried on in 79 works. The greater part of the liquor distilled is derived from ordinary gas-works. There were in operation last year five works where coal is carbonized for the condensable products and the coke. Recovery plant is also attached to two coke-oven works; and, in addition, plant for recovering products from blast-furnace gases is erected at two iron-works. One of these was in full work last year; but the second remained idle. A very fine additional Claus plant has been erected at one of the works in the district; and it has dealt with the sulphuretted hydrogen from 105 tons of sulphate of ammonia per week. Three new plants for the production of sulphate of ammonia were started in this district last year, in each case at gas-works; the method adopted for arresting the sulphuretted hydrogen being the oxide of iron purifier. At one works a very good plant was built for the production of a ton of sulphate of ammonia in 24 hours. The oxide of iron purifiers were arranged with change-valve, &c., for alternate revivification *in situ*. The total quantity of liquor distilled, expressed as sulphate, was 24,356 tons, 94.4 per cent. being treated by the continuous process, and 5.6 per cent. by the intermittent process. The sulphuretted hydrogen is dealt with mostly by oxide of iron or lime; but in two works, making altogether 155 tons of sulphate yearly, the combustion method is employed. At one of these works oxide purifiers have been erected, but not yet connected to the ammonia plant. At the other, the Claus process was adopted until an explosion in lighting up the kiln wrecked the sulphur chambers. In order to allow of the sulphate plant being worked until the chambers and kiln could be rebuilt, permission was granted for the sulphuretted hydrogen to be temporarily burnt in retort flues. The erection of the new plant was delayed, as it had been decided to build an entirely new sulphate works, provided with all the most recent improvements; and the sulphuretted hydrogen would be treated by the Claus process as before. Had it not been for these two works, the plan of burning the sulphuretted hydrogen and sending the resulting sulphurous acid into the chimney would have entirely disappeared from the district. The distillation of tar is carried on in 21 works; the methods described in previous reports for dealing with the gases escaping condensation at the worm being generally adopted.

The remaining reports will be noticed next week.

OPENING OF NEW GAS-WORKS FOR SEATON.

The ceremony of opening the gas-works which have recently been reconstructed for the Seaton Gas Company near the railway station in that town took place last Thursday, in the presence of a large gathering of townsmen and visitors. The new works comprise three settings of retorts (fourteen in all), with hydraulic and foul mains, and condensers; tower scrubber, 3 ft. 6 in. in diameter and 13 ft. 6 in. in length, on the Livesey principle; a gas-engine and exhaustor; a purifier 12 feet square, worked in conjunction with two 6-feet purifiers; a station meter; a gasholder with cast-iron tank, having a capacity of

15,000 cubic feet; and new tar and liquor wells, having a capacity of 7000 gallons. A further contract has been entered into to lay larger mains in the town. New buildings have also been erected, including retort-houses, coal-stores, purifier and governor houses, and lime-stores. The works are now capable of producing 10 million cubic feet of gas per annum. The work of reconstruction has been carried out by Messrs. Willey and Co., of London and Exeter; all the apparatus having been specially designed by the Company's Engineer, Mr. Henry A. Willey, Assoc.M.Inst.C.E. The opening ceremony was performed by the Chairman (Mr. G. Evans), who turned the valve connecting the gasholder with the town mains. A vote of thanks having been accorded to him, the party were conducted over the works by Mr. Willey, who described the various portions of the plant. Subsequently, at his invitation those who had taken part in the proceedings had lunch together at the Beach Hotel, when the toast of "Success to the Seaton Gas Company," proposed by Mr. Willey, who presided, was heartily received. He also presented to Mr. Evans a silver soup-tureen, bearing a suitable inscription, as a memento of the occasion. Mr. Evans, in responding to the toast, thanked the Chairman for his very handsome and unexpected gift. As to the new gas-works, he believed their success was assured. Mr. Willey, and his father before him, had always had the complete confidence of the Directors in any work they had undertaken for them. Other toasts followed, and the proceedings closed.

NEW PUMPING-STATION FOR THE RAMSGATE CORPORATION WATER-WORKS.

Last Tuesday morning, at the invitation of the Mayor of Ramsgate (Mr. L. Hart), a party composed of members of the Corporation and their guests proceeded to the new pumping-station which has been erected at Whitehall, in connection with the municipal water-works, to the designs and under the supervision of the Gas and Water Engineer, Mr. W. A. Valon, and his son, Mr. Arthur Valon. The party left the Town Hall in carriages, and on arriving at the entrance to the new building a brief formal ceremony took place. The Mayor uncovered a brass tablet, bearing the following inscription: "Borough of Ramsgate Water Department. This building was completed A.D. 1898. L. Hart, Mayor; C. J. Gwyn, Chairman; W. A. Hubbard, Town Clerk; W. A. Valon and Son, Engineers." His Worship, in a few timely remarks, expressed the belief that the building, with the valuable machinery it contained, would be sufficient to meet the needs of the borough for many years to come. The party were then conducted over the building by the Engineer, assisted by Mr. A. Valon; the result of the inspection being a generally-expressed opinion that the station was one of the most complete of its kind.

The building is in three divisions, the centre one 63 feet by 59 feet, and 25 feet high. It is lined throughout with glazed bricks, and has an iron roof supported in the centre by cast-iron columns. The main building covers the machinery, which consists of an engine of 50-horse power nominal, working up to 90-horse power. This engine drives one set of 14-inch and another set of 12-inch deep-well pumps; or by changing the gearing it will pick up the new set of three 18-inch pumps, which have been put down in a well 12 feet in diameter, connected directly with the headings. There is also a 30-horse power (nominal) engine, working up to 50-horse power, driving a set of 14-inch deep-well pumps. Each of the three wells is sunk independently; but they are connected underground, at the level of the headings, by galleries. The wells are lighted by gas from top to bottom—an arrangement which minimizes the danger of lubricating and attending to the cranks and pump-rods, as well as facilitates the execution of any repairs that may be necessary from time to time. On the ground floor there has been placed a condenser, through which all the used steam from the large engine passes in brass pipes. The steam is effectually condensed by a jacket of cold water surrounding the pipes; the water being constantly maintained cold by passing some part of what is raised through the condenser. The air is withdrawn by a vacuum pump; the vacuum being kept steadily at 27 lbs. per square inch. This improvement abolishes the necessity of using the jet condenser worked by the engine itself, while it saves the loss of at least 60,000 gallons of fresh water per day. All the valves controlling the main supply pipes leading to the reservoirs are under cover; and the foreman in charge has within range of his vision the whole of the machinery for raising the water, as well as the valves controlling its issue from the pumps to the reservoirs. Adjoining the main building, and directly connected with it, is the boiler-house, 25 feet by 59 ft. 6 in. by 16 feet. Here two Lancashire boilers, 30 feet long by 7 ft. 6 in. in diameter, have been set; the working pressure being 80 lbs. The boilers are worked alternately.

At the close of the inspection, the visitors partook of luncheon upon the premises. The Mayor presided; and Mr. Gwyn was in the vice-chair. Captain Vaile proposed "Prosperity to Ramsgate and Success to the Water Undertaking," coupling with the toast the name of Mr. Gwyn, whose past and present services to the borough he warmly eulogized. This gentleman replied; and concluded by asking the company to drink to the health of the Engineer, who, he said, had been so intimately associated with all that made for the prosperity of the town. Mr. Valon, in responding, gave a description of the building and machinery. He said that under them as they sat there were two miles of pure water waiting to be pumped; and at the present time they could raise 1,250,000 gallons per day. He mentioned that while the general plans and the machinery were his own, the credit for the inside of the buildings belonged to his son; and Mr. Simmers had been Clerk of the Works. These young men had gained all their experience in the Corporation's workshops—they had, in fact, been pupils of the Corporation. In conclusion, Mr. Valon alluded to the Contractors (Messrs. Paramor), who, he said, had carried out their work in a most painstaking, efficient, and conscientious manner. Mr. Paramor, whose health, proposed by the Engineer, had been cordially drunk, responded. He mentioned that the firm proposed to ask the Mayor and Mr. Gwyn each to accept a silver key of the premises; and he suggested that the building should be thrown open for inspection by the ratepayers and the visitors at some stated hour once a week. The health of the Mayor was then proposed and responded to; and the proceedings closed.

THE SUPPLY OF ELECTRICAL ENERGY FROM CENTRAL GENERATING STATIONS.

Report of the Parliamentary Committee.

It may be remembered that, in view of the measures introduced by certain Companies this session for the supply of electrical energy from central generating stations, a Joint Committee of the Lords and Commons was appointed in March to deal with the matter, as the sanctioning of the proposals by Parliament would institute competition with existing undertakings. The members nominated by the Lords were Viscount Cross, Earl Spencer, Viscount Knutsford, and Lord Monkswell; the representatives of the House of Commons being Lord Balcarras, Sir Leonard Lyell, Mr. Ashton, and Mr. Kimber. The first meeting of the Committee was held on the 31st of March; and Viscount Cross was appointed Chairman. The Committee were to inquire—

- 1.—Whether, notwithstanding the provisions of section 12 (1) of the Electric Lighting Act, 1882, powers should be given in any cases for acquiring land compulsorily for generating stations; and, if so, under what conditions as respects liability for nuisance, notices to surrounding owners, and otherwise.
- 2.—Whether compulsory powers of acquiring land for generating stations, if proper to be given in any case, should be given where the proposed site is not within the area of supply.
- 3.—Whether, in case of a generating station, however acquired, not being situate within the area of supply, power should be given for the breaking up of streets between the generating station and the boundary of the area of supply.
- 4.—Whether powers should be given in any case for the supply of electrical energy over an area including districts of numerous local authorities, involving plant of exceptional dimensions and high voltage; and, if such powers may properly be given, whether any, and what, conditions should be imposed—(a) with respect to system and plant, and to the construction and location of generating stations, in view of the powers of purchase conferred upon local authorities by sections 2 and 3 of the Electric Lighting Act, 1888, and (b) with respect to the relations of the promoters to other undertakers and to local authorities within parts of the area.
- 5.—Under what conditions (if any) powers ought to be conferred upon promoters seeking to supply electrical energy to other undertakers, and not directly to consumers.

The sittings of the Committee extended, with intervals, till June 23, when their report was presented. They took evidence from Sir Courtenay Boyle, the Earl of Morley, the Hon. Chandos Leigh, Q.C., Mr. W. H. Preece, C.B. (Engineer-in-Chief and Electrician to the Post Office), and Major Cardew (Electrical Adviser to the Board of Trade); and they had before them Counsel representing the following bodies: Central Electric Supply Company, Limited; Chelsea Electricity Supply Company, Limited; General Power Distributing Company; Midland Electric Corporation for Power Distribution, Limited; House-to-House Electric Light Supply Company, Limited; Kensington and Knightsbridge Electric Lighting Company, Limited; London Electric Supply Corporation, Limited; County of London and Brush Provincial Electric Lighting Company, Limited; Westminster Electric Supply Company, Limited; the Corporations of Doncaster, Glasgow, Huddersfield, Ilkeston, Lincoln, Manchester, Nottingham, Retford, Rotherham, Salford, Sheffield, and Wolverhampton; and the London County Council. The Corporation of Edinburgh and the Metropolitan Electric Supply Company were represented before the Committee by their Parliamentary Agents.

The several Bills pending in Parliament in which effect was proposed to be given to new developments of the electrical industry were brought to the notice of the Committee; but they did not consider them in detail, or take any evidence upon them. They treated them only incidentally, as showing the lines upon which the industry was likely to expand. They laid down the general principles which they suggested should guide Parliament and the Board of Trade; but whether those principles should be applied in whole or in part, and whether any, and what special conditions should be imposed, they left to be decided in each individual case according to its merits. They heard all the witnesses tendered by the several parties, and agreed upon the following answers to the questions referred to them:—

Question 1.

(a) The proved public advantages of electrical energy in the generation of light and power warrant, in their opinion, the granting to undertakers of compulsory powers for acquiring sites for generating stations, and lands or easements for pipes and mains therefrom, and other works.

(b) Provision should be made for the granting of these powers in the Provisional Orders of the Board of Trade, subject to confirmation by Parliament. Such provision would facilitate a continuance of the existing practice according to which more or less uniform conditions under which undertakers are to work are provisionally settled by the Board of Trade. Procedure by Private Bill should be reserved, as at present, for exceptional cases.

(c) Such powers may be given either to local authorities or to incorporated companies, whether the incorporation be by Special Act or Provisional Order or under the Companies Acts.

(d) With respect to liability for nuisance, they are of opinion that where the site for a generating station is acquired under compulsory powers, and is specified in the Provisional Order or Special Act, the undertakers should not be subjected to any further liability than that which, according to Lord Blackburn in *Geddis v. Bunn Reservoir* (3 App. Cases, 455),* is imposed by the common law in the case of persons

exercising statutory powers and duties. On the other hand, where the site for a generating station is acquired by agreement, they think the undertakers ought to be subject to the liability imposed by the common law.

(e) With respect to notices, they think that the existing practice as to notices to the local authorities, and also to owners, lessees, and occupiers of lands proposed to be taken, should be followed. With respect to notices in the "Gazettes" and newspapers, they do not suggest any amendment of the existing procedure. The amendment of the Electric Lighting Acts necessary to empower the Board of Trade to grant compulsory powers will, they assume, comprise provisions for notices and other matters of procedure, for which precedents are found in the Housing of the Working Classes Act, 1890, and in the Light Railways Act, 1896.

Question 2.

Subject to the above observations, the Committee are of opinion that compulsory powers for the acquisition of land for a generating station, and lands or easements for pipes and mains and other works to the area of supply, may also properly be given where the proposed site is not within the area of supply. The local authorities for the district or districts in which the site is, and the owners, lessees, and occupiers, should have the same notices and the same *locus standi* as if that district were the area of supply. Provision also should be made for serving notices to local authorities and owners, &c., of districts or land through whose districts or land mains are to be run from the generating station to the area or areas of supply.

Question 3.

In the case of powers being given for the erection of a generating station outside the area of supply, they think that powers may properly be given for laying the mains in streets leading from the generating station to the boundaries of the area of supply. In such case, the local authority liable to maintain these streets should have the same option of themselves breaking up and reinstating the streets as the undertakers' expense as is now given in the Provisional Orders to local authorities within the area of supply, and should be empowered accordingly.

The Committee are of opinion that, while it may be advisable to maintain the veto of local authorities as to the erection of overhead wires, given by section 14 of the Act of 1882, in respect of other electric wires, it is not advisable that in the case of overhead wires for traction purposes the local authority, other than the London County Council and county boroughs, should have an absolute veto. While due weight should be given by the Board of Trade to the representations of local authorities, the Committee think that in the case of wires for the purposes of traction it would be sufficient to give a *locus standi* to such local authorities.

Questions 4 and 5.

Where sufficient public advantage is shown, powers may be given for the supply of electrical energy over an area including districts of numerous local authorities, and involving plant of exceptional dimensions and high voltage. The Committee further think that undertakings of this character may properly be authorized on conditions differing in some respects from those imposed by and under the existing Acts.

Among the undertakers referred to in the preceding paragraph will be found undertakers supplying energy chiefly in bulk, or wholesale to other undertakers, whether local authorities or companies, whose areas of supply are wholly or partly within the area of such bulk or wholesale supplying company, and who distribute the energy so obtained to consumers.

As to giving compulsory powers of purchase of undertakings to local authorities, the Committee, without questioning the policy of Parliament in having given such powers, observe: First, that when the power of purchase was granted in 1882 and 1888, no such schemes of supplying energy in bulk were contemplated as are now before Parliament. Secondly, that when the power of purchase was thus granted, the question then before Parliament was chiefly one of light; whereas the evidence given before the Committee shows that, although electric light is at present the predominant feature of the enterprises now before the public and Parliament, the application of electrical energy in the form of power to an infinite variety of other purposes is likely to be in the near future the predominant feature and function of these undertakings. Thirdly, it does not appear to them that an undertaking supplying energy in bulk at high voltage, and in comparatively few mains, is, as a rule, so desirable for a local authority to acquire as a low-voltage undertaking with many distributing mains.

The Committee think the provisions of the Electric Lighting Act, 1888, enabling the local authority to purchase an undertaking after a term of years, inapplicable, as a general rule, to the case of an undertaker supplying energy in bulk at high voltage; but there may be special cases where it is desirable that the local authorities should have the right to purchase reserved to them. To meet such cases, they suggest that the Board of Trade should have power to insert the purchase clause in the Provisional Order, if the local authorities concerned can, in the opinion of the Board, show good cause for such a course.

It is to be observed that the exemption from liability to compulsory purchase would not prevent local authorities, either alone or in combination with other local authorities, from applying for powers to purchase; but each case would have to be judged on its merits, and such conditions imposed as might be thought fit. In cases of the exemption from liability to purchase, it would be specially expedient, in the interest of the consumers, that some kind of sliding-scale, as in the case of gas undertakings, should be imposed.

In connection with this question of purchase under section 2 of the Act of 1888, evidence has been given to the effect that, with a view to secure in London one and the same time for the execution of the powers, the Board of Trade have in some cases imposed upon undertakers a less term than 42 years within which they are liable to be purchased. The Committee suggest that, if the full period of 42 years is not granted, and if a substantially shorter period is imposed by the Board of Trade, the terms of purchase should in each case be reconsidered.

The Committee consider that the provisions of the Electric Lighting Act, 1888, which require the consent of the local authority as a condition precedent to the granting of a Provisional Order should be amended. In their opinion, the local authority should be entitled to be heard

* Lord Blackburn's opinion is in these words: "It is now thoroughly well established that no action will lie for doing that which the Legislature has authorized, if it be done without negligence, although it does occasion damage to anyone; but an action does lie for doing that which the Legislature has authorized, if it be done negligently. And I think that if, by a reasonable exercise of the powers either given by statute to the promoters or which they have at common law, the damage could be prevented, it is, within this rule, negligence not to make such reasonable use of their powers."

before the Board of Trade, but should not have, so to speak, a provisional veto, only to be dispensed with in special cases by the Board of Trade.

With respect to conditions, the Committee think it reasonable that where a local authority or company, having power to supply light within a certain area of supply, seeks to obtain compulsorily land for a generating station outside that area, it should not be allowed, except where Parliament or the Board of Trade decide otherwise, to supply from that generating station any area outside the area of supply of such authority or company.

With regard to the powers of purchase conferred by section 2 of the Act of 1888, they are of opinion that local authorities should be empowered to purchase undertakings partly outside their area of supply on terms agreed upon by the Board of Trade.

Provisional Orders.

The ordinary clause which forbids any connection with the earth, except with the approval of the Board of Trade and the concurrence of the Postmaster-General, should be inserted in every case.

As to protection of telegraphs and telephones, the clauses now inserted in Provisional Orders seem to be sufficient in all ordinary cases; and regulations to protect the public can be made by the Board of Trade under section 6 of the Act of 1882.

The clauses which protect gas and water pipes have worked satisfactorily, and should be continued; but the Committee would direct attention to the observations of Mr. Preece as regards the difficulty arising from the working of tramways by trolley wires. His suggestion as to a strong "control clause" should be carefully considered.

They are disposed to concur generally with Lord Morley and Sir C. Boyle in thinking that, as compulsory powers are given solely for the benefit of the public, it would be desirable to make some provision against these companies being subject to foreclosure on mortgage, and against their rolling stock and plant being liable to distress.

ELECTRIC LIGHTING NOTES.

The public installation of electric lighting on the front of Morecambe took place last Wednesday night, when 55 arc lamps from East View to West End Pier were lit. The estimated cost of the entire undertaking is about £40,000.

Professor Fleming has reported to the Douglas Town Council on the question of an electric lighting scheme for the borough. He estimates the initial outlay on an installation sufficient for the needs of the borough at £25,000, with a possible addition of £5000 for land. He suggests that in the first instance only the promenades and principal thoroughfares should be electrically lighted, and that the light should be gradually extended to the other streets.

The result of the recent confirmation of the Electric Lighting Orders for Marylebone and Bermondsey by the House of Commons, to which reference was made in our "Electric Lighting Memoranda" on the 21st ult., was a fall in the prices of shares. This will be seen from the following figures, taken from "London":—

Company.	Price, June 13.	Price, June 20.
Charing Cross and Strand	12½—13	11½—12½
Chelsea	8½—9½	7½—8½
City of London	26½—27½	24½—25½
House-to-House	9—9½	7½—8½
Metropolitan	16½—16½	13—14
Notting Hill	18—19	15—16
St. James's and Pall Mall	16½—16½	14½—15½
Westminster	15½—16½	13—14

It will be noticed that the Metropolitan Company, which was the one chiefly concerned, was affected less than some of the others.

A largely attended meeting of ratepayers was recently held at Blackpool to protest against the expenditure by the Corporation of another £40,000 on works for the supply of electricity. Mr. Rowarth proposed a motion to this effect; and it was seconded by Mr. Howarth. In doing so, he dealt at length with the financial position of the Corporation. He said that last year it required £76,000 to keep the town going—an increase of £10,676—exclusive of expenditure on capital account. That expenditure last year amounted to £120,000, so that the town then got rid of £196,000. The electricity works capital account was £132,890, or £221 per head of the consumers. He condemned the proceedings of the Electrical Committee, and mentioned that in one part of the town, where long cables had been laid, only two councillors and three officials took the current. The Chairman (Mr. Donnelly) criticized the charges made for electricity, and said the recently adopted system meant an increase of 50 per cent. to shopkeepers. They were 40 per cent. in excess of the prices in other large towns, and this notwithstanding Blackpool's favourable position. The motion was carried, as was also one condemning the adoption of the overhead system for tramways as being dangerous, unsightly, and unsuited to a health and pleasure resort.

The works which have for some months been in progress with the object of converting the old Town Mill, in the centre of Salisbury, into an establishment for the generation of electricity by means of water power, were brought into use for the first time on the 22nd ult., though they have not yet been formally opened. The service is in the hands of the Salisbury Electric Light and Supply Company, whose Engineer and Manager is Mr. L. A. Hands. The turbine at present in use for working the dynamos is of 70-horse power, and is capable of supplying 1500 lamps alight at one time, or, by storage, an additional 1500, for the average lighting required during the year. The battery, which weighs about 29 tons, is large enough to supply 1000 lights for nine hours or 1500 lights for four hours. It contains 230 cells. The system of distribution is the low-tension three-wire, with an initial pressure of 420 volts, and 210 volts to individual consumers. The mains are supplied from the station by two feeders, of triple concentric type, connected to two junction-boxes. In the general scheme of the works, the provision made is based upon the assumption that the number of 8-candle lamps required in the compulsory area will not exceed 6000, with a maximum load of about three-fifths of the total number of lamps installed. The mains laid down are large enough for supplying this load, though for some time to come it is not likely that so many lights will be taken up.

METROPOLITAN WATER SUPPLY COMMISSION.

Twenty-seventh Day—Monday, June 27.

(Viscount LLANDAFF, Chairman, Sir JOHN E. DORINGTON, Bart., M.P., Sir G. B. BRUCE, M.Inst.C.E., Major-General A. DE COURCY SCOTT, R.E., Rt. Hon. J. W. MELLOR, Q.C., M.P., Mr. A. DE BOCK PORTER, C.B., and Mr. R. LEWIS.)

The sitting took place at the Guildhall, Westminster.

The following Counsel are engaged: Mr. POPE, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., for the New River Company; Mr. LITTLER, Q.C., and Mr. LEWIS COWARD for the Kent Water Company; Mr. PEMBER, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. RICKARDS for the Chelsea Water Company; Lord R. CECIL for the Hertfordshire County Council; Sir JOSEPH LEESE, Q.C., M.P., for the Kent County Council and Kent Local Authorities; Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN, Q.C., for the London County Council; Sir R. NICHOLSON for the Middlesex County Council; and Mr. GABRIEL P. GOLDNEY (Remembrancer) for the Corporation of the City of London. The Southwark and Vauxhall Water Company are represented by Messrs. BIRCHAM and Co.

Mr. James Bigwood, M.P., Alderman of the Middlesex County Council, and Chairman of the Parliamentary Committee of the Council, examined by the CHAIRMAN, said the three Metropolitan Companies supplying in Middlesex were the West Middlesex, the New River, and the Grand Junction. The East London Company had power to supply in the county, but only to a very limited extent. Excluding the Thames, the only Company drawing water from Middlesex sources—wells—was the New River Company. It was a question whether the New River Company had a statutory right to the water. He had always understood that the Company drew the water from the wells as land-owners. Middlesex had always consistently desired to stand independent of London with regard to the question of the water supply; and they had petitioned against the various Bills which the London County Council had introduced. There was a conference in May, 1891, between the London County Council and the various Outside Authorities, at which heads of discussion were submitted by the London County Council. The needs of Middlesex put forward there were that no scheme would be acceptable to Middlesex which did not provide for no further water being abstracted from the Middlesex supply; which did not give independent control from the beginning to Middlesex of their sources of supply and of their service; and which did not provide for the absolute non-interference with Middlesex, either as to rating or otherwise. Middlesex pleaded for non-interference; that was their strong point. They were satisfied with matters as they stood. Witness was strongly in favour of the maintenance of the *status quo*, subject to some further control on behalf of the Local Authorities. The principal objection of Middlesex to the main proposal of the London County Council—viz., for the provincial system to be applied to London—was that they had no confidence in the Council as a Water Authority. The constitution of the London County Council demanded so much time from the members, that it seemed to be hardly possible they would be able to devote proper attention to the work of such an important body as this would be. Then the Water Authority should be composed of much more independent men than a member of the County Council, or even a member of Parliament, would be; seeing that he had to pay so much regard to the wishes of his constituents.

The CHAIRMAN: I presume Middlesex feels there is a probability of large outlay in the future, in adding to the sources of supply.

Witness: Yes.

And that you have as much in your own county as you want for yourselves?—I think so.

And you do not wish to be saddled with the expense of going to Wales?—Quite so; and we do not want to see our rates increased. I have always held we have a prior right to the water of the Thames.

Mr. MELLOR: If you carry that out, every county as you go up the river has a prior right?

Witness: Yes; but the Thames is sufficient, and to spare. My view is that a large quantity of water flows to waste which might be stored.

The CHAIRMAN: If Middlesex goes on growing as it does now, and claims to be supplied first from the Thames, there will not be much Thames left for London?

Witness: It may be so; but that is London's look out.

Middlesex objects also to having any other county authority the Water Authority for Middlesex?—Very strongly. The interests of the county require that provision should be made against the sinking of new, or the deepening of existing, wells in the county, and for limiting the abstraction of water for London or any other external supply from Middlesex. The fact that the New River Company have surreptitiously sunk wells as landowners, shows that the other Companies might seek to do the same.

Mr. MELLOR: Your proposition is that Middlesex is entitled to all the water which lies underneath its soil.

Witness: Yes; that is my view. Middlesex objects to purchase by the London County Council, even if Middlesex should retain the sources of supply and distribution in their county.

Do you object to purchase by any other body whatever?—No; I do not think we do.

To substituting one managing body for the eight Companies?—I do not think it would be so popular.

Would you not get a chance of equalizing rates with a public Trust?—Yes; but we are quite satisfied with our rates at the present moment. I think Middlesex, in her own soil, supplemented by some water from the Thames, has an ample supply for the future. We do not object to more wells being sunk, except for use by an Outside Authority.

Mr. LEWIS: Hertfordshire contends that sinking wells would be a very bad thing for the county generally?

Witness: I have heard that view; but I believe it is contradicted by experts.

Sir J. DORINGTON: Middlesex is pretty well covered by Companies?

Witness: Yes; fairly well. I have heard that there are certain portions outside the limits of supply of any Company; but those parts are very small. According to Middlesex ideas, there is no reason why, if purchase by the

London County Council took place, only so much of the West Middlesex Company's undertaking as applied to London should not be acquired; the remainder being left in the hands of the Company for the supply of Middlesex. There would be no difficulty about the severance of the works. Middlesex is anxious not to see its water sold to other districts, as is the case now; and they wish to be placed, in regard to an increase of water derived from the county, in a position of priority. On a transfer of the Company to a Central Authority, the county would be wise to make the best arrangement they could for themselves.

Mr. DE BOCK PORTER: Do you not want to get a preferential claim which you have not at the present time?

Witness: No; I do not go so far as that. We are content with the present position.

The CHAIRMAN: Why should you be dissatisfied with a change which alters only the owner of the existing rights?

Witness: Because we fear that the new owner will make greater demands on what we consider to be our water, than is the case now.

The CHAIRMAN: The greater demand will only be made because there are greater wants.

Major-General SCOTT: And the Companies would adopt the same policy. If they wanted more, they would take more.

Witness: They would only take what their statutory powers enabled them to take.

The CHAIRMAN: They could sink more wells.

Lord R. CECIL pointed out that, as regarded wells, they were limited, to some extent at least, by the necessity of raising capital, for which the permission of Parliament was necessary.

Witness (continuing) said Middlesex had no desire to be a Water Authority, and would rather continue to be supplied by the West Middlesex Company.

The CHAIRMAN: What would be left for London, with its five million people, if every county claimed the exclusive right to its own water?

Witness: Then London would have to go to Wales.

Then that is the plain English of it. You wish to throw the cost of fetching water from a distance on London alone?—I think we do.

Would not Wales have a stronger right to object to the transfer of water from itself to London, than even Kent, Middlesex, or Surrey?—There would be the difference that Wales would be paid for its water.

What *quid pro quo* would they obtain that landowners in Middlesex would not get it if the Company secured additional powers of sinking wells in Middlesex?—I do not know how that is. We have prevented the Southwark and Vauxhall Company from getting any further sinking powers in Middlesex.

In answer to further questions, witness said that if Middlesex was supplied in bulk by the London County Council, one objection was that, being an outside area, they would be liable to be charged more than was paid inside; and in support of this, he put in a table giving nineteen instances where extra charges were made to outside districts. On the subject of control, witness said Middlesex desired it in order to ensure Middlesex water for Middlesex; and, still more, to secure a sufficient and efficient supply for all consumers. His present view was that the Companies should be under the control of some Government Authority, with representatives of the Local Authorities and of the Water Companies added. But the Government Department should outweigh the others. He did not see why London should be more fully represented than anyone else. He believed there was enormous waste going on now; and he would give the body stringent powers to prevent this. The Board might also have power to insist on greater economy in the administration of the Companies—such economy as would result from amalgamation. He had not considered how this was to be done. He merely suggested that there should be some authority over and above the Water Companies which should control them, and which would be readily available also to the consumers. Witness was rather closely questioned as to what the position of this body, its duties, powers, and constitution, were to be; but he returned very indefinite answers. It was suggested that, to a large extent, if not entirely, the matters mentioned were already met by the law. He held, however, that there were many small points on which they wished redress, and yet which were too small to warrant the existing slow and costly machinery being set in motion. Since the Act of last year, the Companies had been doing their duty much more satisfactorily. One thing which might be within the purview of the proposed Board would be the case of a Local Authority proposing to lower the level of a road, without regard to the pipes below; so that when frosty weather set in, the water in the pipes was frozen. The Board might then step in and say the road must not be lowered, or take the matter to arbitration. Another case would be the breaking up of a road by a Company to lay a main, immediately after the road had been made up by the Local Authority.

The CHAIRMAN: How are the decrees of this Board to be enforced? The present system is to make the Local Authority the champion of the consumer, if he had a grievance—to go before the tribunal, and collect penalties, and so to redress the grievance. You complain of this, and want to substitute a Board of Control. This Board must have powers to enforce their decrees; and I want to know whether you are going to give them arbitrary powers of distress, or fine, or imprisonment, or what?

Witness: I say that is a question Parliament should decide. All I advocate is that there should be an easy and simple method, by application to a tribunal or officer, for straightway settling disputes between any Water Company and a consumer.

Would you give this Board of Control any power over back-dividends of the Water Companies?—Yes; I should put them in much the same position as the Gas Companies are at present. I should say 10 per cent. should be the maximum dividend that should be allowed. As to back-dividends, I should allow (say) three years.

You would do this without any *quid pro quo* to the Companies?—Yes. I should also give power to deal with charges, where they were excessive or too small, even though they might be in accordance with the law.

What management is left to the Companies? You give the Board power of checking waste by the consumer, the duty of seeing after the supply by the Companies, power of charge, and the extent of dividends to be paid?—That leaves them to conduct their business.

The CHAIRMAN: Not much of it.

Mr. MELLOR: Would it not be better for the Companies to be bought up than to have such control?

Witness: It might be.

The CHAIRMAN: Your Board would have power to overrule and alter every Act that has been passed relating to water.

Witness: No; I think the Board would have power to adjust the differences that occur in spite of every law that has been passed. An alternative system of control would be to give more power to the County Councils as to checking waste, and directing that any scheme for the extension, improvement, or adjustment of the Companies' works should be laid before the County Councils.

By Mr. H. L. CRIPPS (representing the London County Council): He wanted first to provide that no more wells should be sunk in Middlesex, and that those existing should not be deepened. He denied that the Companies had power now to do this. The New River Company had done so; but he had always thought it was *ultra vires*. He agreed with the London County Council that it was extremely desirable to settle this question as soon as possible. At present he thought no Londoner had an adequate supply of water; the consumption per head should be much greater. He really thought a solution on the basis of a Joint Board was practicable.

In reply to the CHAIRMAN, Mr. Cripps said the scheme of the County Council had been always that, if purchase by them took place and a rate-in-aid was necessary, it should not be levied on the outer districts taking water in bulk.

Mr. LEWIS COWARD (to witness): Why should not the Water Companies have similar rights to those which a private individual has as regards sinking wells?

Witness: Private individuals do it to supply their own requirements; the Water Companies do it to sell again. The Company with which I am connected have sunk a well, and sold the water to the public in the form of vinegar; and, putting the matter in this way, I see no reason why the same measure should not be dealt out to all the Companies. Any figure of three years as the limit for back-dividends is the result of a general survey of the whole situation as a business man.

By Lord R. CECIL: One objection to purchase by the London County Council was that Middlesex, in opposing a scheme of the Council, would find it more difficult than if the adversary were merely a Company. Moreover, if London was the purchaser, it would be able to take all the water of Middlesex and sell it to other parts of the Metropolis; so that all London might be sucking at that source.

Mr. E. J. Halsey, the Chairman of the Surrey County Council, was called, and examined by the CHAIRMAN. He said Surrey had always opposed any scheme which would place the county under the control of the London County Council, and had always insisted on having the sources of supply, as well as the means of distribution, in their own hands.

The CHAIRMAN: And to this the London County Council have very liberally agreed. Have you considered at all the practical difficulties there might be in separating existing sources of supply between London and Surrey?

Witness: We were sufficiently satisfied by the London County Council that the thing—if done in a friendly way—was possible, that we left it in that shape, the more so as the agreement with London was an option. We had two years to prepare our option. During those two years, we should have made our own investigations and decided as to whether the option we had got was worth taking up. We had not gone minutely, or from an engineering point of view, into the point of severance; but we have taken it that between two friendly bodies it was possible. In any circumstances, severance need not be so very difficult. What we wanted primarily was the sources of supply. The distribution pipes, of course, were saleable to us; being of no use to anyone else. We were contemplating that, having the water, we should need pumps and filter-beds of our own—not purchasing that part of the undertaking from London. Difficulties have been raised regarding the mains that come through Surrey—what main we were to have, and what main was to be left to London. This was always present to our mind; but we felt it was possible for us to have a main of our own, and not to purchase it from the London County Council.

Did it occur to you that there are only certain existing statutory powers of taking water from the Thames, and that you might get only a share of that, or nothing?—We had secured the statutory right to take water from the Thames; the question was whether we should not very readily obtain powers to put down another pipe to carry the water. Surrey was to have, under the agreement with the London County Council, as much as their existing supply, plus 20 per cent. For the future they contended that they had sufficient in their own county.

In the Thames?—If Parliament allowed water to be taken from the Thames, we should no doubt have secured our share; but even if Parliament had not allowed any more to be taken, we hold, and are advised, that there is sufficient water in our own borders. No detailed study of this matter has, however, been made.

What you opened out is of great importance in our view. Who was to have these new supplies from underground Surrey?—We should certainly come to Parliament to legalize the position—to create the Council a Water Authority. The Surrey Council reckoned on spending money, chargeable to a particular area, for procuring a further supply.

Then you, like Middlesex, think you need never trouble yourselves about a reservoir scheme or a Welsh scheme?—We do not wish to be saddled with it. By the Act of 1888, all Suburban Surrey was taken into the County of London. We were made, or supposed to be made, a rural county; and we wish to be what Parliament made us—a county complete in ourselves, without any dependence on London. Having a water supply of our own, we are content to supply our own population in our own way, and at our own cost.

Where are your supplies?—There are large supplies in the chalk, on the downs that run through Surrey; and there are also large supplies in the lower greensand. I do not think the London County Council would oppose Surrey in sinking wells, because apparently the quantity Surrey would require was not one that was likely to be of any great value to London. With reference to the Metropolitan Water Counties Bill, which the Government introduced in 1896, a meeting of representatives of the Metropolitan County Councils was held, at which a resolution was passed to the effect that the interests of London and of the other surrounding Authorities were so divided as to make the constitution of the Board proposed impracticable, without injustice to the several areas concerned.

Why was the Water Board impracticable without injustice?—In the first place, it is absolutely impossible that there should be a Water Board without London being the predominant partner. It seems to me to be manifestly unfair that London, with its large population and its large consumption of water, should not have a distinct and definite majority upon the Board. If it were not a numerical majority, it would always act as one man; and it would be difficult to get the other counties to act in the same way. Moreover, London might often get one or two other counties to join with it; and this would place the others at a great disadvantage. Surrey would be in a small minority; and in case of disagreement and (say) an application to a Parliamentary Committee, they would be told that they were a minority, and must suffer as minorities always had to. Again, suppose the Water Board went to Wales, and the water was found to be so admirable and good and superior to every other water in London, he should say: "Let us have a share of it; don't palm the Thames water off on us." But they would have to take their chance; and having paid for the Welsh water, they might never get it.

Cannot you imagine a Water Board which should be perfectly fair to everybody?—No, I cannot.

I will suggest—but not as recommending—a Board on which each county should have two members, London, if you please, four, with representatives of the Board of Trade, the Local Government Board, the Thames Conservancy, and other Government Departments possibly, and experts selected by a Government Department. Why should not such a Board do justice to your county?—Such a Board would wish to be fair; but I should have thought that would be a most extravagant way of managing the Metropolitan Water Supply. If the London County Council were the Water Authority, Surrey would be perfectly satisfied with the protection Parliament would give if Surrey opposed any proposal—just as they were satisfied with the protection they had from a Parliamentary Committee when opposing a proposal of a Company; but if Surrey was a unit in a large body, they might suffer very materially.

MR. DE BOCK PORTER: Is Surrey satisfied with the *status quo*?

Witness: The Surrey County Council have never lifted their little finger towards the purchase of the Companies by the London County Council. I cannot say Surrey is entirely satisfied with the Water Companies, for it is not. But, upon the whole, we feel that when more experience has been had of the working of the Act of last year, we may be able to remedy the difficulties that at present exist—the more so when (I am almost afraid to use the word) there is more control.

The CHAIRMAN: Have your County Council had any applications under the Act of last year?

Witness: One; but it has not been before us long enough for us to do anything. I do not like the Act much myself. I think going before the Railway Commissioners is a laborious and expensive process. A great deal of the friction between consumers and the Board of Trade would be obviated by a department of the Local Government Board and the Board of Trade, to which both parties could go with the conviction that they were going before an authority that was absolutely impartial.

On being pressed to give examples of the kind of difficulties at present existing, witness read a letter from the Kingston Corporation, in which was mentioned the hours of supply, the services of turncocks for fires, charges for water for road watering, purity of water, depth of mains in the roads, disturbance of roads, and control. In the charges of the two principal Companies in South London there was a considerable difference. He would advocate one uniform charge, arrived at by reducing the highest and raising the lowest rates. Regarding purchase, no resolution had ever been passed by Surrey that it was not desirable; but it was the general feeling that, subject to certain alterations in the form of control, it would be as well to leave things as they were. The Companies were doing their work well; they were amenable to argument; and there was no great reason to be dissatisfied with them. A conference was held in October, 1897, at which Surrey, Kent, and Croydon were represented. It was there decided that, if purchase took place, each county should have control of its own works, and much greater power of control both as to quantity and quality. He thought it would be an advantage to have a public officer connected with the Local Government Board, who might be called in to try and settle disputes before they went before the Railway Commissioners under the Act of last year. A little judicious management by an experienced official of the Local Government Board, known to have no interest except to do what was right and proper, would be very beneficial to all parties. Such a case might come before this official as the breaking up by a Company of a road to lay a main; the main being improperly laid, the road made up again, and the road having to be again broken up for the main to be properly laid. This actually occurred in one instance; and the road was nearly impassable for a year. The official should have power to support an application to the Railway Commissioners for pecuniary penalties. With regard to the making of uniform charges in Surrey, the reduction would be spread over a much larger area, and over a much larger population, than the increase.

The CHAIRMAN: It is not very unfair that the man who lives at the top of Wimbledon—which is a very high part—should pay a little more for his water than the man who lives near to the banks of the Thames?

Witness: Certainly not.

By MR. PEMBER: As I understand, you would not give the official of the Local Government Board power to come to any decision against one of the two parties who may be brought before him?

Witness: I cannot very well say that I should now, because of the Act of last year. If the Act had not been passed, I would have done so. The official would be used as a go-between.

Is that not rather interposing an intermediate tribunal, and wasting time?—No; I think it would save a great deal of time. I prefer the antecedent chance of conciliation, to the present remedies of proceeding to law—of going to a Magistrate and taking out a shilling summons.

Major-General SCOTT: Do you desire that the Local Authority should have power of inspection of the works of the Company in any form?

Witness: I am afraid I have not had experience enough to say.

The CHAIRMAN: You have no officer who would be competent to inspect?

Witness: Oh, yes; we have the Medical Officer of Health.

But not to say whether the distribution pipes, and so on, were sufficient?—Well, the County Surveyor could, up to a point.

By MR. H. L. CRIPPS: Surrey had a good deal of water in the Wandle, Mole, and Wey, and also in the chalk.

MR. CRIPPS: From rural Surrey, you might be able, if it were necessary,

to obtain from these sources, or some of them, a sufficient supply to meet your requirements?

Witness: Yes. But if a joint body, representing the whole Metropolitan area, or the London County Council, were to apply for powers to take the water for the whole of the Metropolis, it would meet probably with a very strong resistance?—I am certain it would. I would very much rather have to deal with the London County Council than with a Board.

The Commission then adjourned; the Chairman remarking that, in order to make progress, the Commission proposed to meet on Tuesdays, as well as on Mondays, and to sit an hour longer.

The twenty-eighth sitting of the Commission was held yesterday, at the Guildhall, Westminster—Viscount Llandaff presiding. Mr. Howard Martin, Chairman of the Water Committee of the Croydon Corporation, gave evidence regarding the water supply of that borough, which he said was derived from two sets of works, the total capital cost of which was £158,000. To meet the growth of population and the increasing consumption, certain extensions of the works were in contemplation. Croydon had always wished, and did so still, to supply the whole of their district themselves.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commission held their monthly meeting on Monday, with Lord Provost Mitchell Thomson in the chair. Bailie Kinloch Anderson, referring to the report of the Works Committee, said that during May, as compared with the same month of last year, there was an increased output of gas of between 3 and 4 million cubic feet, which, considering the season of the year, was quite satisfactory. The same Committee reported that they had let the contract for the taking down of the old chimney at the Edinburgh Gas-Works to Mr. W. J. Furze, of Nottingham. Bailie Kinloch Anderson said they had been exceedingly anxious to have this work done before the winter; and it was now quite likely that it would be accomplished. It is more than three years since the old chimney was discovered to be out of plumb, and the Commissioners resolved to have it taken down. In a conversation I had with the Engineer (Mr. W. R. Herring) last year, he informed me that the chimney would have to be taken down brick by brick, and most probably they would be sent down inside. The start of the work will be the most delicate part, as there is a very heavy iron top upon the chimney, in sections; and the tackle for their removal will require to be exceptionally strong. Mr. Herring has had experience of the work; and he says it will be necessary to encircle the chimney with chains, as, on account of its being rent nearly from top to bottom, there would be great danger of its falling outwards unless it were bound. The Works Committee also reported that they had arranged the series of deputations which are to visit gas-works in England and on the Continent, in view of the erection of the new works at Granton. The first three are to English works; and the fourth, to the Continent. It was further reported that the Broxburn Oil Company's offer of 2500 tons of oil had been accepted. Bailie Manclark, of Leith, moved that the annual accounts of the Commission, an abstract of which was published in last week's "JOURNAL," should be remitted to the Finance and Law Committee to consider and report. The accounts, he said, showed the Commission to be in a very satisfactory financial position. In their first year, they had a surplus of £40,575; and for the past twelve months it was £54,994, with a balance of £12,110. When they remembered that they started the year with a deficit of £239, the result, he thought, was very satisfactory. The remit was made.

As to the accounts of the Commissioners, the first comment which may be made has reference to the marvellous vitality of the business. The increased output is more than 40 million cubic feet over 1896-7; and in that year, again, there was an increase over the preceding year of nearly 93 million cubic feet. In the year previous to that, the increase was 49 million cubic feet; and in the year before that, it was 103 millions. This is an increase of 285 million cubic feet during the space of four years. Since the Commissioners took over the undertaking, ten years ago, the output of gas has increased 406 million cubic feet, or over 26 per cent. But there is this other feature, which is equally gratifying—that the result has falsified the anticipations of those who predicted disaster to the finances on account of the resolution of the Commissioners last year to sell gas at a price only slightly under cost. In 1896-7, there was a deficit of £239, which, had it not been for the outlay on a new chimney for the Edinburgh Gas-Works, would never have existed, as there would have been a surplus of about £5000; and the Commissioners, having a large reserve fund, resolved to sell gas at what was estimated might be a slight loss, relying on being able to make up any deficit out of the reserve. But the year has more than paid its way. There is no deficit, but, on the other hand, a clear net profit on the year's working of £2601. The Commissioners, therefore, who knew their business, were more accurate than their journalistic and anonymous critics. In accounting for this exceedingly gratifying state of affairs, it is not to be left out of account that, under Mr. Herring's management, the quantity of gas sold per ton of coal carbonized has risen from 9360 cubic feet in 1895-6 to 10,200 cubic feet last year. In 1896-7, it was 9256 cubic feet; but the figures for that year were disturbed by the inclusion of the Portobello works, and the reading of the station meter there at a different period from Edinburgh and Leith. Thus 860 cubic feet more gas is being obtained from each ton of coal, which is a clear gain, and is practically a gift of 133½ million cubic feet of gas in the year to the Commissioners. Of course, there is now carburetted water gas, which helps up the quantity per ton of coal; but it was only a small amount—1373 tons of oil—so that the great bulk of the increased yield is clear gain. This is a pointed object-lesson in good management. I must not close this note, however, without the further remark that the Commissioners have part of the credit for the good management, for they give Mr. Herring a free hand in everything. There is the utmost confidence between them; and even more than that, there is a desire to further his schemes as much as possible. For one thing, Mr. Herring is most thoroughly supported by the Convener of the Works Committee (Bailie Kinloch Anderson), whose experience of gas-works management now goes back ten years, and who in the course of this period has thoroughly

mastered his duties. As to the finance department, it is almost unnecessary now to say that it is most admirably managed by the Treasurer (Mr. John S. Gibb). In this connection, I ought to mention the name of Mr. R. Cockburn, the Collector. His work is most efficiently done. I observe that in the year 1896-7, out of a revenue of £243,000, the bad debts only amounted to £335. It is with regret that I learn that Mr. Cockburn has, on account of ill-health, been laid aside from work, and that it has been found necessary to grant him leave of absence till October. In view of the fact that the Commissioners are about to take the serious step of transferring their works to a new site, it must be a comfort to all the citizens to know that the gas undertaking is in the keeping of a Committee and officials who work so harmoniously together, and whose ability is such that it is difficult to conceive of its being improved upon.

The effect of obtaining statutory powers by the Stirling Gaslight Company, Limited, is seen in the fact that, while it was only last week that the powers were obtained, the shares of the Company—formerly selling at £8 11s. 3d. per £1 share—cannot now be bought for £9 2s. 6d.

Following closely upon the settlement of the Stirling gas controversy, there has come this week the end of the difference between the Aberdeen Gas Committee and the Great North of Scotland Railway Company. The Railway Company have carried their Bill on conditions, which was what everyone outside the Gas Committee—and probably some within it, too—expected. In the House of Lords, the Bill passed on condition that if the Company took land, they should give the Corporation equivalent ground to the extent of 50 per cent. more. The proposal is to take 300 square yards off a corner of the gas-works site; and the ground proposed to be given is on the opposite side of a thoroughfare from the works. The terms which have been agreed upon, and which have been sanctioned by a House of Commons Committee, are that the Company are to give the Corporation 600 yards; that they are to pay them £1000, to be applied in the widening of a street; and that a bridge which crosses the railway is to be widened from 35 to 40 feet. Mr. Littler was in the midst of his opening address when a note was passed to him containing the terms of the compromise which had been come to by the parties; and, of course, the Bill passed unopposed. With regard to the settlement, it is to be noted that the Gas Committee have not been able to retain the gas-works intact. When the Railway Company proceed to effect the alterations they propose, the gas-works will be intersected by a public street. This is not a convenient arrangement; but that the inconvenience was not considered as of great moment is shown by the fact that, when terms were proposed, the Corporation representatives made no serious effort to avoid the partition of the works. In fact, one of the first things to be done was to produce a map which had been prepared by Mr. A. Smith, the Corporation Gas Engineer, in which it was shown how it would be necessary that the Corporation should get 600 yards of land; and the Railway Company agreed to the proposal. The other conditions agreed upon do not affect the gas-works, though they hung upon the proposed interference with the works; and I do not need to refer to them. I have no doubt Mr. Smith will be able to get out of any little difficulty which the division of his works may bring him into. In this belief, I can only say that the agree-

ment is about as fair for both parties as it could have been made; but then it might have been effected months ago, and at home. It is well, however, that it has at last been arrived at.

The shareholders of the Hawick Gaslight Company met yesterday to consider the annual report of the Directors. The Chairman (Mr. Laidlaw, of Sillerbithall) said the Company had earned a profit of £1931, out of which it was proposed to pay a dividend at the rate of 10 per cent. It was also recommended that the price of gas should remain at 3s. 4d. per 1000 cubic feet. Prepayment meters were introduced during the past year. Already 108 were in use; and the number was increasing. In connection with these meters, he would like to see small cookers introduced, as they would be a great boon to the working classes, especially in the summer months. He was satisfied that, for cheapness and efficiency, incandescent gas lighting would be found to be preferable to electricity. He did not think there was a town in Scotland where gas of 28-candle power was produced at the same price as at Hawick. The original £5 shares of the Company, on which there is a guaranteed dividend of 10 per cent., are now selling at £12 each. The report was adopted.

The Saltcoats Gaslight Company are the owners of an undertaking which is not large, but which is in the hands of most capable people, both Directors and officials; and, as a consequence, it is one of the most flourishing gas companies to be met with. The annual balance-sheet is before me. It is a perfect model. Everything is set forth with a clearness which makes it easy for even the most uninitiated to follow the course of the business during the period dealt with. This period is not confined to the year, but, in different places, includes the results of years preceding, by which means the progress of the business is seen. Thus, in the report of the Directors, the quantity of gas made in various years is given. Then in a report which, I presume, must be the product of the Manager (Mr. J. Napier Myers) percentages of the output of gas for every year from 1893-4 are given. All of this, and much more, is most valuable information, not only to the Manager and officials, but also to the shareholders. The balance at the credit of the profit and loss account is £2233, of which £953 was the profit upon the past year. It is proposed to pay a dividend at the rate of 10 per cent., which will absorb £600, and to carry forward £1633. The dividend paid a year ago was 8½ per cent. The quantity of gas accounted for was 15,550,447 cubic feet; and the unaccounted for gas was 6.93 per cent. The revenue from gas was £2533; and from residuals, £324. The coal consumed was 1720 tons, costing £796, and making, with £43 for cartage, a total cost of £839, or an average of 9s. 9½d. per ton, 1s. 0.05d. per 1000 cubic feet of gas made, and 1s. 1.26d. per 1000 cubic feet of gas sold. The yield of gas was 9712 cubic feet per ton of coal.

The Bothwell and Uddingston Gas Company, Limited, had a balance of profit, upon last year's working, of £1900, after charging all renewals and bad debts. During the year they expended £200 upon a new laboratory and fittings and extending the mains, and paid £930 on account of a house which is being erected for Mr. Lawrence Hislop, the Manager. They issued 2500 new shares of £1 each, upon which £1171 premium was realized. Dividends at the rate of 10 per cent. upon both £15,750 of old stock and £2250 of new stock have been paid.

GAS AND WATER COMPANIES STOCK AND SHARE LIST.

Referred to on p. 43.

Issue.	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.	Issue.	Share.	When ex- Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest- ment.
£			p. c.				£ s. d.	£			p. c.				£ s. d.
GAS COMPANIES.															
590,000	10	Apr. 15	10½	Alliance & Dublin 10 p. c.	28-24	..	4 7 6	75,000	5	June 29	6	Malta & Medn., Ltd.	4½-5½*	..	5 14 8
100,000	10	"	7½	Do. 7 p. c.	16-17	..	4 8 8	541,920	20	June 10	5	Monte Video, Ltd.	14-15	..	6 13 4
300,000	100	July 1	5	Australian 5 p. c. Db.	105-107*	+½	4 13 6	617,946	Stk.	Feb. 24	9½	Newcastle & Gateshead Con.	285-240	..	4 1 8
200,000	5	May 26	6	Bombay, Ltd.	52-62	..	4 16 0	252,355	Stk.	Jan. 3	34	Do. 34 p. c. Db. Stk.	115-120	..	2 18 4
40,300	5	"	12	Do. New, £4 paid	42-5	..	4 16 0	150,000	5	May 26	8	Oriental, Ltd.	72-8	..	5 0 0
380,000	Stk.	Feb. 24	12	Brentford Consolidated	280-285	..	4 4 3	135,000	5	"	8	Do. New, £4 10s. pd.	62-7	..	5 2 11
240,000	"	"	9	Do. New	210-220	..	4 1 10	15,000	5	"	8	Do. do. 1879, £1 pd.	12-12½	..	4 11 5
50,000	"	"	5	Do. 5 p. c. Prf.	140-145	..	3 9 0	60,000	5	Mar. 11	7	Ottoman, Ltd.	5-6½	+½	6 6 2
169,375	"	June 10	11	Do. 4 p. c. Db. Stk.	130-135	..	2 19 3	500,000	100	June 1	8	People's Gas 2nd M. of Chicago) Bd.	103-108	..	5 11 1
220,000	Stk.	Mar. 30	11½	Brighton & Hove Orig.	265-273	..	4 4 3	848,070	10	May 26	6	River Plate Ord.	9-9½	..	6 6 4
218,820	"	"	8½	Do. A. Ord. Stk.	195-200	..	4 5 0	250,000	Stk.	June 29	4	Do. 4 p. c. Db. Stk.	96-98*	..	4 1 8
933,500	Stk.	Feb. 24	5	Bristol, 5 p. c. max.	127-132	..	3 15 9	250,000	10	Apr. 29	10	San Paulo, Ltd.	15-16	+½	6 5 0
420,000	20	Mar. 30	11½	British	54-55	..	4 1 9	135,000	Stk.	Mar. 30	10	Sheffield A.	245-248	..	4 0 8
50,000	10	Mar. 11	11½	Bromley, Ord. 10 p. c.	25-27	..	4 5 2	209,053	"	"	10	Do. B.	245-248	..	4 0 8
75,000	10	"	8½	Do. 7 p. c.	20-22	..	3 17 3	447,427	"	"	10	Do. C.	245-248	..	4 0 8
500,000	10	Apr. 29	6	Buenos Ayres (New) Ltd	9-9½	..	6 6 4	5,531,250	Stk.	Feb. 24	5½	South Metrop. 4 p. c. Ord.	141-144	+2	3 12 11
98,122	Stk.	June 29	4	Do. 4 p. c. Db. Stk.	98-100*	+1	4 0 0	1,460,000	Stk.	Jan. 13	3	Do. 3 p. c. Db. Stk.	101-104	+1	2 17 8
150,000	20	Mar. 11	8½	Cagliari, Ltd.	304-312	..	5 4 9	60,000	Stk.	Mar. 11	12	Tottenham and A.	285-295	..	4 1 4
100,000	10	June 10	7	Cape Town & Dis., Ltd.	15-16*	..	4 7 6	60,000	"	"	9	Edmonton J. B.	205-215	..	4 3 9
50,000	50	May 3	6	Do. 5 p. c. 1st Mort.	58-60	..	5 0 0	182,380	10	June 10	7	Tuscan, Ltd.	13-14	..	5 0 0
550,000	Stk.	Apr. 15	13½	Commercial Old Stock.	320-325	..	4 3 1	149,900	10	July 1	5	Do. 5 p. c. Dbs. Red.	160-108*	+2½	4 17 1
200,750	"	"	10½	Do. New do.	250-255	..	4 2 4								
200,750	"	June 10	4½	Do. 4½ p. c. Db. dc.	148-153	..	2 18 10								
800,000	Stk.	June 10	12	Continental Union, Ltd.	205-210	..	5 14 3								
200,000	"	"	9	Do. 7 p. c. Prf.	190-195	..	4 12 4								
61,600	Stk.	Feb. 24	14	Croydon A 10 p. c.	310-315	..	4 8 11	746,164	Stk.	June 29	10½	Chelsea, Ord.	313-318*	-1½	3 6 0
168,400	"	"	11	Do. B 7 p. c.	255-265	..	4 3 0	150,000	"	"	5	Do. 6 p. c. Prf.	170-175*	+½	2 17 2
535,000	Stk.	Feb. 24	5½	Crystal Palace Ord. 5 p. c.	125-130	..	4 0 9	160,000	"	"	4½	Do. 4½ p. c. Prf. 1875	148-152*	..	2 19 3
60,000	"	"	5	Do. 5 p. c. Prf.	142-145	..	3 9 0	175,785	"	Mar. 30	4½	Do. 4½ p. c. Db. Stk.	157-162	..	2 15 7
486,090	10	Jan. 27	11	European, Ltd.	284-242*	..	4 9 9	1,720,560	Stk.	Apr. 15	8	East London, Ord.	225-230	..	3 9 7
364,060	10	"	12	Do. £7 10s. paid	17-18	..	4 11 9	654,740	"	June 29	4½	Do. 4½ p. c. Db. Stk.	157-160*	+½	2 16 3
5,922,110	Stk.	Feb. 10	12½	Gaslight & Coke, A. Ord.	292-296	+1½	4 6 0	390,000	"	"	3	Do. 5 p. c. Db. Stk.	103-105*	+½	2 17 2
100,000	"	"	4	Do. B, 4 p. c. max.	118-123	..	3 5 1	700,000	50	June 29	7½	G'd Junction, 10 p. c. max.	115-118*	..	3 3 7
665,000	"	"	10	Do. C, D, E, 10 p. c. Prf.	305-310	+3	3 4 6	310,000	Stk.	Mar. 30	4	Do. 4 p. c. Db. Stk.	140-145	..	2 15 2
30,000	"	"	5	Do. F, 5 p. c. Prf.	150-155	..	3 4 6	708,000	Stk.	Feb. 10	13	Kent	358-363	..	3 11 9
60,000	"	"	7½	Do. G, 7½ p. c. do.	220-225	..	3 6 8	160,000	"	"	7	Do. New, 7 p. c. max.	213-218	..	3 4 3
1,300,000	"	"	7	Do. H, 7 p. c. max.	195-200	..	3 10 0	1,043,800	100	June 29	10	Lambeth, 10 p. c. max.	295-300*	+2	3 6 8
463,000	"	"	10	Do. J, 10 p. c. Prf.	303-308	+3	3 4 11	406,200	100	"	7½	Do. 7½ p. c. max.	225-230*	+2	3 6 8
476,000	"	"	6	Do. K, 6 p. c. Prf.	182-187	..	3 4 2	850,000	Stk.	Mar. 30	4	Do. 4 p. c. Db. Stk.	140-145	..	2 15 2
1,061,150	"	June 10	4	Do. 4 p. c. Db. Stk.	131-133	+½	3 0 2	500,000	100	Feb. 10	13	New River, New Shares	432-437	..	2 19 6
294,850	"	"	4½	Do. 4½ p. c. do.	148-153	..	2 18 10	1,000,000	Stk.	Jan. 27	4	Do. 4 p. c. Db. Stk.	141-146	..	2 14 10
958,000	"	"	6	Do. 6 p. c. do.	198-203	..	2 19 1	902,300	Stk.	June 29	6	Southw'k & Vxhall, Ord.	163-168*	+1	3 11 5
70,000	10	May 12	8	Hongkong & China, Ltd.	134-144	..	5 10 4	126,500	100	"	5	Do. do. 7½ p. c. max.	168-173*	-½	2 15 2
3,800,000	Stk.	"	10	Imperial Continental	207-212	..	4 14 4	489,200	Stk.	"	6	Do. do. 5 p. c. Prf.	141-144	..	2 15 7
376,400	100	Feb. 1	4	Do. 4 p. c. Dbs. Red.	98-101	..	3 19 3	1,019,585	"	Apr. 15	4	Do. 4 p. c. A Db. Stk.	295-300	..	3 6 8
473,600	Stk.	Feb. 10	3½	Do. 3½ p. c. Db. Stk.	103-106	..	3 6 0	1,155,066	Stk.	June 10	10	West Middlesex	162-165	..	2 14 7
580,000	100	Apr. 1	5	Met. of Mel-1 5 p. c. Db.	110-112	..	4 9 3	200,000	"	"	4½	Do. 4½ p. c. Db. Stk.	104-106	..	2 16 7
250,000	100	"	4½	bourne 4½ p. c. Db.	107-109	..	4 2 7	200,000	"	Mar. 11	3	Do. 5 p. c. Db. Stk.	104-106	..	2 16 7

* Ex div.

The quantity of gas sold was 32,331,000 cubic feet—an increase of 1,209,000 cubic feet. The unaccounted for gas amounted to 5·8 per cent., which, considering the extent of underground coal working in the district, is marvellously low. The quantity of coal carbonized was 3430 tons, as compared with 3463 tons in 1896-7.

The Cupar Gas Company have a balance at the credit of profit and loss account, as the result of the past year's working, of £794, which, with the sum brought forward, makes £972, out of which the Directors propose to pay dividends at the rate of 4 per cent., to set aside £224 for depreciation; to place £100 to the reserve fund; and carry forward £78. The Newmilns (Ayrshire) Gas Company have had a very prosperous year; and they have paid a dividend at the rate of 5 per cent. The Annan Gaslight Company had a revenue last year of £1872; and an expenditure of £1352. Out of the balance, £520, a dividend has been paid at the rate of 12s. per £10 share; and £100 has been placed to the insurance fund, which now stands at £500. The capital account amounts to £6337. The price of gas has been reduced from 4s. 2d. to 3s. 9d. per 1000 cubic feet. The Galashiels Gaslight Company have had a surplus of revenue upon the past year's working of £2051, which, with a balance of £5877 from the previous account, makes a sum of £7928 at the credit of the profit and loss account. The Directors propose to pay a dividend at the rate of 10 per cent., which will absorb £2100, and to carry forward £5828.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, July 2.

Sulphate of Ammonia.—There has been an active market, and a further improvement in values; and the closing quotations are £9 5s. per ton f.o.b. Hull, and £9 6s. 3d. per ton f.o.b. Liverpool and Leith. In the early part of the week, there was considerable anxiety in regard to uncovered contracts for June delivery; and all available parcels were eagerly picked up at full prices. July has opened with a somewhat quieter tone; but there is nothing pressing for sale, and meantime makers are very firm. A moderate amount of direct business has been done. But consumers have been inclined to regard the recent advance as temporary, and, consistently with that view, have not for the most part followed the market. In the forward position, prices required by makers have checked business; and there has been very little speculative offering. Business has been done over near months at about £9 7s. 6d. per ton; but £9 10s. f.o.b. Leith is required by Scotch makers, July-December and October-March delivery. The Beckton quotation, October-December delivery, is £9 5s. per ton, Beckton terms.

Nitrate of Soda is firm; and spot quotations are for ordinary quality 7s. 7½d. per cwt., and for refined 7s. 10½d.—refined quality being very scarce.

LONDON, July 2.

Tar Products.—This market appears to be thoroughly demoralized, especially with respect to the chief products—viz., pitch, benzol, and anthracene. Benzols are marked again lower. Business has been done at a price which would not leave makers more than 8d. for nineties

benzols naked at their works; while "B" quality anthracene has been sold at 3½d., and small parcels are being offered at lower prices than this. At such figures, it does not, of course, pay to extract anthracene; and, when this is recognized by distillers, the production will be still further largely decreased. It is stated that the stocks of anthracene in this country at the moment are much lower than they have been for some years, and that this position will be much further accentuated at the end of the year. Carbolic acid is realizing a little more money; and there is an excellent business doing in it, while crystals are distinctly better, and moving off more freely. The market for solvent and other naphthas is moderately active at about the old rates.

Business noted through the week averages as follows: Tar, 10s. to 14s. Pitch, 19s. to 22s. Benzols, 90's, 9d. to 10d.; 50's, 10½d. Toluol, 1s. 2d. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 1½d. Crude, 30 per cent., naphtha, 4½d. Creosote, 2½d. Heavy oils, 50s. Carbolic acid, 60's, 2s. 1d. Naphthalene, 52s. 6d.; salts, 30s. Anthracene, "A," 4d. to 5d.; "B," 3d. to 4d.

Sulphate of Ammonia.—There is more inquiry for this article; and its position to-day is stronger. It is said that Beckton is out of the market, and well sold. To-day's average price is £9 5s., less 3½ per cent., in all positions, both for prompt and for forward delivery.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—There is nothing further of any very special importance to report with regard to gas-coal contracts, beyond what was referred to last week. One or two important contracts have been partially settled, on pretty much the same basis as that on which business has so far been put through—representing about 6d. per ton advance on the minimum figures of last year. But where collieries secured slight advances early in last season—which in some cases amounted to about 3d. per ton—they are simply putting on a further 3d. this year, making the two advances equal to 6d.; while those who obtained no advance last year are now generally holding out for 6d. per ton above the rates then accepted. There are, however, reports that in the Yorkshire districts some large quantities have been placed at only a very nominal advance over last year's prices; and this is tending to somewhat weaken confidence as to whether the full prices Lancashire coalowners are now asking will in all cases be obtained. One result certainly would seem to be that buyers of gas coal are showing extreme caution about placing their contracts; and there is no doubt that, owing to this, considerable quantities are still held in abeyance pending some further understanding as to prices. With regard to the locomotive fuel contracts, it is reported that the London and North-Western Railway Company were able to place about 130,000 tons outside the collieries with whom they have usually settled their contracts, and that this quantity of coal was arranged for at substantially under the figure that the combination of Lancashire coalowners asked, with the result that probably the average advance

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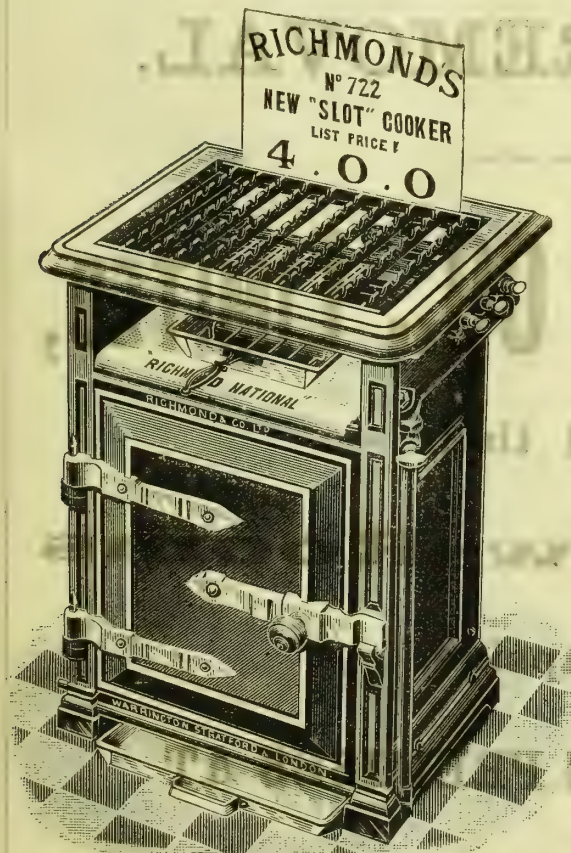
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on their locomotive fuel contracts would not be much more than 6d. per ton all round over last year. Current business with respect to other descriptions of fuel continues very steady, with prices firm. Steam and forge coals and engine fuel are all maintaining full rates; and on forward contracts advances have been obtained of about 3d. up to 5d. per ton in some special cases on engine fuel, and generally about 6d. per ton on round coal. At the pit mouth, average quotations remain at 10s. to 10s. 6d. per ton for best Wigan Arley; 8s. 6d. to 9s., for seconds Arley and Pemberton four-feet; 7s. to 7s. 6d., for common house coal; 6s. 9d. to 7s. for steam and forge coal; 4s. 6d. to 5s., for best slack; 4s. to 4s. 3d., for medium; and about 3s. 6d., for the common sorts. Shipping has been rather quieter, with good qualities of steam coal not fetching more than 8s. 6d. to 9s. per ton delivered at the ports on the Mersey. As to the wages question, which is to be dealt with at a conference of Committees representing the Federated Coal Owners and Miners in London to-morrow (Wednesday), it is generally anticipated that some advance will be conceded without any serious opposition; but that possibly it may be divided into two instalments of 5 per cent. towards the close of the year, and a further 5 per cent. deferred to a later period. This is a proposal which, at any rate, has been discussed; but whether the Miners' Federation would be willing to accept such an arrangement is perhaps doubtful.

Northern Coal Trade.—There has been a very strong demand for coal; and though the supply has been adequate, prices are fairly firm all round. Best Northumbrian steam coals are quoted at 12s. 9d. per ton f.o.b., for early delivery; but any speedy settlement of the Welsh strike would bring down the prices. Second qualities of steam coals are about 11s. 9d. per ton; and steam smalls, being rather scarce, are firm at 5s. 3d. to 5s. 6d. In regard to gas coals, there is a steady demand, which is likely to increase weekly. For large contracts, the quotation is now on the basis of 17s. 9d. per ton f.o.b.; but for early delivery and for occasional cargoes, as high as 9s. per ton f.o.b. is quoted. At present, the exports of gas coals are large, both to the Mediterranean and to the northern ports; and they will continue so for some time to come. There is little or no alteration in the price of manufacturing coals; but the consumption is fuller than it was. Gas coke shows no change in prices.

Scotch Coal Trade.—There is little to be said about the coal trade in Scotland, except that it is still waiting the decision of the Welsh dispute. Questions have been raised in Parliament regarding the use of Scotch coal instead of Welsh coal in the Navy; but, to those who know, not much is expected to come of the bringing forward of the subject. Scotch coalowners will be well advised if they pay no attention to any movement to introduce their coal into the Navy. It has not sufficient calorific value for the supreme purpose for which such coal is required. Apart from this question, there is a large demand, almost more than the supply is equal to. The prices quoted are: Main, 8s. 9d. to 9s. per ton f.o.b. Glasgow; ell, 9s. 3d. to 9s. 6d.; and splint, 9s. 6d. The shipments for the week amounted to 237,707 tons—an increase of 864 tons upon the preceding week, and of 75,765 tons upon the corresponding week of last year. For the year to date, the total shipments have been 4,294,362 tons—an increase over the same period of last year of 743,125 tons.

New Joint-Stock Companies.—The Carlisle Gas Company, Limited, has been registered with a capital of £10,000, in £1 shares, to carry on the business of gas and electric light supply. The O'Brien Flash-Light Syndicate, Limited, with a capital of £12,000, in £1 shares, will enter into an agreement with J. E. O'Brien, and carry on the business of mechanical engineers, lamp manufacturers, gas-fitters, plumbers, &c. The Monifieth Gas Company, Limited, was registered in Edinburgh, with a capital of £5000, divided into 1000 preference shares (4 per cent.) of £1 each, and 4000 ordinary shares of £1 each.

Ottawa Gas Company.—The report presented by the President of this Company (Mr. John Coates, M.Inst.C.E.) at the recent annual general meeting showed that the profit on the operations for the year ending March 31, exclusive of \$2933 paid for repairs and renewals to retort-benches, which was charged to revenue, amounted to \$30,257; being an increase of \$2214 on the sum realized in 1896-7. The net profit was \$25,391, out of which the Directors recommended a dividend of 7 per cent., amounting to \$22,750. The increase in the consumption of gas for the year was 6,678,000 cubic feet, or equal to 18 per cent. This the Directors considered to be eminently satisfactory in face of competition by electricity produced by machinery driven solely by water power. On the 1st of April last, the commencement of the financial year, the price of gas was reduced from \$1.75 to \$1.50 per 1000 cubic feet to all consumers using it exclusively for lighting purposes. This will, of course, make a difference in the income, which the Directors hope will be covered by a greater output; and a further reduction will be experienced in consequence of the extension of electric lighting to the Government Buildings. The manufacturing plant was reported to be in excellent order; and the leakage has been considerably reduced.

Hull Water-Works Assessments.—At the meeting of the Hull Water-Works Committee last Friday, it was reported by the Town Clerk (Mr. E. Laverack) that Mr. Wellsted, the Arbitrator, had made his award in connection with the valuation assessments in the parish of Holy Trinity and St. Mary, and the parishes within the Sculcoates Union. It appeared that the rateable value of the property of the Committee in Holy Trinity and St. Mary at the present time is £3304. The original assessment was increased by the Overseers to £4183, and the amount at which the Corporation thought it ought to be put was £2338. It would therefore be seen that while the amount at which the Corporation thought the property should be assessed was under that fixed by the Referee, the figure at which the Overseers assessed it had been reduced by him by £879. With regard to the property of the Committee in the parishes within the Sculcoates Union, the amount at which it was originally assessed by the Overseers was £6233, which was increased by them to £10,831; and the amount at which the Corporation thought it ought to be put was £9783. It had been fixed by the Referee at £9933; being a reduction of £898. The Chairman complimented the Water Engineer (Mr. F. J. Bancroft) on the manner in which he had handled the business, and said the award was most satisfactory. The report was ordered to be entered on the minutes; and it was decided to withdraw the appeal of which notice had been given.

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EDITORIAL NOTES.

Workmen's Compensation—The Stoke-on-Trent Scheme.

THE subject of the Workmen's Compensation Act has become a standing dish for the technical and general Press. Not a day passes without bringing out something fresh concerning the new order introduced into the industrial life of the nation. An interesting conference was held at the Westminster Palace Hotel on the 28th ult., under the presidency of the Lord Mayor of Manchester, which was attended by representatives of a number of Municipalities owning gas-works, for the purpose of discussing the action to be taken by Corporation Gas Committees in regard to the Act. The meeting was convened by the Mayor of Stoke-upon-Trent (Mr. F. Geen), who proposed that Local Authorities thus circumstanced should join in a scheme of mutual insurance against the liabilities created by the Act. A resolution to this effect was carried unanimously; and an Executive Committee was formed to give effect to the resolution. The Committee is to consist of a representative from each of the Local Authorities for Stockport, Rochdale, and Macclesfield, with Mr. J. W. Wilson, M.P., Oldbury, who are to confer with the Mayor and Town Clerk of Stoke-upon-Trent. Mr. Geen is to be congratulated upon the initial success of the movement started by him; and general interest will be felt throughout the country in the development of his scheme, the ripened particulars of which will, we hope, be shortly forthcoming. It is not quite clear, from the authorized report of the proceedings of the meeting which appears elsewhere, whether such an arrangement is meant to include all Corporation workmen to whom the Act applies. We read the resolution, as altered by the meeting, to apply only to the case of employees in gas and electricity works. Here again it would appear that gas is to help electricity; for there is no doubt as to which is the more dangerous service. Mr. Geen appears to have at least the outline of a scheme already sketched out; so that it was something more than a bare suggestion of principle to which his meeting gave provisional adhesion. He is reported to have said that he considers a premium of 5s. per cent. "ample," and to have suggested that out of such a payment, "after providing a sufficient reserve fund, bonuses should be paid to those authorities whose workmen had not received as much "out as had been paid in on their account."

It is with no desire to pour cold water upon Mr. Geen's well-meant endeavours that we venture to observe that his Insurance Committee will need to be very careful what risks they admit, if they are going to form a strong reserve fund and return appreciable bonuses out of a premium income calculated upon a 5s. rate for all gas-works and electricity supply labour. There are gas-works and gas-works; and the same remark applies with even greater force to the generation and distribution of electricity. It was very nice of the Lord Mayor of Manchester to take the chair at Mr. Geen's meeting, and approve generally of his proposal; but there can be very little in common between the gas undertakings of Stoke-upon-Trent and Manchester. The grouping of gas-works for mutual insurance, under the guidance of somebody with a head screwed on the right way, appears to be the first condition of success for a scheme of the kind contemplated. Gas-works on the largest scale, with power machinery, and steam locomotives running at all levels all over the works, must be more liable to accidents in working than quiet country stations with no working machinery besides the exhauster and a pump or two—if indeed the latter come under the Act at all. Few Corporation Gas Committees possess insurance funds. Capital would have to be provided somehow. Precautions must be taken to cause contributories to adhere to the scheme; and also to make the scheme answerable for continuing liabilities. Moreover, who knows how many more beneficiaries would be fastened upon a mutual fund than the individual works would pay directly out of their own revenue? However originated and supported, a mutual insurance scheme, from the moment of starting in business, would have to be worked exactly like any other insurance office, if it is to succeed.

The argument for mutual association for this purpose does not apply to gas manufacture as it does (say) to collieries, or even to engineering works. A big colliery explosion might ruin the owner of one pit; but there would not be explosions in every pit of a number of associated coalowners. Then among engineers, a gang of

hoisters employed by one firm might meet with some bad accident which the firm might not be able to deal with single-handed. This is a plea for association. The case of gas-works is quite different. The risks of the employment are almost wholly those of individual workers, and are among the lightest of all organized industrial avocations. So far as we can see, mutual association for insurance against workmen's compensation, for gas undertakings, would only increase the cost of the operation, while tending to weaken the sense of responsibility of the contributories, and introducing an element of uncertainty into the protection.

The Year's Work of the Sulphate of Ammonia Committee.

THE first annual general meeting of the subscribers to the Sulphate of Ammonia Committee was held last Wednesday—Mr. W. G. Blagden in the chair. The report presented by the Executive Committee respecting their year's work showed that the task of making sulphate of ammonia better known among British agriculturists is not an easy one. Indeed, it is complained that the English farmer is hardly to be reached at all by means open to the Committee. It is probable that the newspapers and other enterprises which live by this shy recluse manage to get hold of him somehow. The Agricultural Societies seem to have disappointed the Committee by their indifference to the bait of prizes for manuring competitions. There may be more reason for this than appears upon the surface; and it may be worth inquiring whether counsel could not be taken in this regard with the ruling authorities of the principal Societies. The Committee are getting ready for their great prize essay competition, the terms of which are shortly to be advertised. It is to be sincerely hoped that the result will answer their expectations. The company that assembled at Mr. Blagden's offices were not inclined to criticize the first year's operations of the Committee too severely; a placid feeling of contentment, born of better prices, evidently pervading the meeting.

The Accounts of the Manchester Gas Department.

THE annual accounts of the Manchester Corporation Gas Department have been presented to, and received by, the City Council almost without comment. The output of gas shows a decrease of 0.69 per cent., as compared with an increase of 11.16 per cent. in the previous year; the cause being the high temperature prevailing during the winter months. The number of consumers has, on the other hand, increased during the year by 11,616; and it is reported that the use of prepayment meters has largely extended—proving a great boon to the tenants of cottages. There is still plenty of room for the growth of this branch of gas consumption in Manchester and the out-townships; there being at present only 3.05 per cent. of prepayment consumers within the city. The application of gas to purposes other than lighting continues to increase. The total amount of revenue of the department for the year was £553,642, as compared with £552,816 for the year 1896-7, or an increase of £826. The net profit on the year's working was £56,167, of which amount £50,700 was paid over to the City Fund, and the balance placed to the suspense account in regard to the expenditure on carburetted water-gas plant. It is reported that the whole of the works and plant have been kept in a state of thorough repair out of revenue. Under the advice of Mr. G. E. Stevenson, the manufacturing and distributing plant of the different stations is being modernized. The department, as in duty bound, support the Ship Canal by getting their carburetting oil shipped direct to a storage depot at Mode Wheel. It will be remembered that at this time last year the Gas Committee unanimously recommended the Council to reduce the price of gas in the out-townships by 3d. per 1000 cubic feet and abolish the meter-rents; but the recommendation did not prevail. Consequently the City Fund gets the extra £10,000 or so of profit which the proposed act of generosity—or of justice—would have anticipated. In moving the adoption of the report, the Lord Mayor drew attention to the selling price of gas within the city, of which he seemed to be proud. There is nothing particularly creditable to Manchester in selling gas at 2s. 3d. per 1000 cubic feet, without meter-rents. The price has remained at this figure for the past three years, while many smaller towns have been able to encourage local trade by offering reductions in the charge for gas. The Manchester Corporation have not yet learned the lesson of using their Gas Department for this purpose.

Questions of Wages in the Coal Trade.

THERE has been a good deal of talk during the week about prices and wages in the coal trade. The Welsh strike and the Compensation Act have been influencing the whole trade, and creating subjects for discussion in the London and Provincial newspapers. First of all, Sir Edward Fry, the Conciliator appointed by the President of the Board of Trade to deal, according to statute, with the former trouble, has notified his appointment to the Secretary of the Coalowners' Association. He states in this communication that, in pursuance of this duty, he proposes in the first instance to seek an interview with representatives of the workmen; and he will then probably ask the Committee of the Association to meet him. It all depends, of course, upon how the Conciliator fares with the strikers. Meanwhile, the Secretary of the Coalowners' Association has issued a statement setting forth the facts of the dispute, and explaining the action taken by the associated employers. This is done in order that the public may know how the present state of things was brought about, and who is responsible for its continuance. It is admitted by the workmen's representatives that the first step was their own notice to terminate the sliding-scale agreement. This was done in October last; but it was not until February of the present year—a month before the date of the expiration of the notice—that the same men began to discuss the matter with the employers' representatives. Then it came out that the men wanted the masters to commit themselves to a design for controlling the output of coal with the object of keeping up prices and wages simultaneously, and also to accept the proposal for the addition of an outside umpire to the new Sliding-Scale Committee. Neither of these projects could the employers accept. On the 1st of March, the workmen's representatives made new proposals again embodying the "control of the output" scheme; and it became known in the course of the subsequent discussions that they, the representatives, were not equipped with power to settle matters with the other side, who for their part were so prepared. The employers pointed out the inequality of the proposed arrangement, and also stated that, in view of the imminence of the date of expiry of the scale agreement, it would be necessary for them to give a month's notice to terminate contracts of employment. For taking this course the employers have been vilified from platforms and by the Press; the men averring that it constituted the dispute a lock-out by the masters.

The men's leaders have declared that the notices to terminate employment were the source of all the bitterness that has characterized this severe struggle; some of them stating that they personally implored the employers to keep the men in work while the negotiations were going on. If this had been so important a consideration, one would think that the men might have begun negotiating earlier. The employers' statement puts it, however, that the true cause of the trouble was the refusal of the men to trust their leaders with plenary powers. It is asserted that this difficulty still persists. The conclusion of the statement is as follows: "The employers are convinced that the majority of the men, if their opinions could be taken fairly, are in favour of a return to work. But the employers have no desire to take advantage of their necessity, and are still willing and desirous to discuss terms of settlement with properly authorized representatives. They cannot, however, close their eyes to the fact that the men's present leaders are distrusted, and that they distrust one another. Moreover, it is clear, from the conduct and the utterance of these leaders, that they do not, in fact, possess the full authority which the President of the Board of Trade has insisted upon as a condition precedent to action by a conciliator." The statement proceeds: "At present the employers have waited for no less than three weeks without hearing from the workmen, although the latter are aware that the employers are at all times willing, and even anxious, to discuss terms of settlement." The men's leaders, it is reported, are amusing the strikers by attending meetings at which nothing is done but abusing the employers and passing resolutions asking for outside assistance for the men and their families. So long as the strikers continue of this mind, it is difficult to see what the Conciliator can do with them.

A conference between the representative Committee of the Coalowners within the area of the Miners' Federation,

and the Miners' Federation Committee, was held at the Westminster Palace Hotel last Wednesday afternoon, under the presidency of Mr. A. M. Chambers. After some considerable discussion of the men's demands for an advance of 10 per cent., a mutual arrangement was agreed upon by which the men will receive a rise of 2½ per cent. from October next until January, when a Conciliation Board on the lines of the Rosebery settlement will decide the rate of wages within defined limits. The conclusion is regarded as satisfactory, inasmuch as the men get their rate of wages assured for a considerable period in advance, while the employers are relieved from anxiety on this score while they are working out the results of recent legislation.

The Report of the Committee on Old-Age Pensions.

THE report of the Committee appointed to inquire into the question of old-age pensions was published last week. Lord Rothschild was the Chairman, and the report is signed by all the members. The terms of reference to the Committee were generally as to whether anything could be done to encourage the industrial population, by State aid or otherwise, to make provision for old age in some other way than is done by existing arrangements having the workhouse in the background. The Committee found themselves confronted with more than a hundred schemes, which for the most part they were able to classify into four groups. The first comprised schemes involving compulsory contribution towards a pension fund, either by the German plan of deduction by employers from the wages, assisted by a contribution from employees, or by way of an annual or a lump payment made by all young persons before a certain age, and accumulated at compound interest until the pension age. In the second group fell schemes providing a universal grant of pensions to everybody on attaining a certain age. The third group was of schemes providing special facilities and encouragement to voluntary insurance for old age, with material assistance from the State. Lastly, there were schemes applying only to members of friendly societies.

It is for some reasons a pity that the Committee considered that their terms of reference precluded them from recommending any scheme based on compulsion, as contrasted with encouragement. This had the effect of ruling out the German plan, and most others except those included in the third group. One would have liked to have a detailed criticism of the German system by the Committee. Broadly speaking, they find that nothing can be done with the question submitted to them. After examining all the schemes which seemed worthy of any attention, they were forced to the conclusion that there was not one of them, whatever its particular merits, which would not ultimately injure rather than serve the best interests of the industrial population. They did not, however, restrict themselves to purely destructive criticism, but proceeded to hammer out a scheme upon lines originally suggested by one of the members as fulfilling the conditions of the reference. Even this project proved unsatisfying. It was only very slowly, and with great reluctance, that the Committee accepted the conclusion that the thing proposed to them is impossible. The most hopeful observation expressed in the report is the consideration "that a large and constantly increasing number of the industrial population of this country do already, by prudence, self-reliance, and self-denial, make their old age independent and respected." The Committee further "entertain a strong hope that the improvement which is constantly taking place in the financial and moral conditions of labour will do much to deprive the problem we have had to consider of the importance now attaching to it." In other words, mankind must continue to trust in the immemorial methods of Individualism; there being no help in even so modified a Socialism as that which inspires the reference to the Committee.

It is due to the Committee that their report, through which the sense of a heavy responsibility runs so manifestly as to give its sentences an air of great solemnity, should be carefully read by all those who are interested in the subject. The most disappointing feature of it is that it leaves the practical problem exactly where it was. Rightly or wrongly, the community have come to desire that something better than the cold comfort of the workhouse should be provided for the aged poor who have worked all their lives, and yet missed making provision

for themselves at the last. As "The Times" remarks, "it is deplorable, and even dangerous, that a large portion of the working population of the country should be left dependent, when past its prime, on public or private charity, or on the help of relatives who, in the greater number of cases, can hardly pay their own way." We all know the meaning of the latter sentence, and can see around us illustrations of the way in which helping to maintain aged relatives hampers the efforts of the still active workers to provide for themselves. It is all very well to preach "thrift" to working people; but, unhappily, the practice of thrift comes easiest to those who are already selfishly disposed. Large employers of labour are now making provision for their servants who are past work upon the only sound principle—that of superannuation upon a regular scale, irrespective of the recipient's private means, and from a fund to which he has contributed. How the State could be substituted for the employer in such a system, and the right to superannuation be given in respect of citizenship alone, is the problem which the Committee have confessed their inability to solve. It may be doubted if it is possible of solution upon any basis which the nation could accept; but if our Socialists are good for anything in the way of constructive criticism, they will now take the Committee's report in hand, and show the world just what they could do with its unsolved problems.

WATER AND SANITARY AFFAIRS.

THE Suburban and Outer Authorities sent a strong array of witnesses before the Royal Commission last week. There was a consensus of opinion that the London County Council was to be dreaded and avoided. Richmond was said by the Chairman of its Water Supply Committee to have "an indescribable fear of the Council." On behalf of the consumers in the district of the Kent Company, objection was taken to the London County Council having "any power over them;" it being considered that the interests concerned were antagonistic to each other. Beckenham, which was supplied mainly by the Kent Company and partly by the Lambeth, had no favour for the idea that the London County Council should purchase the Companies' property and sell water in bulk. Croydon, as represented by its Corporation, wished to supersede that portion of the local supply which was furnished by the Lambeth Company, and was decidedly opposed to any scheme by which the borough should take a supply in bulk from the London County Council. In short, the Croydon Corporation wished to extend the area of their supply, so as to have the borough to themselves. At the same time, "if matters were left absolutely as at present," Croydon would not press for any change. Throughout the evidence given by the several witnesses, there was an entire absence of anything like serious complaint against the Companies; and if any dissatisfaction was expressed, it was merged in a general apprehension that any interference on the part of the London County Council would be hurtful rather than beneficial. To have the command of their own supply was the prevailing wish of the Local Authorities; and the Chairman of the Council appertaining to the Croydon rural district stated that the ratepayers were opposed to being associated with the London County Council, lest they should be involved in a plan for bringing a water supply "from a long distance." This contingency evidently has an influence on the outlying Authorities, as observed by Lord Llandaff a fortnight ago. The attitude of Middlesex and Surrey is repeated in Kent; and there is a desire to avoid being drawn into the maelstrom of a gigantic Welsh project. On the other hand, there is a narrow feeling that the local resources are to be kept in reserve for purely local purposes. The enormous resources of the chalk area are thus to be locked up for the benefit of particular districts—a policy which Nature herself forbids; the underground waters being continually seeking an outlet in the direction of the sea. One of the Commissioners, Major-General Scott, has suggested another view of the case—namely, that the local supply may fail, and that the policy of isolation may lead to a difficulty. The Croydon rural district, in connection with Surrey, is thus referred to. We cannot but feel that the appropriation of water areas is a subject for scientific

inquiry, and one which should be dealt with on a broader basis than that afforded by sectional local demands.

If the world is governed with little wisdom, the Local Authorities exhibit little knowledge with respect to the enactments which relate to the water supply. There is a cry for "more control" over the Water Companies. But control already given is not exercised. It is very likely that the want of action arises in a great measure from the circumstance that the law itself is not wanted. But there is the curious fact that the Local Authorities are often in ignorance that the law exists, and are asking for that which has been already given. This singular defect was apparent in the case of some of the witnesses who came before the Commission last week, and provoked the remark from the Chairman that the Local Authorities never seemed to read or trouble about Acts of Parliament relating to water. Lord Llandaff was so impressed by this extraordinary ignorance as to say that "it made one rather shy about recommending any further enactments." The Beckenham witness complained that the Lambeth Company gave only an intermittent supply; but, when questioned on the subject, he candidly acknowledged that no steps had been taken to obtain a constant service, as provided for by the Act. Lord Llandaff seemed to feel that the case was past remedy, when a Local Authority ignored the statutory powers which had been placed at its disposal for years. Some of the witnesses dwelt on the importance of enabling the Sanitary Authorities to take samples of water for the purpose of analysis; and it was apparently thought that nothing was simpler than filling a bottle with water, and having the liquid analyzed.

Insurance against Employers' Liability.—A correspondent writes on this subject as follows: I send a form of policy for insurance against employers' liability, which has been introduced by the underwriters of "Lloyds;" the rates being about one-third or one-fourth of those charged by the Tariff Companies, and which appears to be meeting with great approval, especially by employers whose records for accidents have hitherto been good. Of course, with such low rates of something like 2s. 6d. per cent., the risk taken must necessarily be different from that of the Tariff Companies. The difference is this: The Companies take all the risk; but Lloyds only take the uncertain part of it. The employer has no claim under his policy until he has paid compensation up to a certain definite amount. Suppose, for instance, he pays £10,000 a year in wages, on which the Lloyds insurance premium of 2s. 6d. per cent. amounts to £12 10s., he will have no claim until he has paid £37 10s. in compensation; but beyond this limit the policy covers all risks—workmen's compensation, employers' liability, and common law. The advantage consists in the removal of the uncertainty. If the accidents in any year are normal, the employer bears the burden, which cannot exceed a fixed amount; but should there be a catastrophe of any kind—either a serious accident, involving death or injury to a number of men, or an abnormal succession of accidents—in any year, then all the extra risk is to be taken by the insurers. Such a case as the accident at Tynemouth a few years ago, when several lives were lost, and which may happen anywhere, shows the advantage of this system, which seems to be especially applicable to small employers and small companies.

The "Pluto" Patent for Utilizing the Waste Heat of Gas-Lamps.—The latest development of the novel lamp introduced by the "Pluto" Hot-Water Syndicate is now to be seen in Leicester Square. It was opened to the public on Thursday last; and the simple function drew together a crowd of people whose appearances were as diversified as the criticisms which they passed on the substantial and useful structure around which they were assembled. The primary object of the invention is the utilization of the waste heat of street-lamps in the heating of water, which is retailed to the public on the "penny-in-the-slot" system. The means by which this is accomplished were described in the "JOURNAL" for Sept. 21 last; and the only improvement in the gas lighting and heating portion of the arrangement is in the adoption of a Denayrouze burner, on which are mounted five incandescent mantles. It was thought by some that there would be a loss of efficiency in the water-heating power by the change from flat-flame burners to incandescent ones; but the contrary has been proved. During the daytime the lights are turned down so that the mantles are merely glimmering; and this is found sufficient to maintain the supply of hot water. At night the light given by the lamp is most brilliant; and it affords much satisfaction in the neighbourhood. The greatest development has been made in the base of the lamp; for the one in Leicester Square not only supplies hot water, but purveys light refreshments in the shape of beef tea, coffee, cocoa, sweets, &c. The novelty of the thing attracts good custom; but it is to be feared that, after the novelty has worn off, the competition of the street lamp with the existing cheap refreshment establishments will be short-lived.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 112.)

LAST week was rather disappointing on the Stock Exchange. It opened very strong, and afforded good promise of a general improvement. But people remained rather shy and cautious, and business did not increase. The consequence was that things relapsed into a dull condition; and inactivity and heaviness prevailed right up to the close. Prices in almost all departments have given way, from Consols downwards—the American market from its special circumstances being the only conspicuous exception. Money for short loans was more abundant than ever, and could be had on the very lowest terms; but discount rates hardened, owing to Continental demands. A fall in the Bank rate on Thursday was regarded by many as probable; but the Directors made no change. The Gas Market was much more active than it has ruled of late; and the general tendency was good. The chief feature was the brisk demand for the debenture and preference stocks of The Gaslight and Coke Company at well advanced prices. Good safe securities which afford a better return for money than the choicest gilt-edged stocks are being inquired for. Gaslight "A" was in fair demand, though not so lively as the other issues; and it slowly and gradually rose from 293 on Monday to 297 on Saturday. South Metropolitan was quieter, but showed no sign of yielding its strong position. There was more doing in Commercials. The old stock was depressed by a parcel being thrown on the market; but the new stock improved a couple of points. Little enough was done in the Suburban and Provincial group. Movements were irregular—Alliance advancing, while British receded. Business in the Continental undertakings was much below the average; but the characteristic was strength. Imperial had a fair advance; and Union preference rallied after its fall. Among the rest, for some occult reason or other, Bombay was put up, and Oriental was put down. San Paulo had a further rise. In Water, as in Gas, the chief business seemed to be in the debenture stocks, and for the same reason. Business was only moderate; but all issues were strong and buoyant.

The daily operations were: Business in Gas was quiet on Monday, being confined to Gaslight issues; and the "A" advanced 1. In Water, Lambeth tens rose 2. Tuesday was very brisk; and Gaslight secured issues again almost monopolized attention—"A" rising 1 more. Imperial gained 1; and San Paulo, $\frac{1}{2}$. Lambeth Water rose 1 more. Business was much quieter on Wednesday; but quotations moved freely. Gaslight "J," Commercial new, Union preference, and Imperial advanced 2; and Bombay, $\frac{1}{4}$. But Commercial old fell $2\frac{1}{2}$; and Orientals, $\frac{1}{4}$. In Water, West Middlesex rose 2; and Southwark "D," $3\frac{1}{4}$. Thursday was brisk; and activity in Gaslight secured was resumed. "G" rose $12\frac{1}{2}$; "F," $3\frac{1}{2}$; "C," "D," and "E," 3; "J," 2; and "K," 1 $\frac{1}{2}$. British was $\frac{1}{2}$ lower. Friday was quieter; but Gaslight secured were still on the move—"J" advancing 1 more. In Water, Kent rose 2. Saturday wound up with another gain of 1 in Gaslight "A;" and Alliance rose $\frac{1}{4}$.

ELECTRIC LIGHTING MEMORANDA.

Mr. J. L. Sayer on the Electric Lighting of the City of London—A Defence of Commercial Enterprise—The Generation of Electricity in Bulk—Competition in Electricity Supply.

THE subject of the electric lighting of the City of London, mentioned in this column last week, has been dealt with in a letter addressed to the "Daily News" by Mr. J. L. Sayer, who was Chairman of the Streets Committee of the late Commission of Sewers at the time of the formation of the Pioneer Company. We recorded the fact that the personalities indulged in with respect to this transaction by the journal called "London" have drawn upon that publication an action for libel. Now the ex-Chairman of the Streets Committee, disregarding for the time being the personal side of the matter, has explained the circumstances very much upon the lines of our last week's comment. Mr. Sayer declares that the article in "London" contains "serious misstatements of facts, and is otherwise calculated to create false impressions both of the past and present conditions of electric lighting in the City." This article put a bad complexion on the whole arrangements to which Mr. Sayer was a party in his official capacity. Naturally, he objects to this treatment; and he asserts that the Commissioners of Sewers acted honourably and for the best throughout the business in respect of which they and others have been "so ignorantly attacked in 'London.'" Moreover, he claims that the Commission made an uncommonly good bargain for the electric lighting of the City. The City actually pays about 2 $\frac{1}{2}$ d. per unit for the electricity supplied for public lighting, including everything; and, as Mr. Sayer justly remarks, not only was this a remarkably low charge at the time the contract was made, but it is probably as cheap as the City could do the work for

themselves at the present day. He confirms our statement that the public lighting of the City is not worth having as a business by itself, by showing that the Company have expended £128,000 of their capital upon it, for which there has been little or no return.

Our perfervid Progressive contemporary is not to be envied the situation it has so wantonly created for itself. Advocacy of the principle of electricity supply by local authorities, like every other "cause," needs to be conducted with circumspection. Unhappily, respect for the motives and conduct of those who differ from the party is not one of the points of the Progressive "program." In regard to the particular matter of the provision of electric lighting for the City of London, it may be, as Mr. Sayer admits, that it would have been better for the City to have kept the work in its own hands; "but it is easy to be wise after the event." The Commission of Sewers deemed it preferable, in the public interest, to allow electric lighting to be developed by private enterprise; objecting to enter into what at the time was a doubtful speculation. "Experience must always cost something; and in the home and centre of commerce the public should not grumble if the cost of leading the way is sometimes evident." This is the right and proper manner of looking at the question.

Some of the measures glanced at by the Joint Select Committee of Parliament on Electrical Energy Generation and Supply, whose report was specially discussed in last week's "JOURNAL," have been considered and disposed of by a Committee of the House of Lords presided over by the Earl of Northbrook. The Metropolitan Electric Supply Company's Bill proposed to establish a large generating station at Willesden, and to bring the current into the Company's areas of supply by a conduit laid along the Grand Junction Canal. The proposed station, in effect, was to be a northern analogue of the Deptford establishment. Thus is Mr. Ferranti justified of his opponents. The Metropolitan Company find themselves short of station room. Consequently, they have decided to go outside, and build an electricity generating factory which with the trunk connections will cost close upon half a million sterling. The London County Council wanted to insert clauses in the Bill giving them the power of purchasing the undertaking as a whole. The suggestion failed, on the ground that the Council are not one of the Local Authorities to whom powers of purchase are reserved by the Electric Lighting Act. If the Council desire to proceed upon the resolutions passed by the Joint Select Committee, they must come to Parliament for the purpose, as suggested in the Committee's report. The St. Giles's Board of Works, one of the Local Authorities having at present the right of purchasing their portion of the Company's undertaking, objected to the Bill as proposing to nullify these rights by the removal of the generating works. The opposition was futile; the Committee declaring the preamble of the Bill proved.

The financial press has discussed, from its own peculiar standpoint, the situation illustrated, rather than created, by the decision of Parliament in regard to the Bermondsey and Marylebone Electric Lighting Orders. It appears from this discussion that "the City" had overlooked the fact that a limited and regulated competition in supply is one of the features of statutory electric lighting which the Board of Trade are careful to encourage whenever the chance offers itself. Yet nothing can be clearer than the intention and the wording of the Acts. In several Metropolitan districts there has been competition from the first. The various Electric Light Companies so competing are always ready and willing to extend into fresh fields and compete against other concerns. Of course, they do not like to be treated in the same way by anybody else, above all by a local authority; but such is the fundamental condition of the business. One newspaper sagely observes upon the question that "no general principle seems to run through legislation affecting the rights and privileges of capitalists who embark their money in furnishing the community with comforts and facilities which are greatly needed." This is nonsense. The idea of monopoly in any public service is foreign to British legislation; and it is expressly excluded from the Electric Lighting Act of 1888. To argue that the letter of this Act is different from the intention of its framers in this regard, is waste of time and energy.

THE LESSON OF PHILADELPHIA.

SECOND ARTICLE.

RESUMING with Dr. Rowe the consideration of the case of the Philadelphia municipal gas undertaking, we come to his account of the manner in which the period of municipal administration came to an end. Ever since 1883, combinations of capitalists had been scheming to get control of the business; but it was reserved to the United Gas Improvement Company to carry off the prize. Dr. Rowe admits that, whatever the nature of the political forces set in operation by the Company, they were greatly aided by the attitude of a large portion of the business community, for whom the prospect of obtaining gas of better quality at a lower price overshadowed for the time being all other considerations. "It is argued that as a result of this combination the permanent interests of the city were lost sight of. This was, of course, no affair of the United Gas Improvement

Company. It is further stated that the Company secured an exclusive privilege upon too easy terms; but this is an aspect of the "deal" which is chiefly of local interest. It is Dr. Rowe's principal complaint that, whereas "the consideration in return for a franchise should be determined on the basis of the value of the privilege," in this lease there is no provision for disclosure of what the lessees make out of it. This omission strikes Dr. Rowe as a grave defect; and it is a view that most people in this country would also take. British gas legislation proceeds upon the principle of the rigid connection between selling price and undertakers' profits. Both are defined and limited. This principle has been lost sight of in the Philadelphia lease, as to which the only question which interested the grantors was whether the Company were prepared to give better gas at a lower figure than the old Gas Bureau. The observation is made that "had the terms of the lease been formulated with reference to the possibilities of profits to a company enjoying a monopoly of the gas supply, the results would have been different."

The lease as finally signed gives to the Company a monopoly of the supply for thirty years. At any time prior to July 1, 1907, the City may terminate the lease, on condition of reimbursing the Company for all improvements, plus 6 per cent. simple interest on the cost. Dr. Rowe declares that the option thus given can never be exercised by the City, because the amount that would have to be paid would increase the City debt beyond its constitutional limit. In return for their exclusive privilege, the Company engage as follows: First, to supply gas of 22-candle power at the price of \$1 per 1000 cubic feet. Secondly, to pay into the City treasury upon all gas sold prior to Jan. 1, 1908, all sums received in excess of 90 c. per 1000 cubic feet; after Dec. 1, 1907, and prior to Jan. 1, 1913, all sums in excess of 85 c. per 1000 cubic feet; from Dec. 31, 1912, to Jan. 1, 1918, all sums in excess of 80 c. per 1000 cubic feet; and from that time until the expiration of the lease (Dec. 31, 1927), all sums in excess of 75 c. The Council have power to fix the actual selling price of gas at these dates at the figures given, in which event the City will receive no money rental. Thirdly, to light, free of all charges, all public buildings and lamps, and to provide for the lighting of 300 additional lamps every year. Fourthly, to expend within three years \$5,000,000 in alterations, improvements, and extensions, and at least \$15,000,000 for the same purpose during the thirty years of the lease. Lastly, on the expiration of the lease, the City is to receive back the works without charge in first-class working condition.

At a first glance, as Dr. Rowe admits, these provisions appear to assure a large return for the franchise. He insists, however, that one cannot be certain of this without knowing what are the corresponding possibilities of profit to the lessees. These hinge upon the question of the cost price at which the Company can reasonably expect to make gas. Dr. Rowe argues that this price will be considerably reduced immediately and in the near future. He believes that it will not cost the United Gas Improvement Company more than 10 per cent. more to make gas in Philadelphia than the actual cost of the same quality of gas in Glasgow or Birmingham. His point is that the Company will net 90 c. per 1000 cubic feet for all gas sold for private lighting in Philadelphia until Dec. 31, 1907, while it will only cost them 35 c. per 1000 cubic feet to manufacture and distribute. If this is the case, it will undoubtedly be good business for the Company.

Apart altogether from the consideration of the lease from the business standpoint, there remains the general question of the expediency of such an abandonment of a municipal function. Dr. Rowe laments that the attitude of the populace to this phase of the question furnished a striking illustration of the poverty of American communities in civic ideals. He argues that in parting with the gas-works Philadelphia deprived itself of the power of performing an important social service—meaning that a municipal gas supply should be used for something more than merely getting money by the sale of certain products of the industry. He points to the important part played by gas in the economy of modern life, and thinks it indubitable that this part will be a greater one in the years to come. Here, again, he refers to the experience of English cities for enlightenment; and this what he finds: "At the time the gas-works were placed under municipal control in Glasgow—and the same statement applies to the other cities of Great Britain—the use of gas was limited to the well-to-do classes. After careful study and inquiry, the municipal authorities came to the conclusion that to introduce its use for cooking and illuminating purposes by the working classes, particularly in the thickly-settled tenement districts, would work radical changes in their mode of life. The wastefulness of the coal stove, and the comparatively high cost of its maintenance, had given to uncooked foods an important place in the standard of life of these classes—a fact that seriously affected their industrial efficiency and physical vigour. The widespread use of alcoholic liquors was largely to be explained by the crude diet of the poorer classes. It was evident that the introduction of a new element into the standard of life could only be effected by the City through a temporary subordination of financial considerations. In order to facilitate the use of gas for illuminating purposes, automatic penny-in-the-slot meters were introduced." This is a very pretty picture of the deliberate combination of gas supply policy with philanthropy, hygiene, and the temperance cause; only unfortunately it is not strictly in accordance with the facts. It was not the British

gas-supplying municipalities, but gas companies, who encouraged the use of gas cooking-stoves, and introduced prepayment meters and free interior fittings. Glasgow certainly takes the lead among municipalities in popularizing the use of gas; but this is chiefly due to the fact that the supply is sold at cost price. All the other English Municipalities mentioned by Dr. Rowe follow the plan condemned by him in the case of Philadelphia, of making the gas profits subsidize the local rates. There are, of course, degrees of this practice.

In conclusion, Dr. Rowe condemns the Philadelphia Gas-Works lease because it is a bad stroke of business for the City, and because it is also a retrograde policy. He anticipates Mr. McDougall's suggestion, as contained in his letter in the "JOURNAL" for the 28th ult., that the most effective means of eliminating corruption is to "reduce to a minimum the functions which the Municipality performs," and agrees with us that "this method, in reality, increases the evil." The work of cities has to be done somehow; and whatever the City Government does not undertake, falls into the hands of corporate bodies who become more powerful than the regular authorities. This is especially the case in the United States, where "in those very classes that should furnish leaders in our civic life, we find waging the conflict between private interests and public welfare which usually results in the triumph of the former." The ideals of local patriotism have not yet succeeded in establishing themselves in the United States, outside the Universities; and every trade combination that is strong enough crushes the individual citizen and sets the local governments at defiance. "As regards Philadelphia, the danger is increased by the fact that the monopoly of the street railway and the gas and electric light service is vested in the same combination of individuals."

Dr. Rowe deplores the fact that just now, when a perception of the true relation between municipal activity and social progress is finding acceptance with a constantly increasing percentage of the American people, so discouraging an example should be offered by Philadelphia to other American cities. He cites the number of English and German Municipalities owning and managing their gas-works; and he wonders whether the cities of the United States will ever develop an equally efficient administration. "Upon their ability to do so depends the future of our democratic institutions." He perceives also that the process of improvement and development must be gradual. The people must be prepared for temporary discouragements, and to withstand the temptation to throw off the burden of public service in favour of private agencies. Until this is done—until the people are able to discriminate more clearly between the temporary and permanent interests of their Municipalities, in Dr. Rowe's opinion the road to good city government in the United States will remain closed. There is no short and easy way to sound local government. The order of historical development in this regard is complex; encountering difficulties which must be consciously met by every progressive society. "Temporary expedients may postpone, but cannot avoid, the vital problems of governmental activity. Their successful solution soon becomes the requisite for civic advance." Such is the professional pronouncement—a little pompous, perhaps, but undeniably true. We shall next have to see what Dr. Rowe's brother professor, Mr. E. W. Bemis, has to say upon the same subject.

Water-Hammer Action.—A fatality caused by an explosion of a steam-pipe near Bristol, has led a correspondent to call attention to the above subject in "Engineering." He points out how a small quantity of water in a steam-pipe may, under not unusual circumstances, cause loss of life. He takes the case of a 2-inch pipe, at the end of which steam at 100 lbs. pressure is admitted beneath (say) 4 lbs. of water, and asks what will be the probable result. A force of 314 lbs. producing motion in 4 lbs. of water equals in accelerative effect 2527 feet per second; and so the water, before it has been driven 2 feet along the pipe, will have acquired a velocity of 100 feet per second, which means the possession by the water of 624 foot-pounds of kinetic energy. Thus a small quantity of water may be rendered a very formidable projectile, the bringing to rest of which would probably require setting up a resistance of material considerably beyond that required to encounter the ordinary working force.

Calcium Carbide and Acetylene Patents.—Most readers of the "JOURNAL" will remember that during the past two years a very large number of patents have been granted for processes and appliances for the production of calcium carbide and for the generation of acetylene gas; but, according to some figures given in the "Electrical Review," they are only about half those applied for. In 1894, there were three applications, which were granted; in 1895, there were 35, of which 25 were granted; in 1896, the number was 180, of which 90 were granted; while last year there were 269, of which 104 only were granted. In the four years, there were 487 applications and 222 grants. The total number of this class of patents granted up to August, 1897, was as follows in the countries named: Germany, 21; Switzerland, 67; United States, 91. Our contemporary has not much faith in the pecuniary value of any one of the 222 British patents, and fails to see why so much time and energy should be devoted by inventors to the designing of acetylene generators.

PERSONAL.

Mr. G. E. VINT, Assistant Surveyor for the Eastern Division of Sheffield, has been appointed Surveyor and Water-Works Manager to the Holmfirth District Council.

Mr. HAROLD WOODALL has resigned the appointment he has held for the last twelve months as assistant in the Distributing Department of The Gaslight and Coke Company.

Mr. ARTHUR RHODES, Deputy-Manager of the Gaythorn Gas-Works, Manchester, was the recipient, on Monday last week, of a handsome case of cutlery, on the occasion of his marriage. The presentation, which was from the officials and workmen, was made by the Manager (Mr. John Merrell), who spoke in eulogistic terms of Mr. Rhodes, and wished him joy and happiness. His remarks were supported by Mr. E. Williams, Senior Chemist, and Mr. J. W. Bradbury, Chief Clerk. Mr. Rhodes, in a brief speech, suitably acknowledged the gift.

NOTES.

A Test of Motor Vans.

There have been a series of tests of motor vans for heavy traffic in the neighbourhood of Liverpool, which may be taken as representing the best performances possible of achievement by the most modern vehicles of the kind. Gas power, whether in the form of compressed coal gas or oil gas generated on the spot, was unrepresented on this occasion. All the motors were steam-engines; but liquid fuel and coal were used in different examples. Two Thorneycroft vans had coal-fired boilers; while the vans of the Liquid Fuel Engineering Company and the Lancashire Steam-Motor Company burnt oil. Which form of fuel is preferable seems to be for the present an open question. A contemporary remarks that oil is the lighter fuel, and in some respects the easier to handle. But it is not easy to take on board without spilling; and a very little spilt makes a great deal of unpleasant mess. It is questioned, also, whether the average driver will easily learn the management of the oil-burner. When once the thing is started, and so long as nothing goes wrong, the labour of stoking is done away with; but oil-burners often do not run for long without a hitch, and the volumes of pungent smoke then emitted from the chimney are a great nuisance. The oil-fired boiler has not the disadvantage of the so-called oil-engines by which so many motor cars are driven, but which in reality use benzine or light oil. Burning oil is procurable at any oil-shop; but not light spirit. Compressed gas seems to have dropped out of consideration.

A Report on Carbonic Oxide Poisoning.

Rather more than a year ago, Dr. Le Neve Foster, F.R.S., nearly met his death by carbonic oxide poisoning while investigating the circumstances attending an underground fire at the Snaefell Lead Mine, in the Isle of Man. A detailed report upon this accident has just been published in a Blue Book, which, according to "Nature," is not merely a statement of facts relating to the working of the mine, but also a document containing information which will prove of service to persons exposed to the risk of carbonic oxide poisoning. Dr. Foster alludes to the rarity of carbonic oxide in the atmosphere of mines, and states that when present it always comes from some artificial source. He found sufficient evidence to justify the conclusion that the deaths of the 20 victims of the Snaefell disaster were due to carbon monoxide produced by timber burning in the mine. It is startling to find how very little timber need be burnt to empoison to a dangerous extent the passages of a mine. Dr. Foster admits that the presence of 1 per cent. of the gas is quite sufficient to cause immediate loss of consciousness, followed speedily by death. He therefore recommends that the linings and fittings of all mine shafts and roadways should be made fireproof, unless naturally damp. The use of oxygen in restoring sufferers from carbonic oxide poisoning is referred to, and the keeping of a supply is recommended. With Dr. Foster's report is a report by Dr. Miller upon the physiological effects of carbonic oxide poisoning, and an appendix containing statements concerning the sensations, symptoms, and after-effects produced by breathing the gas.

The Examination of Fuels by Röntgen Rays.

An interesting statement concerning the employment of Röntgen rays in coal and coke testing has been submitted by M. Couriot to the Paris Academy of Sciences. The suggestion depends upon the transparency of carbon in all its forms, and the opacity of silicious and other impurities of fuel to the rays. M. Couriot has found it quite easy to form an opinion, by the agency of a powerful Crookes tube and a fluorescent screen, as to the purity of a fuel. On placing a lump of coal between the tube and the screen, all the details of the slag and clinker forming constituents of the mineral at once appear. M. Couriot has examined by this means numerous samples of anthracite, coal, lignite, peat, coke, and artificial block fuel. The finest silicious particles present, though quite invisible to the eye, show up at once on the screen as dark spots or bands upon the bright ground. Differences in the physical composition of a series of coal samples can be traced by this means step by step; thus disclosing at a glance the variations on the

quality of the fuel. The conglomerate structure of block fuel is clearly revealed; while in the case of coke the particles of iron sulphide are indicated by black spots on the fluorescent sheet. Carbon is so transparent to the rays that it is unnecessary to regulate the size or thickness of the test pieces, as the rough blocks, with sides following the natural planes of cleavage of the coal, serve perfectly well for examination. M. Couriot has successfully taken radiographs of coal samples from 1½ to 2 inches thick, with a 10-inch spark and 5 minutes' exposure. It is evident that the equipment must be a powerful one to produce these satisfactory results.

Comparative Economy of Gas and Oil Engines.

It is remarked in "Engineering," with respect to the recent Cardiff show of the Bath and West of England Agricultural Society, that, though exhibitions of the kind follow one another pretty frequently, it is always possible to discover in the machinery sections a large number of improvements in detail—little things, perhaps, which might escape ordinary observation, yet important in their effect upon the space, the economy, or the simplicity of the work turned out. This appreciation was particularly easy in the case of the Cardiff show; and one of the circumstances of this display which particularly struck our contemporary was the unanimity with which the leading manufacturers are replacing gas-engines with oil-motors. The ostensible reason for this change is worth noting: It is not so much, the manufacturers say, that oil and crude petroleum oil are intrinsically more suitable than gas, or steam coal for that matter. It is rather because gas is an unattainable article for motive power in many parts of Rural England; costing from 2s. 10d. to 4s. per 1000 cubic feet, where a supply can be depended on. "When gas is 2s. 6d. to 2s. 10d. per 1000 cubic feet," said one of the "showmen" of the convertible gas or oil engines quoted by our contemporary, "it may pay to use gas; but when the price exceeds that charge, oil is in every way the cheaper medium, and it has the advantage of a capacity for use and control which even the ordinary labourer understands after half-an-hour's instruction." The statement is given for what it may be worth; but, in any case, it is expedient that the manufacturers of coal gas should learn from an independent source of information the limit of price at which the use of gas for power purposes is likely to be arrested.

The Proximate Analysis of Coal.

A Committee of the American Chemical Society have been engaged in considering the customary methods for the proximate analysis of coal, with a view to the adoption, if possible, of a uniform system for national use. After discussion among themselves, the Committee have formulated an outline method which they have published rather as a means of securing further information than as a final report. They request correspondence on the subject, which may be addressed to Professor A. Noyes, Rose Polytechnic Institute, Terre Haute, Indiana. It is suggested that at least 5 lbs. of coal should be taken for the original sample, with care to secure pieces that represent the average. The sample is to be quartered down; and the final sample powdered as quickly as possible. It is thought that drying the sample in *vacuo* for 20 hours over sulphuric acid gives the best results for this part of the analysis. Experiments were carried out by Mr. W. E. Burk, for the purpose of determining whether volatile matter other than water is lost in the drying of bituminous coals. The loss of such matter was always less than 0·7 per cent., and may therefore be disregarded. Directions are given for testing for loss of volatile combustible matters by heating over a bunsen flame. With regard to the determination of heating value, the Committee observe that a calculation of the results of 21 analyses, and determinations of heating effect with the bomb calorimeter, made with Indiana and Pittsburgh bituminous coals, shows that the heating effect may be found in all cases examined, with a maximum error of 2 per cent., by the following rule: Subtract from 100 the percentage of moisture and ash, and one-half the percentage of sulphur, and multiply the remainder by 80·7. The product will be the heating effect of the coal burnt to vapour of water, expressed in calories per kilogramme. The Committee will be glad of any data which will enable them to further test this factor.

COMMUNICATED ARTICLE.

PHOTOMETRIC STANDARDS.

By W. GRAFTON, F.C.S., of Beckton.

(Continued from p. 49.)

Experiments with the Methven Standard.

In making tests with this standard, only pentanized coal gas was used with the small slot and a 2½-inch flame in the chimney. First, then, I will briefly review some work with this standard and candles made some nine years ago. The candles were not certified by the Gas Referees in 1887. Some of the most important work is by Mr. Dibdin, who made a series of comparisons with the standard candle and various proposed substitutes, as reported to the Metropolitan Board of Works, and published in the "JOURNAL" on Aug. 9, 1887. In this report, Mr. Dibdin criticizes generally the proposed substitutes for the standard

candle. A few extracts therefrom are worth considering and comparing with the results obtained nine years later.

Let us notice first a table giving the total number of tests made:—

Standard Employed.	Total Tests Made.	No. within 1 per Cent. of Mean.	Percentage No. within 1 per Cent. of Mean.	Value of Comparison Light by Standards.
Candles (not certified)	454	154	34	16·7
Pentane (Harcourt)	468	373	80	16·3
Methven	283	211	74	16·3
Pentane argand (Dibdin)	243	212	87	Not given.

Mr. Dibdin found that "the result of the very numerous tests which have been made with these two proposals clearly demonstrates that the Methven screen is an exact multiple of the pentane air-gas flame; . . . therefore, the Methven screen being equal to two average candles, and the pentane unit equal to half the value of the Methven, the pentane must be equal to exactly one average standard candle, which is the value claimed for it by the inventor. . . . The mean value given to the comparison flame by candles is 16·7 candles. The mean result of both the Methven and the pentane air-gas units is 16·3 candles respectively. So that, after including in the tests by candles many obviously incorrect results, I find that there is only a difference of 0·4 candle, which difference may be unhesitatingly ascribed to the faulty candles."

From these experiments Mr. Dibdin shows the Harcourt 1-candle standard and the Methven screen to be 2·4 per cent. too powerful; but, to equalize matters, he puts aside those candle tests that gave "obviously incorrect results." Why was this done, especially since he upheld them by including them in the final average? Surely they were not rejected because of burning more or less than the prescribed 126 and 114 grains of sperm per hour. No; that could not be, or they could not be called tests. The Referees instruct that "no testing is to be rejected on the ground that the result seems improbable." Those tests which were "obviously incorrect" ought to have been rejected at once, and not included as tests made at all, if any valid objection could be raised against them; and a test must not be objected to because it was made in a warm room, and consequently gave a higher return to the gas than would have been recorded at a lower temperature. We must accept the 16·7 candles as being the average of 454 valid standard candle tests. So far, then, these candle tests, made nine years ago, record a value to the Methven of 2·048 candles, and to the Harcourt air-gas flame one of 1·024 candles.

Using similar candles (Miller's) from the 15th to the 31st of May, 1893, the writer made a comparison with them, the Dibdin standard, and the Methven screen, against gas supplied from a small holder in the photometer-room on a 60-inch Letheby instrument, with the following results:—

Total No. of Tests.	Mean by Candles.	Mean by 10-Candle Standard.	Mean by No. 643 Methven Screen—Small Slot.	Difference between Candles and 10-Candle Standard.	Methven Screen.
102	15·89	14·57	15·82	1·32	0·07

In 1895 and 1896, certified candles make the Methven screen less than 1 per cent. out. The figures are as follows; the tests strictly complying with the Referees' Instructions, and the gas that was tested was supplied from a holder:—

Barometer.	Temp. of Room.	No. of Tests Made.	Mean by Certified Candles.	Mean by No. 536 Methven Screen.	Value ascribed to Methven Screen.	Consumpt. of Sperm, Grains.
30·17	65·19	1457	16·88	16·96	1·991	40·8

The comparison light varied day by day; but since a screen test was always checked by a candle test, this does not matter. It will be interesting to notice how well the candles burned if judged by the percentage number within 1 per cent. of the mean, although this is not a fair way of judging of the results, since the quality of the gas that was tested varied from day to day. The total average shows how well Mr. Methven did his former work, and also that the candles have not materially altered in light-value from those used in 1893.

Number of candle tests within 1 p. ct. of mean	711 = 48·80	Per Cent.
" " " " 2 p. ct. " "	407 = 27·94	
" " " " outside these limits	339 = 23·26	
100·00		
Number of screen tests within 1 p. ct. of mean	862 = 59·16	
" " " " 2 p. ct. " "	479 = 32·87	
" " " " outside these limits	116 = 7·97	
100·00		

The above tests represent the work of five testers, and can therefore be relied upon.

Using Miller's uncertified candles having wicks of three strands of 23 threads each, very much the same results were obtained:—

Date.	No. of Tests Made.	Mean by Uncertified Candles.	Consumpt. of Sperm, Grains.	Mean by No. 536 Methven Screen.	Value ascribed to Methven Screen.
June, 1896.	60	17·02	40·57	17·94	1998

A comparison was now made in the same photometer with

the 10-candle standard and a Methven screen, with the following results:—

Value of 10-Candle Standard.	Value of Methven Screen.	Baro- meter In.	Temp. Deg. Fahr.
10'455	2'00	29'96	75

The gas manufactured at Beckton and supplied to London was tested by a Methven screen; and on reaching the City it was tested with certified candles in the official stations by independent gentlemen, whose return must be accepted. The comparison dates from Nov. 5, 1895, to March 3, 1896, when the Dorset Buildings station was closed for cleaning. This is the coldest period of the year, and the most trying time for gas travelling. The loss is what might have been expected:—

Date.	Baro- meter. In.	Temp. Deg. Fahr.	Tests by Methven Screen.	Official Tests by Candles.	Differ- ence. Candle.	Baro- meter. In.	Temp. Deg. Fahr.
1895.							
Nov.	29'97	63'3	16'91	16'64	0'27	29'89	68'6
Dec.	29'88	63'4	17'00	16'59	0'41	29'87	68'3
1896.							
Jan.	30'44	63'0	17'05	16'67	0'38	30'16	70'5
Feb.	30'42	63'0	17'03	16'69	0'34	30'30	69'4
March	29'37	63'0	17'10	16'95	0'15	29'27	68'2

Difference = 0'31

The above difference of less than 2 per cent. represents a result obtained by 2232 screen tests, and at least 303 candle tests. In the latter, probably more than three tests were made on some days. This is a splendid performance, and shows how well the screen works in practice. If, for the sake of argument, we look upon this 2 per cent. as representing the screen to be too weak, then deduct this from the result attributed to the Dibdin, and we still get $4'7 - 2'0 = 2'7$ per cent. This means that, had the Dibdin standard been used at Beckton, the coal gas on reaching London would have gained $\frac{1}{4}$ -10ths of a candle, which is an utter impossibility.

More recently we have equally satisfactory results, as may be judged by the following monthly averages:—

Date.	TEMPERATURE.		ILLUMINATING POWER.	
	Of the Air.	Of the Gas in the Main.	At Beckton Outlet.	Average of Official Tests.
	Deg. Fahr.	Deg. Fahr.	Candles.	Candles.
1897.				
April	46'2	..	16'55	16'50
May	51'3	61'8	16'46	16'54
June	60'3	64'5	16'46	16'59
July	63'3	68'2	16'58	16'68
Aug.	63'2	69'5	16'65	16'71
Sept.	56'4	63'8	16'50	16'59
Oct.	50'7	60'3	16'48	16'56
Nov.	46'0	56'6	16'50	16'52
Dec.	42'3	52'4	16'47	16'71
1898.				
Jan.	44'8	52'4	16'47	16'48
Feb.	41'8	50'7	16'55	16'58
March	40'3	50'2	16'54	16'54
Average	50'5	59'1	16'52	16'58

Number of tests. 14,688 3672

The Beckton daily average is the result of 48 tests, as compared with three official tests in each station. This is good reliable work, and results in showing the Methven screen to be considerably under 1 per cent. out.

The following experiments are given to show the effect of water gas on the Methven screen; it being used in admixture with coal gas in stated proportions. The standard of comparison was a Methven screen supplied with pentanized coal gas; and the figures are the average results:—

[Date, Aug. 17 to Sept. 29, 1897.]

Nature of Gas Supplied to Screen.	Quality of Coal Gas.	Quality of Carburetted Water Gas.	Power of Long Slot.	Power of Short Slot. (Pentanized Gas Used.)
			Candles.	
Coal gas only	17'00	..	1'994	1'993
5 p. ct. mixture	17'25	20'64	2'011	1'988
7 " "	17'25	20'64	2'011	1'981
9 " "	16'86	20'59	2'026	1'988
10 " "	16'80	20'77	2'033	1'982
12 " "	16'19	20'68	2'034	1'982
14 " "	16'15	20'38	2'054	1'988
16 " "	17'02	21'04	2'064	1'994
18 " "	16'99	20'50	2'084	1'993
20 " "	16'99	20'50	2'095	1'990
25 " "	15'44	20'02	2'122	1'990
30 " "	16'44	20'12	2'142	1'991
Carburetted water gas only.	..	21'51	2'472	1'989

From these results, it appears that there is no serious change in the value of the standard, using the long slot, until the gaseous mixture contains 14 per cent. and upwards of carburetted water gas. If, however, the gaseous mixtures are carburetted with pentane and the short slot is used, there is no change in the value of the light passing through it, even although the carrier of pentane is wholly composed of water

gas. The percentages which have been chosen will, it is believed, cover all ordinary proportions of water gas with coal gas sent out by gas companies.

In practice, the Methven screen, supplied alternately with pentanized coal gas and pentanized carburetted water gas, recorded the following qualities to the gas from a holder. The results are the mean of many ten-observation tests of different gases by several testers, and bear out the above experiments:—

Quality of Gas under Test.

By Short Slot and Pentanized Coal- Gas Flame.	By Short Slot and Pentanized Carbu- retted Water-Gas Flame.	Greatest Variation from Mean.
21'11 candles	21'14 candles	Under. 0'60 per cent. Above. 0'78 per cent.

Effect of Temperature on the Methven Screen.

As with the Dibdin standard, the greatest care is necessary, in carrying out experiments at a high temperature, to see that the air is pure, and not vitiated by products of combustion. By increasing the temperature of the carburetter, a difference of one-tenth of a candle was found, due to increased pentane vapour in the gas; this being equal to an increase in the power of the screen of $\frac{1}{2}$ per cent. for a range of temperature from 66° to 86° Fahr. By increasing the temperature of the room, the standard was reduced in value $\frac{1}{2}$ per cent., due to pentane vapour and rarefied air.

The effect of moisture on this standard is very little indeed, as shown by Mr. Methven in his paper on "Photometry" in 1889, and may be neglected, since it does not affect the zone of maximum intensity to anything like the extent it does the lower and upper portions of an argand flame. As the temperature increases, the light from a flame increases in the lower region; while by a lowering of the temperature the light is augmented in the upper portion of the flame. We must take into consideration the variation in temperature which inevitably occurs in all testing-rooms. In the wintry months it is easy to keep the temperature between 60° and 64° Fahr.; but in the warm months of the year the temperature runs up 20° to 25°, and cannot be reduced below outside conditions unless the testing-room is in a basement.

The results of the following experiments clearly prove that the portions of the flame taken by Mr. Methven to form his standard are reliable between working limits with the ordinary air supply. He showed that, by using ordinary air between 50° and 90° Fahr., the illuminating power of the mass of flame at the level of the slot is augmented 2'6 per cent.; but up to 70° Fahr. no rise, but a tendency to fall, takes place.

Analyses of the Methven 2½-inch Pentanized Gas-Flame.

TEMPERATURE 70° FAHR.			
Sections. Inch.	Candles.	Light Per Cent.	
2½ to 2½	0'530	3'356	
2 " 2½	0'816	5'167	
1½ " 2	1'206	7'638	
1½ " 1½	2'224	14'086	9'282 candles,
1½ " 1½	3'340	21'155	or
1 " 1½	3'718	23'549	58'79 per cent.
¾ " 1	2'958	18'735	
0 " ½	0'996	6'308	
	15'788	99'986	
TEMPERATURE 83° FAHR.			
Sections. Inch.	Candles.	Light Per Cent.	
2½ to 2½	0'390	2'53	
2 " 2½	0'436	2'83	
1½ " 2	1'372	8'93	
1½ " 1½	2'146	13'97	9'186 candles,
1½ " 1½	3'260	21'22	or
1 " 1½	3'780	24'61	59'80 per cent.
¾ " 1	2'980	19'40	
0 " ½	0'992	6'46	
	15'356	99'95	

With this range of temperature there is a gain of 1 per cent. of light on the ¾-inch portion of the flame level with the slot. But the actual effect upon the portion opposite the slot, and used to form the Methven standard, is, of course, negligible, since the whole mass of flame level with the slot is increased by only 2'6 per cent. for a range of 40 degrees; according to the above experiments the flame is reduced 2'73 per cent. Now, with the Dibdin standard, for a range of temperature of 25° Fahr. the total flame was reduced over 12 per cent.

Difficulty in Adjusting the Height of the Flame.—With proper burners, there is not the slightest difficulty in setting a 2½-inch flame, provided the atmosphere is still; and even if slight draughts are present, a mean of the peaks and depressions of the flame should be taken as representing the true length. It will be found that no appreciable difference exists if the flame be so adjusted. But with all flame-setting, great care should be exercised in order to be accurate; and no test should be made with any standard that works with a definite length of flame until that flame remains constant to the line. To steady the flame in draughty situations, fine gauze could be fixed to the screen without affecting the standard. The glass chimneys for use with any standard should be thin, and stand vertical, and be always used, until broken, in one particular position, so that the amount of light passing through the glass may not be altered by defects in other parts of the chimney. They should be free from striæ or other markings, which may act

more or less like a lens. In fact, all chimneys for use with the standard should first pass through the Referees' hands; then there would be no cause for complaint with respect to faulty chimneys.

The burners used on the Methven screen are, or should be, certified by the Board of Trade; and if the latter, they are certainly reliable. There is one desirable improvement that might easily be made in this standard, and that is by securing the burner to the screen to prevent the distance being altered; as it will readily be seen that the nearer the burner is to the slot, the greater will be the light passing through the aperture, and *vice versa*. In fact, the burner could be made of brass, and the cone also, or else of some less easily melted metal than that of which the present burner is made.

This standard is simple, cannot get out of order, and does not require any special precautions, except setting at right angles with the bar of the photometer. It burns gas which may vary considerably, since only a little is required to carry the pentane vapour. Professor Lewes, in his paper on "The Work of the Photometric Standard Committee," read before the Institution of Gas Engineers in 1895, characterizes the Methven screen as "the most convenient standard of light;" and certainly it is. The eyes are much relieved from strain by using the screen. As with candles, the disc is less illuminated; producing thereby a soft and comfortable sensation to the eyes, very unlike the distressing effect of the 10-candle standard. This is particularly the case after making a number of consecutive observations with that standard, which produces a sort of ableps, causing the operator to read quite abnormally. The desire for a standard having a higher power than two candles was principally to overcome the effect of moisture, &c., in the atmospheric air, and to facilitate the testing of high-power lamps. But the primary object is to test common gas, varying between 14 and 30 candles, as supplied to the public; and while we want a standard that is less variable than the sperm candle, there should be no departure from the ordinary method of procedure, which is quite accurate but for the varying standard. No alteration of photometers is needed, because to alter them means the introduction of probably greater errors than exist at the present time. A 10-candle slot could be fitted to the Methven screen in place of the 2-candle long slot, which latter is useless unless supplied with 15.7 to 17 candle coal gas. A $2\frac{1}{2}$ -inch pentanized-gas flame would serve for either the 2 or the 10 candle slot.

(To be continued.)

TECHNICAL RECORD.

WESTERN (U.S.A.) GAS ASSOCIATION.

The Annual Meeting at Detroit.

(Concluded from Vol. LXXI., p. 1575.)

A paper on the "Estimation of the Value of Ammoniacal Liquor" was read by Mr. O. O. Thwing, of St. Louis (Mo.), who described the usual methods of conducting a distillation test, the preparation of volumetric solutions of soda and of sulphuric acid, the indicator, &c. Of the latter, he preferred cochineal as being the only indicator that had a distinctive colour for the neutral condition. The accuracy of the solutions could be tested by making an examination of a known weight of pure ammonium chloride. The Twaddell hydrometer was useful as a preliminary test to determine the quantity of test acid, &c., to be used in the experiment. The saturation test was also described in detail.

An interesting discussion followed the paper; and many members stated their experiences in testing ammoniacal liquors. There was a general agreement that the Twaddell hydrometer, or the saturation test, was not sufficiently accurate; and the contracts should be based on the distillation test.

Mr. F. Egner, of Norfolk (Va.), followed with a paper on "Hindrances to the Adoption of the Inclined Retort System in America." He said that though the inclined retort was introduced as early as 1804, it had not been made a practical success till within the last few years. It now afforded the most rational means for securing the best all-round results; and as such, had not met with the recognition that one might with good reason expect. This might be ascribed to the well-known conservatism of gas companies in general, and to a laudable caution on the part of their engineers. Then there were the failures which attended the first introduction of the Coze system. It was possible to be over-cautious and too conservative, as was the case with water gas; and history might be repeated in this respect, in connection with the inclined retort, which was now largely used with satisfactory results. He argued that, while "let well alone" was a good motto, "Excelsior" was a better one. Then some companies had sought to impose conditions so outrageous that no sane contractor could accept them. For example, to erect and work the inclined retorts for two years, and the payment to depend upon satisfactory working during this period. Why should a contractor be asked to accept more onerous conditions with inclined retorts than with horizontal ones?

Discussion being invited, Dr. Moss said that the coke from an inclined retort was more free from breeze, and generally cleaner and better than from a horizontal one. There was no doubt

that the leading gas engineers in England preferred inclined retorts. Speaking from experience, he said that the yield per pound of coal, and per retort per diem, were both improved; and the producing capacity of a retort-house could thus be increased to a large extent. Replying to questions, Mr. Egner said that the saving of labour was fully one-half, as compared with the ordinary system. He was assured that an inclined retort bench cost less than a horizontal bench of similar producing capacity. The yield of gas per pound of coal was about the same, and that of coke a little better, as there was not so much breeze. The saving in ground space was very marked. The inclined retort was suitable for works so small as to only require one bench at a time; and the retort could be readily charged, by simply dumping from a wheelbarrow, without machinery.

Mr. G. T. Thompson, of New York, read a paper describing the results of some inquiries he had made in England as to the use of isolated generators for retort-firing. In connection with the paper read by Mr. E. C. Carpenter, of Vauxhall, and the discussion thereon, at the November meeting of the Southern Association (England), he had inquired of the author respecting subsequent improvements, and had been furnished in reply with a description of isolated generators applied to inclined retorts. He had also been able to make a personal inspection of the installation; and he found that single producers erected at the back of the stack were applied to the heating of three benches, each containing eight retorts. The system, however, could not be made self-firing, or to admit of the use of red hot coke, as it would not be practicable to raise the lower or discharging end of the retorts above the level of the mouth of the producer. He submitted that the innovation would well repay attention and further trial.

Mr. Bredel opened the discussion by saying that he had tried outside generators in connection with the use of coal as fuel, and had been able, after some difficulty, to make them a success. But when it came to using coke, there was no advantage. In any case, the outside generator would mean considerably more fuel. The cost would be greater; and difficulties of a mechanical nature in connection with the controlling valves would arise. He knew of a first-class Siemens producer that was put in at Paris, and used 25 per cent. of the coke made. The draught, air supply, &c., required continual regulating, and careful adjustment; and he did not recommend the system. It might do for boilers or other low temperature work; but the high temperatures required in a retort-bench were a different thing. Dr. Moss did not see why it should not be possible to work as well with outside generators as with the ordinary system. In any event, the air supply, &c., must be carefully adjusted to secure the best results. Mr. Weber had worked detached generators on a large scale, and with great success. Mr. Doherty advocated the system as offering many advantages. Mr. Forstall thought it was not well to have too many eggs in one basket; and it would be awkward if a large producer failed or got out of order at a critical time. Mr. Egner agreed that there was much to think about in the paper, and moved the appointment of a Committee to make further inquiry. This was seconded by Mr. Butterworth and adopted.

Mr. E. H. Jenkins, of Buffalo (N.Y.), presented his report as Editor of the "Wrinkle" Department; and, as usual, this was of an interesting character. One useful suggestion was to insert a ring of sheet iron in the flange-joints of valves on large pipes, &c., with projecting pieces for extracting the same when required. Then, at any time when it might be necessary to take out the slide for repair or cleaning, the pipe could be blocked by pulling out the ring and inserting a plain sheet of metal in its place. Another idea was an electrical tell-tale for the station meter, consisting of an arrangement by which a circuit was completed each time any desired two pointers on the index were at zero together. This circuit caused a pencil to tap, and make a point on an ordinary pressure diagram; thus showing the time at which each thousand or ten thousand was completed. A simple contrivance for preventing the overflowing of gas-holder cups consisted of a hole drilled at a proper level in the outer ring of the inner cup. Any excess of water passed back, inside the outer lift, to the tank, instead of overflowing and running down the outside. For closing a gas-tap at any desired hour, a simple lever attachment in connection with any ordinary alarm clock was described. The clock is wound and set in the usual way; and the starting of the alarm disengages a catch and the tap closes by the falling of a weight.

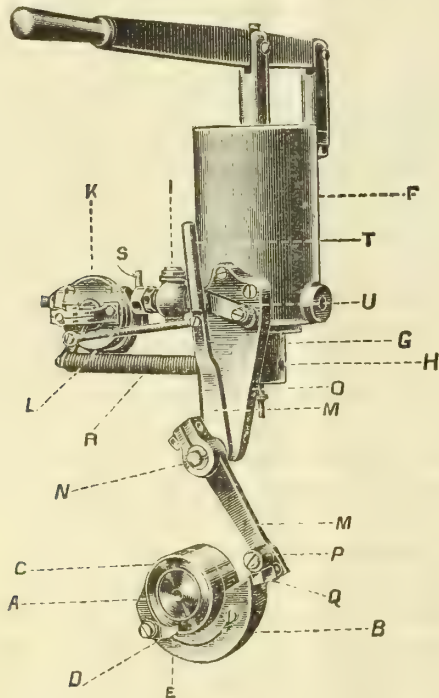
This concluded the business of the meeting; and the usual votes of thanks were embodied in one document, in the form of a report from the "Committee on Final Resolutions."

EDMONDSON AND DAWSON'S GAS-ENGINE STARTER.

The advantages to be derived from the use of an efficient starter for gas-engines are appreciated by every owner of a motor of this class of more than 4-horse power; but the various appliances which have been introduced up to the present time have, as a rule, been somewhat uncertain in operation. It is claimed for the starter which has been patented by Messrs. Edmondson and Dawson, an illustrated description of which is given below, that it is entirely free from this defect; its special features being that it gives an initial impulse automatically proportioned to the

requirements of the engine at the time, and follows this up by a further impulse at each cycle, until the ordinary ignition apparatus of the engine takes up the running, when the starter may be thrown out of gear.

The following is a description of the starter: A is the cam-shaft of the engine, revolving clockwise; B being the cam of the starter, loose upon the shaft. C is a collar set fast on the cam-shaft, carrying forward (clockwise) the cam B by means of the click D fixed on the cam, and dropping into the notch E on the collar. This leaves the cam free when the engine runs backwards. F is the pump, and G its valve-box, having an aperture H coupled to the gas supply, and a second aperture (not shown in the engraving) for admitting air. I is the check-valve, and K the ignition-valve; L, a link connecting the arm on the plug of the ignition-valve with the adjustable lever M, which moves on the stud N on the bracket O. P is a roller on the square stud Q on the lever; and R, a spring having one end attached to the arm on the plug of the ignition-valve, and the other fixed to the bracket. S is the pilot flame lighting a jet in the ignition-valve. T is the handle to the lever M; and U, the catch to hold the lever out of gear.



The action of the starter is as follows: The engine being set on the explosion stroke with the gas-cock turned on, and with the crank a little behind the top centre (the starting cam B having the square stud Q resting on it), and the exhaust-valve of the engine being set open, a charge of explosive mixture (gas and air) is driven into the cylinder by the pump F. When the cylinder is filled with the mixture, the exhaust-valve is closed. The pumping being continued, the charge is slightly compressed till it propels the piston slowly, and moves the cam forward (clockwise) till it drops the roller P into the gap, and releases the lever M. The spring R rotating the plug of the ignition-valve towards the right, ignites the charge in the cylinder, and propels the engine. If the pumping is continued so as to keep the connections between the pump and the cylinder full of the explosive mixture, the revolution of the cam, by opening and closing the ignition-valve and exploding the charge at the proper times, will give successive impulses to the piston; increasing its speed until the ordinary igniting apparatus takes up the firing, and the engine is effectually started. The starter is then thrown out of gear by pushing the handle T to the left, when the catch U falls and holds the lever, so that the roller stands free of the cam, and the action of the starter ceases.

There are three characteristics of this starter which, it is claimed, differentiate it from other appliances of its class. In the first place, the initial impulse being delivered on a piston already set in motion by the compression of the charge by the pump, is cumulative in its effect. In other words, the primary inertia of the piston having already been overcome, the influence of the initial explosion upon it is much greater than it otherwise would be. Secondly, the initial charge being compressed by the pump, the initial explosion is proportionately more powerful than in any starter working at atmospheric pressure. The result is that the initial impulse carries the running well over the first cycle, and the piston is moving steadily when it receives the second impulse. Thirdly, at the slow speed of starting by any self-starter, the proportions of gas and air in the charge drawn into the cylinder are frequently not ignitable by the tube. Hence the extreme difficulty of starting an engine by a single initial impulse. In the starter above described, the patentees claim that this difficulty has been entirely removed. It injects a flame into the midst of the charge, and will therefore ignite a mixture so badly proportioned that the tube would, in all probability, fail to fire.

LAYING PIPES UNDER WATER.

In the "JOURNAL" a few weeks ago, particulars were given (p. 1151) of some additional works which have lately been completed in connection with the Boston (U.S.A.) water supply, which came into the hands of the Metropolitan Water Board at the beginning of the present year. In the construction of the distributing system, a number of large sub-aqueous mains have been laid under conditions which present many features of interest; and the subject has been dealt with by the Chief Engineer of the works (Mr. F. P. Starns), in his third annual report. Some notes prepared therefrom appeared in a recent number of the "Engineering Record," from which the following particulars are taken.

The Charles River is crossed at two places by a line of 48-inch pipe, which is changed at the river to two lines of 36-inch pipe for convenience in construction, and to guard against the interruption of the water supply in case of accident. At one of these crossings, the pipe passes under the Boston and Albany Railroad before reaching the river; and the laying of these pipes without interfering with the passage of trains only a few feet above their top surface, was in itself a task requiring special care and patience. This part of the pipe-lines rests on a base of natural cement concrete 11 feet wide, with holes on its upper surface to receive the bell-ends of the pipes, which are 5 ft. 9 in. apart. On the other bank at this crossing, it was necessary to support the pipe on piles 6 feet apart. Gates are provided at both ends of each pipe, so that in case of accident to one a flow could be maintained through the other. The pipes for the river crossing were laid in a trench about 25 feet wide at the bottom and 8 feet deep on an average, which was smoothed down after dredging by a wooden plough attached to a boat, and drawn by a rope from a winding engine.

The work required 2031 feet of 36-inch pipe 1'65 inches thick, weighing 677 lbs. per linear foot. Three types of joint were used. One was like the ordinary joint, except that it had three turned grooves in the bell instead of one. The second type had a bell like the first; but the spigot was turned to a slight smooth taper, uniform in each joint of this type. After inserting one of these tapering spigots in the socket of a pipe, and running the joint with lead, the spigot could be withdrawn and again inserted, leaving the joint tight. The third type was a flexible joint. The spigot was made larger and thicker than usual, and turned truly spherical. On the inner surface of the socket, 8 inches from the end, there was a raised ring 1 inch wide, turned to fit the spherical surface of the spigot. There were five grooves in the socket, between the ring and end, to hold the lead. This connection permitted a deflection of about 1 in 10 without the spigot projecting into the waterway.

The pipes were put together on a platform on shore, in sections of six or seven lengths. At one end of the section was a tapered spigot, and at the other end a socket in which lead had been cast to receive the spigot of the next section. The section was then hung from a stiff truss about 75 feet long, which was lifted by two derricks on the pipe-laying punt, and held so as to just clear the gunwale. Mooring lines were run out in different directions, and by means of winches the punt could be hauled so as to hold the section suspended within a few inches above its true place. Then the section was lowered and moved as directed by a diver, until the spigot entered the lead socket of the section previously laid. To assist in this operation, and to protect the lead from injury, a wrought-iron guide-ring was attached to the socket of each section before lowering. As soon as the taper spigot entered the guide-ring, a hook on the end of the piston-rod of a hydraulic cylinder attached to the truss was fastened to a chain fixed to the section of pipe already laid, and, by pumping water into the cylinder through pipes leading from the punt, the two sections of pipe were drawn together with much force. The joints were afterwards caulked by the diver. The flexible joints were used where there were vertical deflections in the pipe, and where it was thought there might be movement from future settlement. The second crossing of the Charles River is much shorter than that just described; but the pipe was laid in the same manner. Owing, however, to the narrowness of the stream, more flexible joints were needed.

A double line of 36-inch pipes was also laid across the Mystic River. In this case, 2625 feet of pipe were used for the twin lines. The mud in the bottom of the river was from 10 to 15 feet deep; so the pipes were laid on a pile foundation. Spruce piles were driven 12 feet apart, and capped with spruce timbers 10 inches square and 10 feet long. For a distance of 100 feet the tops of the pipes are about 10 feet below mean low water; but for the greater part of the distance across the river they are at mean low water. Five of the flexible joints already described were used on each line.

The 48-inch main which crosses the Charles River crosses the Malden River by another twin line of 36-inch pipes. This river is shallow, with its bottom at about the level of low tide, and there is little navigation at the point of crossing; so it was decided to lay the pipes within a cofferdam. Six-inch tongued and grooved spruce planks about 24 feet long were driven through the mud and sand into a stiff clay bottom. These lines were about 15 feet apart. The earth enclosed in this way was excavated, the water pumped out, and the pipes laid in the usual manner in open trench-work. About 94 feet of each line is horizontal. At either end the pipes rise on pile supports.

THE DECOMPOSITION OF GAS OIL, PHENOL, AND CREOSOTE BY HEAT.

(Concluded from Vol. LXXI., p. 1576.)

Summary of Results.

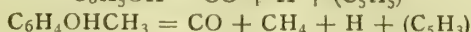
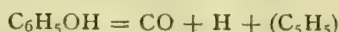
The results of the five principal experiments of which particulars have been given are tabulated below; the figures referring to 100 grammes of raw material in every case. The results of a sixth experiment on the fraction of turpentine oil which boils between 311° and 320° Fahr., are also given in the table.

	Gas Oil.		Phenol.		Creosote.		Mixture of Gas Oil and Phenol.		Mixture of Gas Oil and Creosote.		Turpentine Oil.	
Grammes of material gasified per minute	0'50		0'44		0'20		0'34		0'52		0'23	
Cubic centimetres of gas evolved per minute	240		282		120		132		240		126	
Cubic centimetres of gas made	44,680		64,808		60,300		39,750		46,001		60,010	
Weight of one litre of the dry gas, in grammes	1'0120		0'5618		0'5999		0'7361		0'8151		0'6291	
	Volumes per Cent.	Grammes.	Volumes per Cent.	Grammes.	Volumes per Cent.	Grammes.	Volumes per Cent.	Grammes.	Volumes per Cent.	Grammes.	Volumes per Cent.	Grammes.
Constituents of the air-free gas—												
Ethylene	39'60	27'6	1'3	1'05	1'5	1'1	14'9	9'7	16'9	10'8	8'9	6'73
Carbonic oxide	1'70	0'9	30'8	24'90	29'2	21'9	14'7	7'3	16'9	9'6	3'2	2'46
Hydrogen	9'60	0'3	58'9	3'40	50'2	2'7	35'3	1'2	25'9	1'0	32'4	1'74
Methane	49'10	15'2	9'0	4'10	19'1	8'2	35'1	9'6	40'3	12'9	55'5	23'77
Totals	100'00	44'0	100'0	33'45	100'0	33'9	100'0	27'8	100'0	34'3	100'0	34'70
Grammes of distillate below 248° Fahr.	12'78		7'80		16'60		8'00		17'00		15'00	
Specific gravity of the distillate	0'801		0'910		0'899		0'91		0'903		0'888	
Grammes of benzene present	5'84		4'37		10'54		5'17		8'50		6'02	
Yield of products in percentages—												
Gas	44'00		33'40		33'90		27'80		34'30		34'70	
Separated carbon	—		29'00		28'30		1'90		0'40		1'40	
Tar and absorption in paraffin oil	51'50		27'90		31'70		63'70		58'80		51'90	
Loss, per cent.	4'50		9'70		6'10		0'60		6'50		12'00	

* There is a discrepancy between the figures in this column and those previously given (Vol. LXXI., p. 1395).—ED. J. G. L.

manner to phenol; but the methyl group is split off, and by addition of hydrogen becomes methane, while the oxygen takes up a carbon atom from the benzene ring and forms carbonic oxide. These deductions refer to the gasification of the pure materials, with which a separation of as much as 50 per cent. of carbon occurs. In mixtures, the separation of carbon does not occur; and hydrogen and carbonic oxide are formed in large quantity. If the small quantities of carbonic oxide and hydrogen, which according to the tests are to be ascribed to the gas oil, are deducted from the total production of these two gases from the mixture, it will be found that 46 per cent. of the carbonic oxide, and 32 per cent. of the hydrogen theoretically obtainable from the phenol gasified, are actually obtained. With creosote, 67·3 per cent. of the carbonic oxide, and 21·9 per cent. of the hydrogen, are obtained.

These facts lead to the observation that the equations—



apply also to phenol and creosote, when diluted with gas oil. But the residue (C_5H_3 or C_5H_5) of the molecule, in place of undergoing further decomposition and yielding carbon and hydrogen, unites with the decomposition products of the gas oil, and forms complex hydrocarbons; while a little hydrogen is split off. It is not clear whether the gas is impoverished in respect of olefines owing to the combined reactions. Observation, however, shows that gas oil alone yields 27 per cent. of olefines; but when mixed with phenol or creosote, it yields only 20 per cent. It is not possible to explain the formation of carbonic oxide and hydrogen on the assumption that water is produced and is subsequently decomposed by incandescent carbon, for water was only found in trifling amounts in the tar and paraffin oil; and moreover, at the temperature of about 1380° Fahr. at which the experiments were conducted, only one volume of carbonic oxide to three volumes of carbonic acid would be formed from water and carbon. The trifling amount of carbonic acid actually found in the gases precludes the possibility of such a decomposition having occurred.

The formation of benzene in the cases of phenol and gas oil is clearly due to a minor reaction, as the amount ranges from 3 to 6 per cent. of the weight of the products. With creosote, however, it is different. The amount is at least 10 per cent. It may be surmised that one of the cresols, after carbonic oxide has been split off, is able to re-form the aromatic ring by means of its methyl group. The ortho-cresol seems most susceptible to this change, which might also occur with para-cresol, but is improbable with meta-cresol. The occurrence of methane in the gases is intimately associated with the presence of the methyl group in the raw material. Haber's work has shown that the terminal groups are those which are split off in

An examination of the results indicates that the aromatic nature of the benzene molecule is weakened when complex groups replace hydrogen atoms in the combination. This is clearly shown by the results of the investigation of phenol. The presence of the divalent oxygen renders possible the production of carbonic oxide, which is not very stable at high temperatures. The only source of carbonic oxide from phenol lies in the benzene ring; and if a carbon atom is removed by the opening up of this ring, the combination C_5H_5 remains, and of necessity forms carbon and hydrogen as chief products, while olefines, methane, &c., are produced through subsidiary reactions, to a trifling extent. Creosote behaves in a similar

the process of decomposition by heat. Thus phenol, which has not a terminal methyl group, yields methane equivalent to only 3 to 4 per cent. of its weight; but creosote, which has one such methyl group, yields 8 per cent. of methane. On treating turpentine oil in a similar manner, nearly 24 per cent. of the weight of raw material was recovered as methane. This result is supported by an experiment made by Tocher.* It therefore appears that the more methyl groups readily susceptible of being split off there are in the molecule of a body, the more methane will be found in the products of its gasification. The yield of high molecular hydrocarbons isolated from the tar by means of petroleum ether was low; but nevertheless it diminished as the proportion of the low molecular phenol or creosote in the material gasified diminished. Thus there was obtained from phenol or creosote about 2 per cent., from the mixture with gas oil 4 per cent., and from the gas oil itself 6 per cent. of these high molecular hydrocarbons.

The composition of the gas obtained indicated that ethane was present in all cases in which gas oil was used, but in none of those in which pure phenol or creosote only was gasified. Though the values for ethane are within the limits of experimental errors, the deviations are nevertheless all towards one side, and lead to the conclusion that the ethane is produced only by scission, and is not built up. It should therefore only be found in the gas from a material in the molecules of which side chains with more than one branch exist. This observation is in consonance with Dr. Haber's views on the course of the pyrogenous decomposition of fatty hydrocarbons. The experiments also show that Scheithauer's statement† that a ton of creosote yields only 4900 cubic feet of gas, needs modification, since at the medium red heat of from 1300° to 1470° Fahr., which is used in oil-gas manufacture, a ton of creosote yields 21,536 cubic feet of gas. The yield diminishes very rapidly if the temperature is lower, as the phenols distil over without undergoing decomposition. This fact explains why oil-gas manufacturers have long since believed that phenols possess the property of deteriorating gas oils. The assay of gas oils according to the proportion of creosote they contain, finds justification, however, in the fact that the creosote effects a dilution of the oil gas with non-illuminating gases, the presence of which is observable through the influence they exert on the illuminating power of the gas.

Dr. SAMUEL RIDEAL has been awarded by the Council of the Society of Arts a silver medal for a paper read by him last session on "The Purification of Sewage from Bacteria."

* See "Journal" of the Society of Chemical Industry, 1894, p. 271; or "JOURNAL," Vol. LXIII., p. 478.
† See "JOURNAL," Vol. LXXI., p. 1319.

REGISTER OF PATENTS.

Manufacture of Acetylene.—Preston, A., of Atherton. No. 12,263; May 18, 1897.

In this apparatus for the manufacture of acetylene, the patentee proposes to employ a ball-valve and float (to which is connected a stem provided with a spring at its upper end) operated by the gasholder at a suitable point in its descent, for admitting water to the carbide, and regulating the supply of gas from the generator into the holder. A back-pressure valve is employed on the upper end of the pipe conveying gas into the holder, so as to automatically prevent the return of gas on the removal of the covers during the re-charging of the generator. The acetylene is conveyed through divisions of a chamber containing suitable material or solution for purifying the gas generated previous to admitting it into the holder.

Prepayment Meters.—Silberberg, S., of New York, U.S.A. No. 12,454; May 20, 1897.

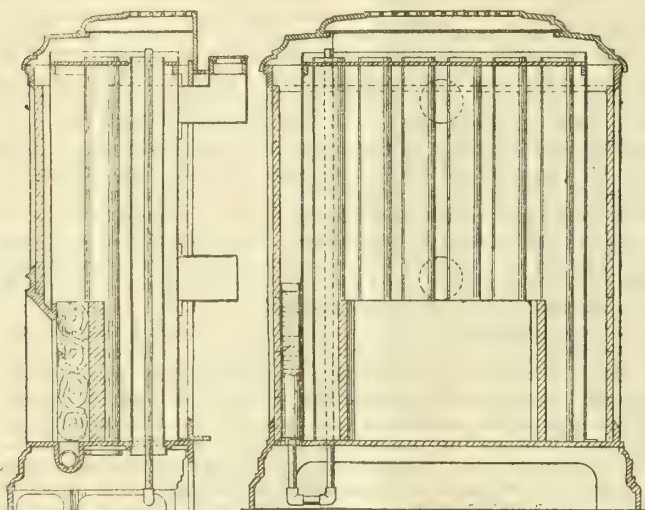
As explanatory of his arrangement of apparatus, the patentee remarks: "This invention relates to prepayment apparatus for fluid meters of the class in which it is necessary to insert a coin or other token, in order to get a supply of the fluid commodity. It is desirable to operate such devices with a token other than a coin; for the temptation to dishonest persons to break into the receptacle is not then so great. The token, whatever it may be, will be worth a certain amount of money; but as it is not a legal tender, the temptation to secure it by breaking into the apparatus is not great. It has heretofore been proposed to operate gas-meters by means of a coin; the insertion of the coin permitting the quantity of gas to flow which the coin pays for. In all such devices, as generally constructed, however, the apparatus is made to operate by a coin of a single denomination—as, for instance, by a silver 25 cent. piece. If more gas or water is desired than a single 25 cent. piece will pay for, it is necessary to insert a second or a third before it can be obtained. It is also found, in practice, that coins of the same denomination vary in size—due to wear, or to the fact that they belong to different series."

In accordance with the present invention, the patentee proposes to use for a token "a metal plate of peculiar design, which may be regarded as a key, and to construct the apparatus to be operated by keys of several designs." In this way, any quantity of the fluid may be obtained by inserting a key of corresponding design or value; the several keys representing different values.

The invention is not further described apart from a series of illustrations, and a lengthy lettered explanation.

Gas Heating-Stoves.—Langfield, J., of Manchester, and Kenworthy, J. H., of Ashton-under-Lyne. No. 12,756; May 24, 1897.

This invention in gas heating-stoves consists (as shown) in the combination with a bunsen or other suitable burner of a closed heating chamber, in the lower part of which the burner is fitted; the chamber being provided with air-tubes communicating at the top of the chamber with the place to be supplied with hot air, and at the bottom with a fresh air supply. One or more of the air-tubes is formed with a small internal tube, kept continually supplied with water; and the heating



chamber is also provided with an outlet for the heated products of combustion at such a point in its height as to leave a considerable column of heat, which practically remains at a constant temperature. The heating chamber has also at the upper part a safety-valve, so that, in case the gas is turned on and not ignited until the mixture of air and gas in the heating chamber becomes explosive, the pressure in the heating chamber will be relieved, and so prevent its bursting and the flame issuing from the stove.

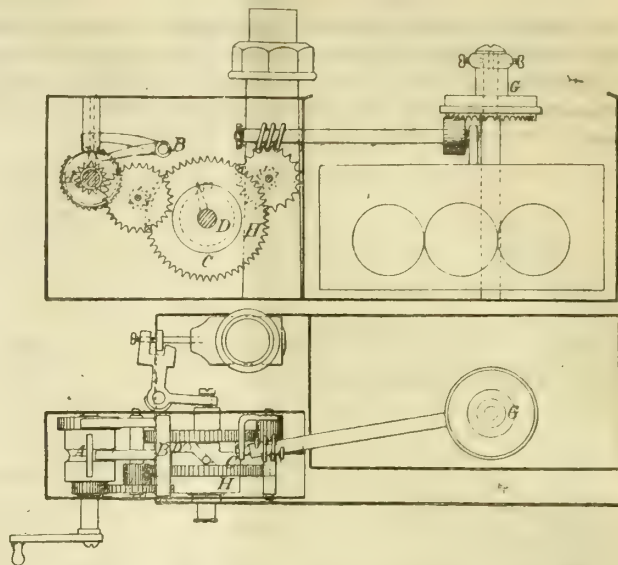
Coin-Freed Gas-Meters.—Lake, H. H.; a communication from L. P. V. Madsen, of Copenhagen. No. 13,547; June 1, 1897.

The claims advanced for this invention are—

1.—In prepayment or automatic gas-meters, in which the purchase-wheel C, which effects the opening of the gas-valve, may be rotated through a certain distance each time a fresh coin is inserted in the rotatable coin cylinder A, the arrangement by means of which the purchase-wheel is rotated either directly by a toothed wheel mounted upon the axle of the coin cylinder, or indirectly by means of an intermediate toothed wheel introduced between the first mentioned toothed wheel and the purchase-wheel.

2.—In prepayment gas-meters of the kind described in Claim 1, in which the rotation of the coin cylinder is normally effected by a two-armed stopper B arranged above this latter (one arm of which is raised by the coin inserted), the arrangement by means of which the other arm of the stopper forms a stopping pawl, the free end of which is provided with a

triangular notch, and also that the teeth of the ratchet-wheel mounted either upon the coin cylinder or its axle, is cut away for a part of its periphery so that the stopping pawl, when its end engages with the portion of the ratchet-wheel not provided with teeth, prevents any rotation of the coin cylinder, while when its end in engagement with the teeth of the ratchet-wheel is raised, it prevents the coin cylinder from turning backwards.

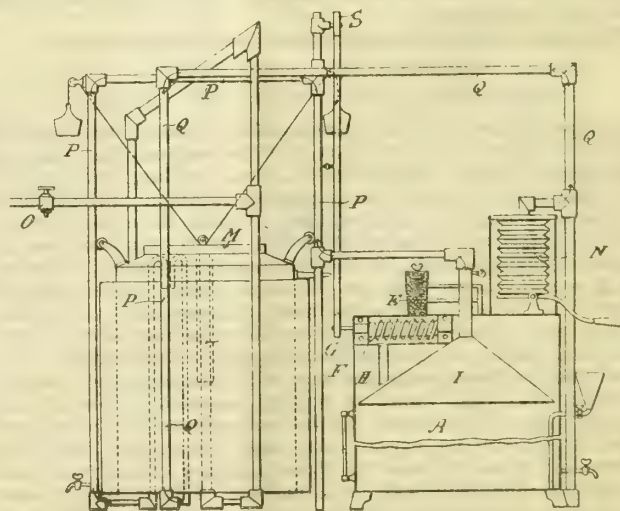


3.—In prepayment gas-meters of the kind described in Claim 1, effecting the opening of the gas-valve by means of the displacement of an axle or arm of a lever, so that the displacement is effected by a pin arranged upon the cylinder D, which is itself mounted upon the displaceable axle, and which cylinder likewise is provided with a large toothed wheel driven by means of the ordinary clockwork of the meter. This provides for backward sliding motion in the well-known manner; the pin resting in the slot provided in the boss H at the time of setting the apparatus. It is, however, forced by the rotation of the purchase-wheel to follow the oblique slot, thereby moving both the wheel and the axle into the position shown in the plan, owing to which the gas-valve is opened. There is an arrangement of stopper upon the boss H which fixes the greatest number of coins which may be inserted in the meter one after another.

4.—In prepayment gas-meters of the kind described in Claims 1 and 3, in which the backward rotation of the purchase-wheel C is effected by means of a toothed or crown wheel mounted upon the principal rotating axle of the drum of the meter, either the arrangement by means of which this crown wheel is connected with an index G, removably fixed upon the axle by means of a screw, in such a manner that it may be loosened and rotated independently of the axle, also that it may be readily exchanged for an index the crown wheel of which has a different number of teeth.

Production of "Oxycarbene" Gas.—Soxhlet, E., Van den Berghe, F., and Borremans Frères, of Hal, Belgium. No. 13,905; June 5, 1897. Date claimed under International Convention, Jan. 22, 1897.

The process of manufacture and of production of "oxycarbene" (so called by the patentees) by means of this apparatus, has especially in view "the use of acetylene gas derived from the carburets or acetylenes by eliminating the inconveniences and dangers which this gas presents in its preparation and its use."



The inconveniences and dangers of acetylene are thus enumerated—

(1) In most of the existing apparatus, the water falls on the carburet; and thus lime is produced—a reaction accompanied by a production of intense heat, which may be communicated to the gas formed, and be sufficient for the combustion of the latter. Besides, the carburet in presence of the small quantity of water is covered with a white layer of hydrate of lime, forming a coating, and preventing the subjacent layers of the carburet from being attacked by the liquid. Thus notable losses of the material occur. In the present apparatus, these inconveniences are said not to exist. The carburet falls into the water, and is totally decomposed; and the gas traversing the whole layer of water in the holder arrives cooled under the bell.

(2) Few appliances are provided with a scrubber, without which the

impurities in the produced gas are not removed. By means of the apparatus shown, the gas passing through the whole water in the holder arrives under the bell washed; the water having absorbed the sulphide of hydrogen, the ammonia, and other soluble gases.

(3) In all the present systems, the carburet is exposed to a damp atmosphere or is in contact with carburet already reached by the water. It therefore results that the part not yet attacked deteriorates quickly by absorbing moisture. A considerable loss of first material thereby results, and slow and untimely formation of gas, which not being able to disengage itself from the generator, when the apparatus ceases to work, accumulates in the latter, is compressed, and has a tendency to explode on account of its endothermic properties. This apparatus protects the acetylene or carburet completely against the water.

The troubles likely to arise during the use of acetylene are thus enumerated.

(1) It requires the use of special burners formed with capillary apertures. Under these conditions, a considerable part of the gas escapes complete combustion, as is proved by the carbon which is deposited under the form of soot. The apertures are very easily obstructed; and the burners often have to be renewed after some hours' use. The consumption suffers from it, and economical conditions are not realized. The process and apparatus now patented is said to allow the use of any burners now in use for lighting-gas. "No deposit of soot can be formed; and the whole carbon of the gas is integrally burned."

(2) The regulation of the gaseous afflux of acetylene burned in appropriate burners cannot be done. The burners must be totally opened or totally closed, on account of their small openings. The present process allows of regulation by taps and regulators inherent to ordinary gas-burners.

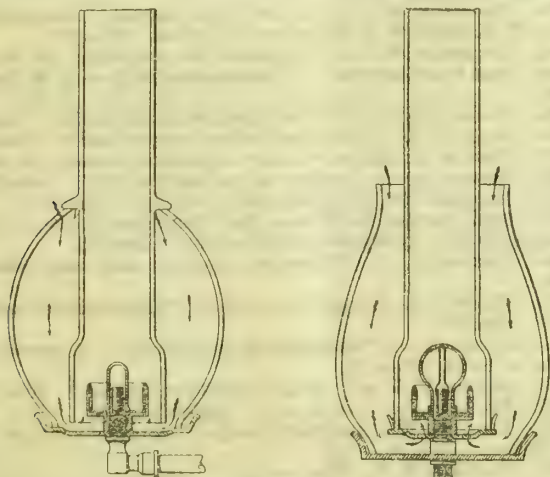
(3) The pure or unpurified acetylene being an endothermic gas—that is to say, susceptible of decomposing spontaneously and of combustion by the brisk heat produced by this decomposition—is a gas offering a permanent source of danger. This danger lies essentially in its brisk combination with the surrounding oxygen—a danger, of course, carried to the maximum when the gas is compressed or liquefied under pressure, by the fact that there is an enormous quantity of gas in a small volume. By means of the process and apparatus now to be described, the acetylene is consumed gradually and slowly, and diluted in order to reduce its endothermic power to the minimum.

A is the generator, into the lower part of which water is passed. E is a chamber for the carbide, pressed down by a spring. At the base of the chamber is a worm F, in connection with a delivery-pipe H. The shaft of the worm carries at one end a chain-wheel G. The moveable dome of the holder M is guided by the gas-pipes P. I is a collecting bell in the generator; and N is a bellows or blower of any suitable kind, to be worked by hand or otherwise. Its delivery-pipe leads to the pipes Q, which pass to the interior of the holder. By means of this device air may be pumped into the holder. On the frame is a chain-wheel S; and gearing the two chain-wheels S and G is a chain, on which is an adjustable stud. When the dome has risen so far that a finger moves the stud, the wheels G and S revolve. The worm F is thus revolved; and carbide is fed by it into the water in the generator, and acetylene commences to enter the holder. Having therefore, by means of the bellows N, pumped air into the holder until the dome M has risen sufficiently to cause the finger to move the stud (which has been adjusted so that this amount of air is exactly that required to give the desired proportion when the holder is filled up by the acetylene), the carbide will be then automatically fed, and continue to be so, by the rise of the dome M until it is full, whereupon there will be a mixture of air and gas therein ready for use.

O is the pipe for delivering the gas mixture. Close before each burner is placed a regulator and "flame arrester," consisting of rolled-up metallic gauze having on its outside screw-threads or helical ribs, and tapering to nearly a point at the end nearer the burner—such point being provided with a fine bore. This device reduces the pressure at the burner, and prevents any return of the flame to the holder.

Gas-Lighting Apparatus.—Muir, J. S., of Fulham, S.W. No. 14,240; June 11, 1897.

This invention consists of "a new method of treating gas to be used for lighting purposes, and of the atmospheric air required for supporting and assisting in the formation of the flame, and of the apparatus connected therewith."



The plan proposed is to enclose the gas as it leaves the gas-nipple in a "mantle" made of material capable of standing a great heat, sealed at its upper and lower extremities, and perforated around its side near its lower extremity to allow the gas to issue from the interior. The lower end of the mantle is surrounded by another mantle or burner of sufficient height to cover the perforation. This is closed at the bottom, but open at the top, so as to allow the gas as it issues to form the flame. The

whole is then enclosed in a glass shade sealed at the base, but open at the top, and terminating with a serrated edge. On this is suspended a glass chimney having a flange round it for the purpose of effecting the suspension, and of sufficient length to cover the opening above mentioned for the escape of the gas at the top of the outer mantle, but not sufficiently long to reach the tray on which the shade rests.

The result of the invention is said to be that "the gas to be consumed becomes superheated to form the flame."

According to a modification, the mantle is enlarged or made bulbous at its upper part, so as to be in closer contact with the flame; the bulbous part serving as a gas reserve for feeding the burner with gas of a much higher temperature, from its retention in the bulb, than is possible by the plain mantle. The top of the bulbous mantle is also much higher than in that of the plain mantle, and enables a "concentrator" of the gas as it issues from the nipple to be employed, in order that it may strike against the hot dome of the mantle, and be the better deflected to spread downwardly to the gas-passage of the ring burner.

Recording Apparatus for Automatic Gas-Meters.—Beechey, C. G., and Wright, A. T., of Liverpool. No. 14,287; June 12, 1897.

According to this invention, there is proposed to be combined with an automatic gas-meter a recording diagram chart operated by the part moved when setting or moving the meter on inserting a coin; and a pencil adapted to mark the chart and record the movement of this part and the insertion of coins. The diagram chart is arranged to indicate the quantity of money introduced into the apparatus, corresponding with the money-worths of gas for which payment has been made, and also (by a special marking) each time the drawer into which the coins fall and are collected is moved, or access is had to the part in which the collection of the coins introduced takes place. Thus whenever access to this part of the meter is had, the fact is recorded by the diagram chart, and preferably, upon the line indicating the number of coins introduced—i.e., the money-worths of gas paid for. The apparatus is also so adapted that the money-line is in the form of a continuous line; so that, by repeated revolutions of the chart, the recording in each revolution is clear of that in the former revolution. The chart consists of a rotating disc, with radial lines dividing the recording surface into a number of divisions—say, from one to twenty—each division, in this case, representing one shilling. The whole would therefore represent twenty shillings—that is to say, in the movement from one division to another, twelve pennies would have to be introduced, and the meter actuated as regards its automatic parts twelve times.

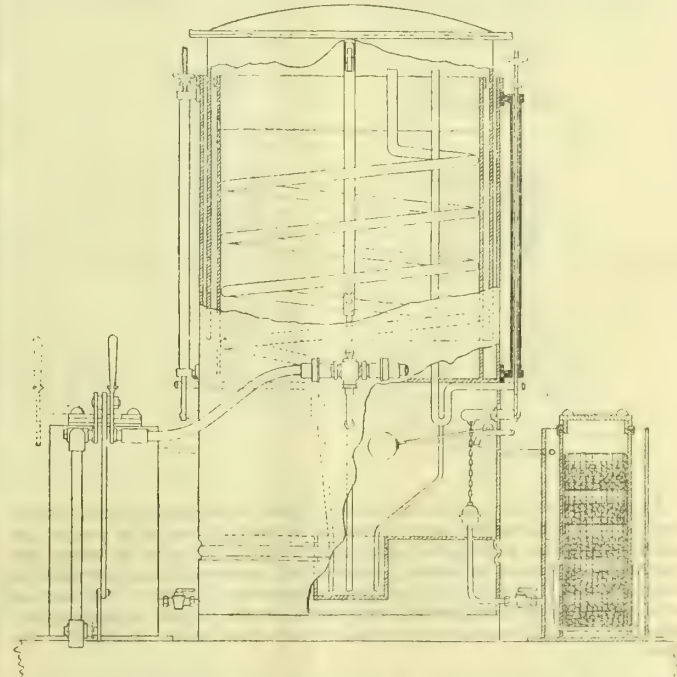
Manufacture of Gas.—Lake, H. H.; a communication from A. Piatti and Co., of Rome. No. 14,505; June 15, 1897.

This invention consists substantially in utilizing the products of combustion resulting from the burning of the straw of cereals or of any other vegetable substance, and in carburizing the products, either by mixing them with a certain proportion of acetylene gas or by other adequate means.

This object, say the patentees, is effected "by burning without flame, or carbonizing the straw or other vegetable substances in an apparatus constructed for the purpose, and collecting the gaseous products of combustion in a gasholder or other reservoir in which these products are mixed with a certain quantity of acetylene gas, which may vary from 10 to 50 per cent., according to requirements. Instead of the acetylene gas which serves for carburizing the gas, the carburizing may be effected by means of hydrocarburets or other equivalent substances."

Manufacturing Acetylene.—Fowler, T. R., of Liverpool. No. 14,742; June 18, 1897.

This generator (as shown) consists of an upright, and preferably cylindrical, vessel having double walls. The inner cylinder is provided with a gas-tight lid, and is adapted to contain the carbide which may be



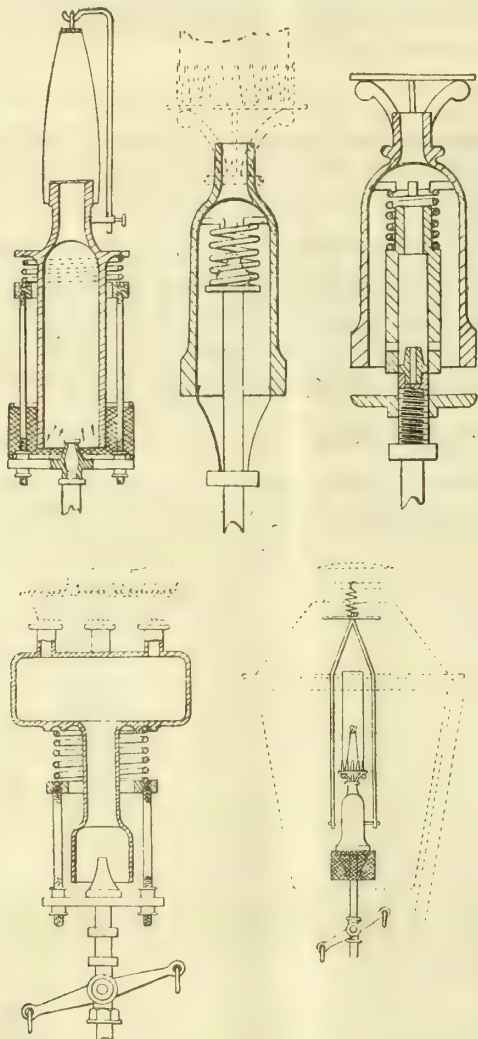
supported within it in a basket, cage, or otherwise in such manner as to leave a small clear space at the bottom. A feed pipe or tube passes through the inner wall into this space, and outside is turned in an upward direction—its outside portion lying between the two walls of the apparatus.

The mode of action is as follows: The carbide is placed in the inner cylinder; and, the lid being placed in position, water is fed into the space between the walls, and rises therein until its level reaches the top of the outer tube. At this point, a portion of the water will flow down the tube into the space beneath the carbide, and rising therein will cause the generation of gas as soon as it touches the bottom layer of the charge. The water inside the inner cylinder will lie above the entrance of the tube, and thus seal it and prevent leakage. The water-inlet to the main cylinder is preferably controlled by a spring or lever cock or valve, opened automatically when the supply of gas is so far used that a further feed of water is desirable. The gas exit-pipe is near the top of the inner cylinder. Each succeeding increment of water serves to raise the level in the inner cylinder, and to attack the carbide in an upward direction.

The holder consists of an upright vessel, divided by a partition into upper and lower portions. In the upper portion (which is double walled) floats the bell, as in an ordinary holder. The lower one contains the purifying chamber—a small cylinder depending from the partition, and adapted to hold the purifying material. The lower chamber is supplied with water; and this, surrounding the purifying chamber, serves to keep it cool, and also supplies the generator. The gas from the generator passes into the holder through a spiral tube; and in passing through it is cooled by the surrounding water. A second tube leads from above the water-level to the purifying chamber, from which chamber the gas is withdrawn for use. The spring or lever-cocks for the generators are opened by rods attached to the bell, when it sinks below a certain limit.

Supporting Incandescent Gas-Burners.—Clay, W. R., of Bolton. No. 17,679; July 28, 1897.

This invention relates to means for counteracting, intercepting, or diverting any or all jerky or violent vibrations or movements that might be transmitted through the burners and their bearings to incandescent lamp mantles, in public lamps and elsewhere. Heretofore the means employed for this purpose have consisted "of resilient bearings for the burners and their mantles, together with flexible pipe couplings for supplying the gas thereto, or the metal supply-pipe is bent or coiled to afford resilience for the burner and its mantle." As, however, these are somewhat unsightly, says the patentee, their use has been to a certain extent avoided.

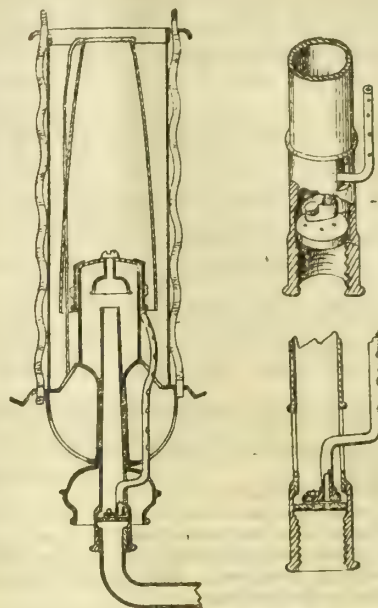


In order to produce a burner embodying all the advantages that can be desired of it without the use of a flexible or resilient gas supply-pipe, the patentee proposes to construct the burner so that the part by which the mantle is supported is entirely carried and everyway held by resilient bearings, and that clear of all guiding-pieces or rigid stays. The method of construction followed for this purpose is shown in the accompanying selection of arrangements as depicted in the illustrations attached to the specification.

Lighting Incandescent Gas-Burners.—Lynd, C. T., and Miller, B. M., of San Francisco, U.S.A. No. 25,374; Nov. 2, 1897.

This gas-lighting device (as shown) consists of a diaphragm placed across the interior of the gas-pipe at some point between the ordinary

gas-cock and the burner; the diaphragm having two or more perforations through it, in combination with a perforated lighting-tube having its lower end adapted to be placed in connection with one of the perforations, and to be disconnected therefrom after the gas is lighted. A swivel arm is pivoted to the diaphragm and adapted to have its free end swing over one of the perforations and a perforated lighting-tube connected at its lower end with the free end of the swivel arm, and adapted to pass through an opening in the gas-tube and thence to the burner tip. This lighting-tube can thus be moved to register with one of the gas-passages, or be moved to one side to disconnect it from the gas-passage.



In lighting the gas at the burner-tip, the air case is first turned so as to bring the lower end of the lighting-tube in line with one of the perforations in the diaphragm. The ordinary gas-cock is then turned on full. The gas thus admitted into the gas-tube will be divided—one portion passing through the perforation in the diaphragm into the lighting-tube, and the other portion (which passes through the other perforations in the diaphragm) going up the gas-tube to the burner-tip. A lighted taper or match is then presented to the lower perforation in the lighting-tube, and the gas which issues is ignited. The flame is then carried upward from perforation to perforation in the tube until it reaches the top of the tube, where it ignites the gas that issues from the burner-tip. The air case is then turned so as to cut off the gas from the lighting-tube, and this extinguishes the line of flame that reaches to the burner-tip; and the gas which was cut off from the lighting-tube then passes up through the main tube to the burner-tip along with the gas that passes through the other perforations in the diaphragm. By this means the gas inside the mantle is lighted without any liability to explosion.

APPLICATIONS FOR LETTERS PATENT.

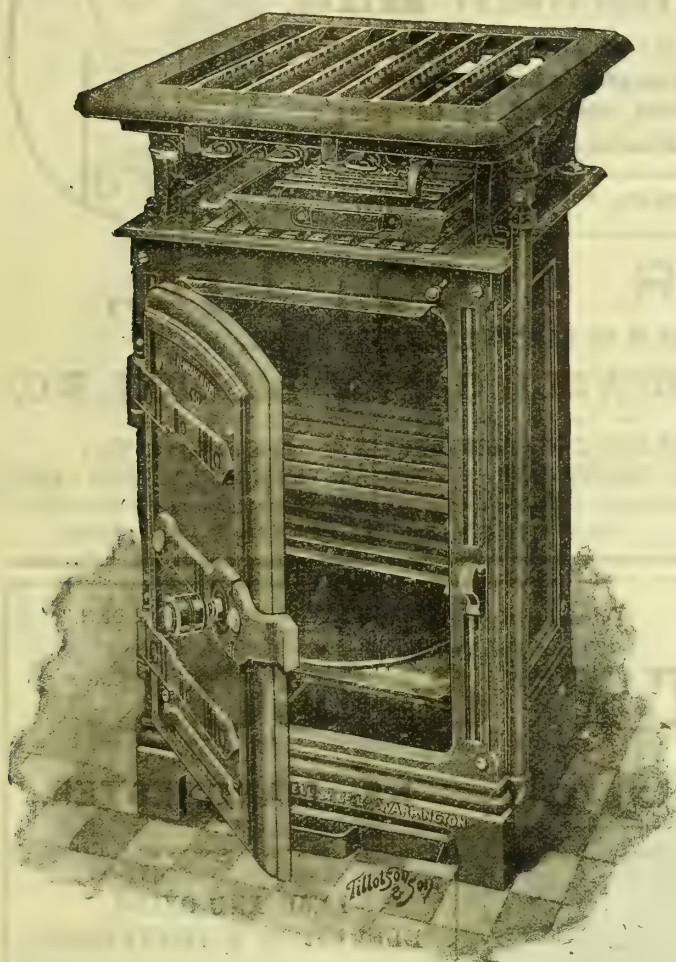
- 14,144.—PARRINSON, F. B., "Generator for acetylene." June 27.
- 14,184.—STAMM, A. E., "Impregnating incandescent gas-mantles." June 27.
- 14,191.—IMRAY, J., "Improvements in incandescence baskets." A communication from J. Moeller. June 27.
- 14,196.—SMITH, W. R., "Acetylene generators." June 27.
- 14,197.—THOMPSON, W. P., "Producing acetylene." A communication from H. Sez. June 27.
- 14,210.—BOULT, A. J., "Production of acetylene gas." A communication from Suret et Cie. June 27.
- 14,225.—COWAN, W., "Automatically varying the load and pressure of gas-governors." June 28.
- 14,234.—THOMPSON, W. P., "Gas and other engines." A communication from T. H. Hicks, T. S. White, and T. Friant. June 28.
- 14,235.—THOMPSON, W. P., "Apparatus for generating and burning gas from liquid hydrocarbons." A communication from R. M. Snyder. June 28.
- 14,295.—FORBES, Sir C. S., "Enriching coal gas or the like." June 28.
- 14,362.—SHAW, E. J., "Rising and falling gas pendants." June 29.
- 14,387.—DONKIN, E. BRYAN, "Rotary apparatus suitable for use as exhausters, blowers, pumps, motors, meters, and the like." June 29.
- 14,428.—KITCHEN, J. G. A., "Gas and oil engines." June 30.
- 14,432.—THE BRITISH ACETYLENE GAS GENERATOR COMPANY, LTD., and SPENCE, H. K., "Acetylene gas-generators." June 30.
- 14,438.—INGRAM, S. J., "Charging coal gas and other retorts." June 30.
- 14,453.—WOODS, J. E. T., and BYROM, W. A., "Manufacture of calcium carbide." June 30.
- 14,454.—BOULT, A. J., "Incandescent gas-burners." A communication from G. Delin. June 30.
- 14,463.—SCHODT, P. G. DE, "Incandescent gas lighting." June 30.
- 14,476.—TITCHETT, J., "Gas-stoves." June 30.
- 14,485.—LAKE, H. H., "Acetylene lamps." A communication from L. des Essards. June 30.
- 14,486.—CASGRAIN, H. E., "Carbureters." June 30.
- 14,505.—ARMOUR, A. L., "Steam or gas turbines." July 1.
- 14,567.—DAVOREN, M., BELTON, J., and DAVOREN, J., "Manufacture of illuminating gas." July 1.
- 14,616.—FOURNIER, M., "Production of acetylene gas." July 2.
- 14,620.—SMEDLEY, E., "Acetylene lamps and generators." July 2.
- 14,634.—JONES, H. H., "Clearing gas service-pipes of residual deposits." July 2.

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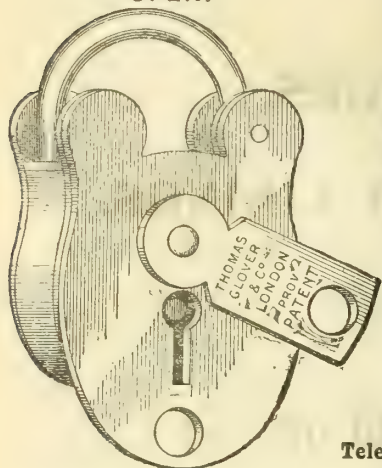
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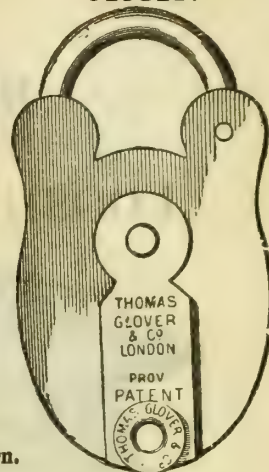
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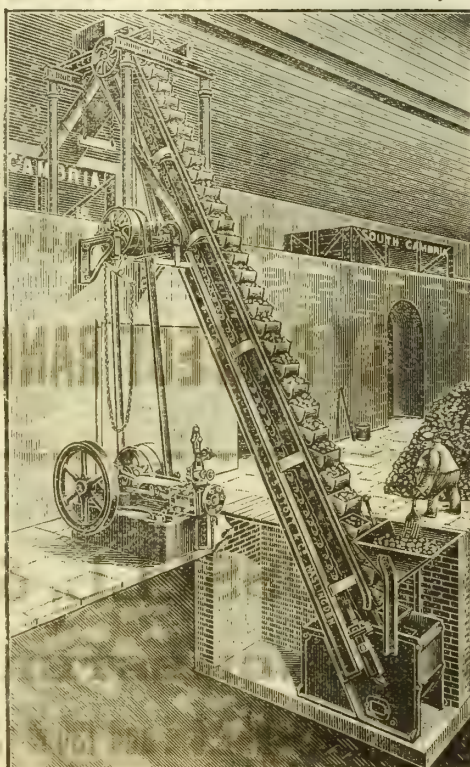
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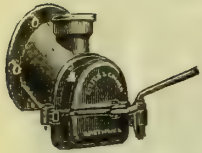
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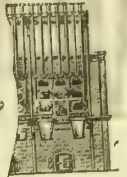
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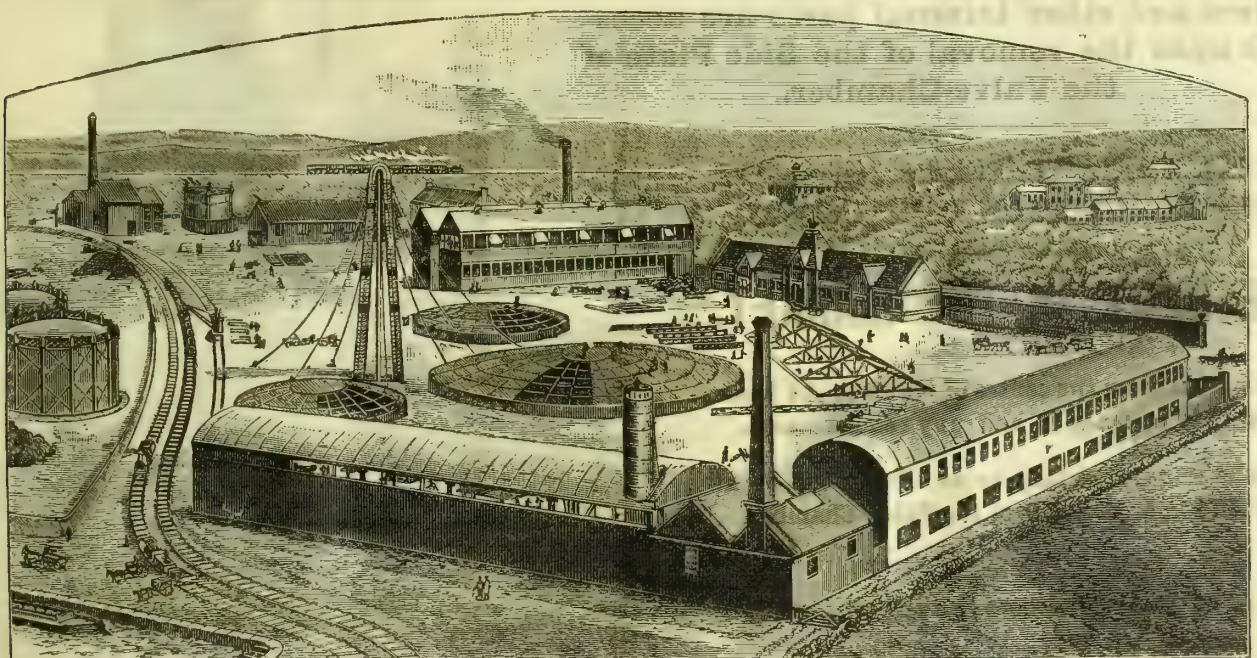
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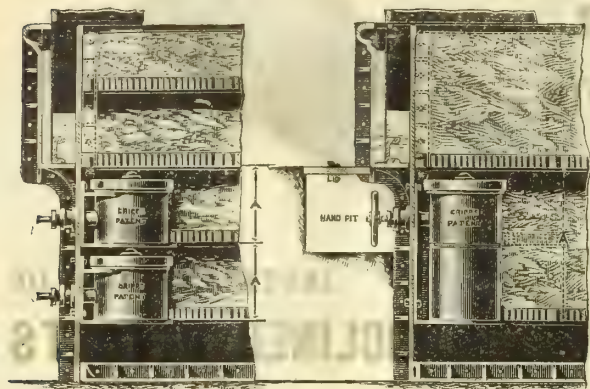
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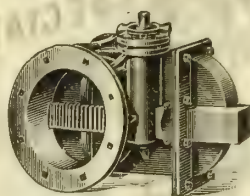
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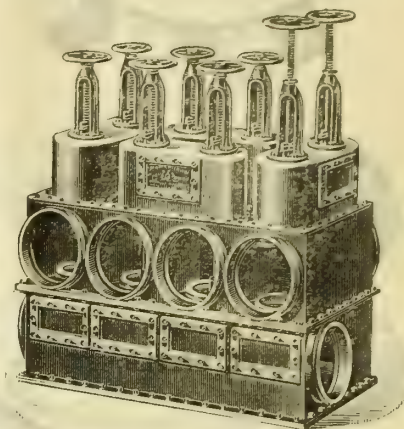


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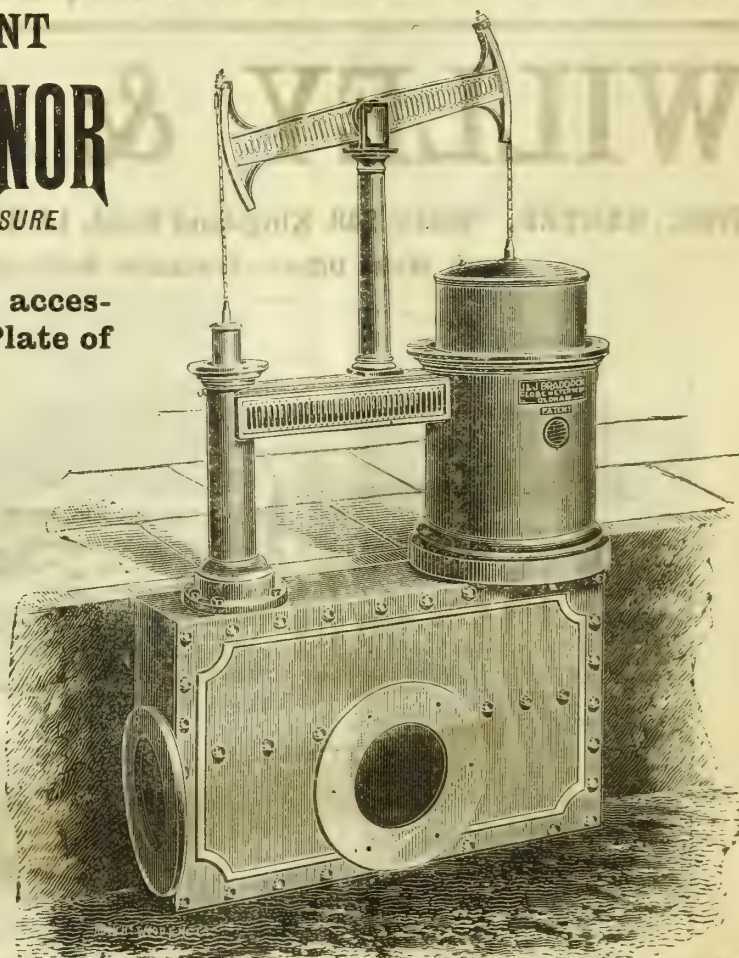
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## PARLIAMENTARY INTELLIGENCE.

### HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills reported, with amendments: Coventry Corporation Gas Bill, Cromer Gas Bill, Drogheda Gas Bill, Higham and Hundred of Hoo Water Bill, Middlesbrough Corporation (Gas) Bill, Plymouth and Stonehouse Gas Bill.

Bills read the third time and passed: Cranbrook District Water Bill, Crawley and District Water Bill, Cromer Gas Bill, Drogheda Gas Bill, Water Orders Confirmation Bill, Wigan Corporation Bill, Wishaw Water Bill.

The Earl of Camperdown has been appointed a member of the Select Committee on The Gaslight and Coke Company Bill in place of Lord Clinton; and he will be Chairman of the Committee.

The Wey Valley Water Bill has been referred to a Select Committee, consisting of Lord Ribblesdale (Chairman), Earl Grey, Viscount Falkland, Lord Methuen, and Lord Muncaster; to meet on Monday, July 11.

### HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill read the first time and referred to the Examiners: Water Orders Confirmation Bill.

Bills reported: Folkestone Water Bill, Gas Orders Confirmation Bill (No. 1), Halifax Corporation Bill, Keighley Corporation Bill.

Bills read the third time and passed: Blackpool Improvement Bill, Gas Orders Confirmation Bill (No. 1), Sheringham Gas and Water Bill, Yeovil Corporation Bill.

**Electric Lighting Undertakings.**—A Select Committee of the House of Lords, presided over by Lord Northbrook, had under consideration last week three important Bills relating to the supply of electricity. One was promoted by the Chelsea Electricity Supply Company, with the object of obtaining power to acquire additional lands and erect generating stations. It was opposed by the London County Council, who claimed to be the lighting authority, under the Electric Lighting Act, for certain parts of the County of London, and moreover to have the power of supervising and controlling the lighting by the Vestries. The Committee passed the Bill with the addition of a clause securing to the Council the powers conferred upon them by the Chelsea Electric Lighting Order, 1886. Another Bill was that of the Metropolitan Electric Supply Company, who propose to establish a large generating station at Willesden, and convey the current into their district by means of cables laid along the Grand Junction Canal. This Bill was passed with amendments limiting the Company's operations to their present area, and retaining the existing conditions. The third Bill was promoted by the Central Electric Supply Company, at the back of whom were the Westminster and the St. James's and Pall Mall Company, to obtain power for the acquisition of land and the construction of works for the supply of electrical energy, and other purposes. It was opposed by the London County Council, the Great Central Railway Company, and three electricity supply companies; the Railway Company putting forward a prior claim to the site selected for the generating station. In this case, the Committee decided that the preamble of the Bill had not been proved.

## LEGAL INTELLIGENCE.

### HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Tuesday, July 5.

(Before Mr. Justice WILLS.)

*Hughes v. Erith Urban District Council.*

This case was before his Lordship and a Special Jury for several days towards the end of last month (see "JOURNAL" for June 28, p. 1581), and resulted in a verdict for the plaintiffs; but the question as to how judgment should be entered was reserved. This matter was decided to-day.

Justice WILLS said he should first consider whether the plaintiffs were entitled to be paid by the defendants for their work in repairing the air-mains laid down by them. The material facts might be very shortly stated. In 1895, the defendants made a contract with one Ossington, by which he undertook to lay down a line of drain-pipes through their district. It was part of the defendants' scheme that these drains should be combined with a system of air-mains afterwards to be constructed, through which compressed air should be forced along the drains; and by this agency the sewage was to be lifted to a higher level. Ossington completed his work in the part of the system with which this case was concerned in March, 1896. On the 7th of May following, the defendants entered into a contract with the plaintiffs to lay down air-mains and construct the rest of the apparatus necessary to lift the sewage. The drain-pipes were some 20 to 30 feet, and the air-mains between 2 and 3 feet below the surface. The plaintiffs finished their work in October, 1896; and as the Jury had found, it was properly done. Ossington was at this time at work on another section of the drains; and, as his work was not forward enough for the plaintiffs to follow on, they left the neighbourhood, and did not return until 1897. When they left, their air-mains were tight; but on returning they were found to leak. The plaintiffs complained to the defendants' Engineer, asserting that the leakage was the consequence of imperfect work—he not filling up his deep trenches, which led to lateral subsidence of the soil in which their air-mains were laid. He replied that he would require them to test their mains up to 40 lbs. when the whole work was finished, and that he had nothing at all to do with any subsidence. As, under the contract, the

plaintiffs could not be paid for any part of their work without the certificate of the Engineer, they had to repair the mains, which they did at a cost of £244 odd, the sum claimed in the action. The defective state of their mains, the Jury found, was due to the lateral subsidence occasioned by the imperfect way in which Ossington filled in the trenches which he had had to cut to lay the drain-pipes. Under the terms of the contract, the plaintiffs were obliged to do the necessary work of repairing; and the question appeared to him (Justice Wills) to be reduced to this: Was the disabled state of the air-mains due to the default of the defendants within the meaning of the contract? He entertained no doubt that, outside the contract, no such duty could be established. In his opinion, the expression "default" in the contract was not confined to questions of actionable negligence, or of failure to perform specific obligations; nor did he see anything in the nature of the case to confine it to things that might happen in the future. "Default of the defendants" seemed to him to include failure to do something which ought to have been done somehow, and which the defendants were the natural and proper persons to do or to have done. The simple question was: Was it owing to the default of the defendants that the mischief arose? It would not do to say that the injury resulted from the default of Ossington, and that this was not the default of the defendants. The defendants caused a hole to be dug in the ground, and when they failed to fill it in properly they made default in what was their proper and natural work, and even their legal duty, though not a duty towards the plaintiffs in the sense that a right of action could be based upon it. In his opinion, the default was one on their part within the meaning of the contract, and the plaintiffs were entitled to be paid the sum in dispute. It was said that the plaintiffs had wrongly conceived their cause of action. But this was a matter which could be remedied by amendment; and the defendants had suffered no damage from the form of the action. Accordingly, he gave judgment for the plaintiffs for £244 15s., with costs.

### Complaint of Nuisance at the Bath Gas-Works.

In the Chancery Division of the High Court of Justice last Thursday, Mr. Justice Kekewich had before him the case of *Carr and Co. v. Bath Gaslight and Coke Company*, by which an injunction was sought to restrain the defendants from polluting the River Avon by permitting the escape of effluent water from their works to the detriment of the plaintiffs in their business of cloth manufacturers, carried on lower down the stream. Mr. Phipson Beale, Q.C., reminded the Court that an arrangement had been made for inspection of the gas-works when the matter was last mentioned. Experts had accordingly visited them, and the results were now given in the affidavits; among them being one by the defendants' Engineer and Manager (Mr. C. Stafford Ellery). He stated that the particular process complained of had been discontinued, but that the defendants intended to resume it at any time they chose. In the circumstances, an injunction was necessary. Mr. Butcher, Q.C., for the defendants, said the cause for complaint at the tank mentioned in the evidence had been removed. Mr. Beale said the question was not in reference to a tank at all, but to a particular process which the defendants expressed their intention of resuming. His Lordship suggested that, as probably the trial could not take place before the Long Vacation, an arrangement should be made in the meantime to keep matters *in statu quo*. After some discussion, Mr. Butcher agreed to give an undertaking not to discharge into the river any residual product or effluent arising from the process in question. His Lordship, on this undertaking being given, granted leave to set down the case for trial at once; either side to be at liberty to make application to the Court if necessary.

### In re the Self-Lighting Gas Company, Limited.

This was a petition by the above-named Company, for whom Mr. Levett, Q.C., appeared, asking the sanction of the Court to the reduction of capital by returning money not required. The Company was formed in 1895, with a nominal capital of £200,000, in 20,000 shares of £10 each. Only 2000 shares, however, had been issued, which were all fully paid up. The Company was formed to acquire and work certain patents, a great many of which had been sold; and the business now consisted mainly of the receipt of royalties. The result was that it had in the bank £16,000 which was not required. A special resolution had therefore been passed, which not only provided for the repayment of the £16,000 of capital, but also divided each of the remaining unissued shares of £10 into five shares of £2 each, so that all the shares issued and unissued would be on the same footing; £8 per share being returned to the holders of the 2000 shares already issued. An advertisement had been published by the direction of the Master, and he had made his certificate that there were no debts or liabilities. Justice North, before whom the matter came last Saturday, made the order as asked.

### Action as to Ventilating Apparatus.

In the Chancery Division of the High Court of Justice last Wednesday, Mr. Justice Bigham, sitting as an additional Judge of the Division, had before him the case of *Simman v. Sugg and Co.*, in which the plaintiff, Mr. John F. Simman, sued the defendants for royalties alleged to be due under an agreement by which he granted to them a licence to manufacture certain articles he had patented (No. 18,801 of 1889). The royalties were claimed in respect of two classes of articles manufactured by the defendants. The first was an apparatus used on torpedo boats for the purpose of creating a down-draught into the vessel. An apparatus similar to that invented by the plaintiff was used for the purpose of preventing a down rush of water. His Lordship ruled that this apparatus would not have been an infringement of the plaintiff's patent, and that therefore no royalties were payable in respect of it. The second class of articles in respect of which royalties were claimed were ventilators fitted by the defendants with valves and cowls of their own design. The defendants said as to these articles that they were only liable to pay royalties for the valves, and not in respect of the whole article manufactured. His Lordship said he was satisfied that, under the contract, the defendants were liable to pay to the plaintiff 10 per cent. upon the net price of the



whole of the apparatus manufactured by them. The royalty was on an apparatus which included any adaptation by the defendants. There was a counterclaim by the defendants on account of the plaintiff having made and sold gas-fire ventilators under the patent in question during the existence of the licence granted to the defendants. This was admitted by the plaintiff, and an injunction was granted against him. His statement of the profit made was, however, accepted by the defendants, who were credited in the account with £30 damages and £38 for goods. No order was made as to costs.

#### Use of Gas Companies' Reserve Funds to Meet Extraordinary Claims.

At a recent sitting of the Barnsley West Riding Police Court, Mr. Raley applied on behalf of the Elsecar, Wentworth, and Hoyland Gas Company, for permission to take from the reserve fund of the Company the sum of £470 11s. 9d., funds invested in the Lancashire and Yorkshire Railway Company, for the purpose of meeting an extraordinary claim within the meaning of the Gas-Works Clauses Act. He explained that the Company had to construct an additional main between Elsecar and Hoyland, and the money was required for the purpose. The 32nd section of the Gas-Works Clauses Act, 1847, provided that a gas company should have power to use the money for such work, if the consent of two Justices of the Peace was obtained. There was no opposition; and the Bench assented to the application.

#### A Manchester Gas Official's Sentence for Embezzlement.

At the last Manchester Quarter Sessions, before the Recorder (Sir J. F. Leese, Q.C., M.P.), George Frederick Bateman pleaded guilty to indictments charging him with stealing £484 11s. 0½d., the money of the Lord Mayor, Aldermen, and Citizens of Manchester, on the 21st of April last; and with embezzling sums of £126 0s. 7d., £226 17s. 2d., £110 15s. 4d., £48 19s. 3d., £258 7s., and £20 0s. 11d., on the 8th of January last, and subsequent dates. The accused had been in the service of the Gas Committee of the Corporation for a great number of years—first as a collector, and afterwards as cashier; and his defalcations amounted in all to about £1730, the whole of which had been taken in twelve months. The amounts specified in the second indictment were moneys received under the prepayment meter system. The accused was charged at the City Police Court on May 5 (Vol. LXXI., p. 1076), when the nature of the frauds and the method of their detection were explained. Mr. Woodroff Fletcher appeared for the prosecution, and stated that the prisoner had previously borne a good character, and that, while his salary had been £275, he had had something like half-a-million of money passing through his hands annually. The Recorder said the prisoner's offence was a terrible one, and he could have no pity for him. He would be sentenced to three years' penal servitude.

#### Pollution of the River Wey.

At the Guildford Police Court, a few weeks since, the Guildford Gas Company were summoned, at the instance of the Thames Conservancy Board, for polluting the Wey. Mr. W. S. Bunting prosecuted; Mr. R. Sparkes, the Company's Solicitor, defended. Mr. Bunting said the offence alleged was admitted, and steps had been taken by the Company, since complaints had been made, to put an end to the pollution. The Conservators' Inspector had visited the works, and considered the improvements that were being made would be effectual and satisfactory. Under these circumstances, Mr. Sparkes would ask for a mitigated penalty; and he (Mr. Bunting) in view of the Inspector's report, would be satisfied with a small fine. Mr. Sparkes said the Company had acquired a piece of land which was formerly a cricket-ground. It appeared that the ground had surface drains laid to drain the cricket-pitch; and when the land came to be used for the purposes of the gas-works there must have been some overflow into the pipes, and then into the ditch with which they were connected. The Company had dug a trench and filled it with puddled clay. They had also taken up the pipes, of the existence of which they had not been aware, and had stopped all openings effectually. He therefore asked for as small a penalty as possible, as this was neither a gross case nor a wanton infringement of the law. The Bench imposed a fine of 40s., and £5 18s. costs.

**Supply of Acetylene Gas by a Gas Company.**—The Cowdenbeath Gas Company, Limited, have resolved to supply acetylene gas. The contract for the provision of the necessary plant has been let to the Home and Colonial Acetylene Gas Company.

**Birmingham Corporation Coal Contracts.**—The Gas Committee of the Birmingham City Council have completed contracts for 490,000 tons of coal for the twelve months from the 1st inst. The quantity is smaller than that used last year; and this is owing partly to the increasing production of water gas, and partly to the stocks of coal in hand. Last year the contracts were for approximately 510,000 tons; but the water gas produced added to this amount gave an equivalent in coal which would have necessitated a consumption of 527,000 tons. The price is 6d. per ton more than that of last year.

**The Coalville District Council and the Local Gas Undertakings.**—The Chairman of the Coalville District Council (Mr. W. D. Stableford), at a recent meeting, proposed that the necessary steps be taken for promoting a Bill in Parliament, to enable the Council to purchase the works of the Whitwick Gas Company. He believed all the members agreed that this was a wise thing to do. The benefits to the ratepayers would be that the Council would be able to supply gas at a less cost than the Company; and the profits would be applied to public purposes. The motion was carried unanimously. Mr. Heward subsequently moved that the Ibstock Gas-Works be purchased at the same time, seeing that a part of the district was lighted by the gas supplied from them. After a discussion, the matter was adjourned to the next meeting.

## MISCELLANEOUS NEWS.

### THE LONDON COUNTY COUNCIL AND THE SUPPLY OF CARBURETTED WATER GAS.

The Public Control Committee of the London County Council have presented the following report on the above matter:—

We have received a letter from the Departmental Committee of the Home Office which is considering the questions of the manufacture and supply of water gas, asking for the opinion of the Council on the subject. Having considered the matter, we have come to the following conclusions, and have communicated them to the Departmental Committee: (a) That considerable danger arises from the introduction of water gas in the process of the enrichment of coal gas. (b) That non-carburetted and non-odorized water gas should not be allowed to be used under any conditions, since it is devoid of smell which would give warning of any escape of the gas. (c) That 25 per cent. should be the maximum amount of water gas allowed to be introduced in the enrichment of coal gas; the proportion of water gas being ascertained by determining the amount of carbonic oxide in the enriched coal gas, which shall not exceed 16 per cent. Coal gas enriched to this extent would correspond in poisonous character to the Dowson gas, which is already in use for heating purposes and for gas-engines, and would exclude the use of carburetted water gas. (d) That when it is proposed to supply poisonous enriched gas to houses and the interior of buildings, a proper inspection be made of the service-pipes by a responsible officer appointed by the local or other suitable authority, who should certify that the pipes are in a sound condition, and that there is no escape of gas; and that the cost of such inspection be borne by the gas company.

### THE SULPHATE OF AMMONIA COMMITTEE.

#### The Work and Plans of the Executive.

The First General Meeting of the subscribers to the above Committee was held on Wednesday last at the Offices of the Chairman (Mr. W. G. Blagden), 4, Fenchurch Avenue, E.C.; but as there was little information to be furnished beyond what appeared in the report of the Executive Committee and that already published in the "JOURNAL," the attendance was not large. Mr. BLAGDEN presided.

The report dealt with the work of the Executive from the date of the formation of the Committee (July 29 last) down to June 30. The first step taken was to offer prizes to agricultural societies, &c., for the best grown crops with the aid of sulphate of ammonia, or in conjunction with other manures. In response to the circular sent out, the Secretaries of about 65 societies undertook to bring the subject before their Committees; and this had resulted in some 50 societies organizing competitions for prizes of the value of £10 each. Then a prize of £50 was offered to, and accepted by, the promoters of the Brewers' Exhibition for the best exhibit of barley for malting purposes grown with the aid of sulphate of ammonia. Prizes of £5 each had also been offered to, and accepted by, the Scottish National Fat Stock Club for the best beasts, fed on sulphate of ammonia grown turnips in five classes, exhibited at their show. It had also been decided to give a prize of £5 for the best sheep, fed on sulphate of ammonia grown turnips; and a prize of £5 for the best sulphate of ammonia grown turnips and swedes exhibited at the show. The report next referred to the literature, which had been circulated. Of the pamphlet on "The Science of Manuring," by Mr. John Hunter, about 120,000 copies had been distributed; and of that by Mr. Middleton, who wrote as a practical farmer with experience of sulphate of ammonia, about 135,000 copies. The report next announced that it had been arranged that Mr. Hunter should act as Agricultural Adviser to the Committee for one year, commencing in November, 1897, at a salary of £150, upon the undertaking that, should his services be still further required, this amount should be increased to £200. It was further decided to expend a sum not exceeding £500 on a series of advertisements in twelve of the principal agricultural periodicals and about 100 provincial papers. These advertisements appeared early in March, and continued until the end of May. Alluding to their decision to offer a prize of 500 guineas for the best essay on the "Utility of Sulphate of Ammonia in Agriculture," the Committee mentioned that they had secured the services of Mr. W. C. Little, Member of the late Royal Commissions on Agriculture, and Dr. Voeleker, Consulting Chemist to the Royal Agricultural Society, to act as Judges of the essays; and these gentlemen had appointed Mr. Samuel Rowlandson, a Member of the Council of the Royal Agricultural Society, to act as Referee, in case of any difference arising. The Committee considered they had every reason to be satisfied with their labours so far as they had gone; but the benefit of the year's work could not be fully appreciated until the results of the numerous competitions were known and tabulated. The accounts showed that the subscriptions received amounted to £2669 1s. 6d. (106,763 tons, at 6d.); and two other small items in connection with the issue of the pamphlets made the total receipts £2683 14s. 1d. Deducting the expenditure (of which the two largest items were advertising, £547, and printing and distributing pamphlets, £491), a balance of £1228 3s. 2d. remained. Adding to this £6 1s. 4d. subscriptions outstanding and £2 10s. for sales of pamphlets gave the Committee £1236 14s. 6d. But they are committed to the following expenditure in connection with competitions: £525 for the essay on sulphate of ammonia; £100 for the remuneration of the Judges; £550 for prizes to agricultural societies, &c.; £50 for prizes to National Scottish Fat Stock Club; and £50 for the prize for malting barley at the Brewers' Exhibition. Salaries and travelling and sundry expenses made up a total estimated expenditure to Dec. 31 next of £1544. A further levy will therefore have to be made to meet the difference, and to enable the Committee to prosecute their work.

The report having been taken as read,

The CHAIRMAN said, as it was fairly ample, he did not propose to trouble those present with many remarks; and he would simply add a few words. In the first place, with regard to the prizes which had been



offered, he thought he ought to tell the subscribers that, although they had managed to get about fifty agricultural societies to undertake the work of organizing competitions for prizes for the best crops grown by the aid of sulphate of ammonia, the anticipations of the Executive had not been by any means realized. In all, they sent out 611 circulars to societies of various kinds; but only about 60 were prepared to go on with the matter. Half of those were in Scotland; and the other half were confined to a few English counties—Yorkshire, Derbyshire, and Lancashire. It therefore appeared that there was a very large area of the country which they could not touch at all in this way; but he thought that, if the Committee continued their labours for another year, they might perhaps be able to devise some means of getting at those areas—perhaps by appointing paid judges of their own, who would themselves organize the competitions.

Mr. W. R. CHESTER (Nottingham) inquired if the Chairman could tell them where the failure came in. Did the societies who had not taken up the competitions express any reason as to why they did not?

The CHAIRMAN said they simply did not answer; so that the Committee were in absolute ignorance as to why they did not accept the offer. Not 10 per cent. replied to the invitation to organize competitions. Then with regard to the prizes they were offering to exhibitions and shows, the Committee would no doubt in another year, if they continued their work, be able to do considerably more, because they would be better known, and would be in a stronger position to appeal to the committees who organized the shows; and, moreover, they would be in the field much earlier. Before the Committee were able to do anything in regard to the present year, many of the organizing committees had already made their arrangements. As to the circulation of the pamphlets which had been prepared, the Committee had distributed 25,000 of each among the farmers in Scotland; from 40,000 to 50,000 of each had been sent to the members of the Committee; and from 15,000 to 20,000 had been forwarded to the landed proprietors of England. The Committee did not see their way to getting at the farmers in England. They were very numerous; and there was no machinery for reaching them properly. Therefore the pamphlets had not been sent out to them from his office; but no doubt many of the individual members of the Committee had distributed copies among the farmers in their own immediate locality. Then again, with reference to advertising, they were unfortunately late in commencing. Instead of starting as they ought to have done quite early in the year, it was not until March that they were able to get their advertisements out to the bulk of the papers; and besides that he did not think the selection of the provincial papers was perhaps quite so good as it might have been. But in future, they hoped to have the benefit of the advice of the members of the Committee as to the proper mediums in their own localities for making sulphate of ammonia better known. Regarding the prize which it was proposed to offer for an essay on the "Utility of Sulphate of Ammonia as a Fertilizer," the Committee had had considerable difficulty in finding proper Judges for the competition. However, they had succeeded at last in getting hold of suitable gentlemen; and the necessary advertisement, in its final form, had been adopted, and was ready for insertion in scientific journals as soon as the requisite expenditure was sanctioned. It would be noticed in the accounts that the subscriptions received represented only 106,763 tons of sulphate of ammonia; whereas the total quantity produced in the United Kingdom was estimated at something like 200,000 tons. It was very much to be deplored that they had only got a comparatively small proportion of the total number of manufacturers to join the Committee; and they hoped that those who still stood out would in future be prepared to bear a certain portion of the burdens which the work entailed in view of the benefit which they obtained from the labours of the Committee. He concluded by proposing that the report be received, and the accounts (subject to audit) be adopted.

Mr. ISAAC CARR (Widnes) seconded the motion, which was at once unanimously adopted.

A brief discussion ensued as to the appointment of Auditors for the accounts to June 30 last. The names of Mr. S. Y. Shoubridge, Mr. Charles M. Ohren, and Mr. H. D. Ellis were suggested. With reference to the nomination of Mr. Ellis, the CHAIRMAN mentioned that the Commercial Gas Company were not subscribers, so that it would be of no interest to Mr. Ellis to undertake the work. It seemed to be the general opinion that a firm of Chartered Accountants should be appointed; and eventually, on the motion of Mr. CHESTER, seconded by Mr. ALFRED COLSON (Leicester), Messrs. Alfred Lass, Wood, and Co. were selected.

Mr. FYFE (of Young's Paraffin Lighting and Mineral Oil Company, Limited) next moved—"That an Executive Committee be appointed, with full power to appoint officers, to take such steps as they think fit in the interests of sulphate of ammonia manufacturers, and to levy subscriptions as required on members, not exceeding in the whole 6d. per ton, during the ensuing year.

Mr. C. A. CRAVEN (Dewsbury) seconded the motion, which was agreed to.

Mr. FYFE said that following the previous resolution was a list of the names of the gentlemen who had been working during the past twelve months; and, in order to simplify their proceedings, he would propose that they be re-elected. The names were: Messrs. Fraser, Kennedy, and Fyfe, Colonel Sadler, Messrs. Orr, Craven, Dempster, Blagden, Lennard, F. Livesey, Brotherton, and Hanbury Thomas, Alderman Miles, Messrs. Brunner, Mond, and Co., the Bradford, Salford, Leicester, and Nottingham Corporations (represented by Messrs. Wyld, Woodward, Colson, and Chester respectively), and Messrs. Carr and Harman, of the Widnes and Huddersfield Corporations.

Mr. J. W. HELPS (Croydon) seconded the proposition, which was unanimously adopted.

On the motion of Mr. HANBURY THOMAS, seconded by Mr. HELPS, Messrs. Alfred Lass, Wood, and Co. were further appointed to audit the accounts for the current year.

Mr. CRAVEN moved a vote of thanks to Mr. Blagden for the interest he had taken in the work of the Committee during the past year.

Mr. E. A. HARMAN, in seconding, remarked that the time and energy Mr. Blagden had devoted to the work were beyond all praise. He had undertaken an immense amount of work—not only in issuing the pamphlets, but in the detail work, besides which the use of his office had been most acceptable to the Committee, in its early stages at all events.

The motion was carried by acclamation.

The CHAIRMAN, in reply, said he need not say he was very grateful

indeed for this cordial vote of thanks, and the kind way in which it had been proposed. He could not, however, really take much credit to himself for what had been done. He was nothing more than the willing servant of the gentlemen who formed the Committee; and if he had succeeded in carrying out their wishes to their satisfaction, to know he had done so was all the reward he required.

This concluded the proceedings.

## THE EXAMINATIONS IN GAS MANUFACTURE.

### The Pass List.

The following are the names of the successful candidates in the last examinations in "Gas Manufacture" by the City and Guilds of London Institute, the question papers for which were given in the "JOURNAL" for May 10 last (p. 1077):—

#### HONOURS GRADE.

| First Class.          |                  | Second Class.   |                    |
|-----------------------|------------------|-----------------|--------------------|
| Cowper - Smith, A. T. | Pettigrew, W. E. | Davies, H.      | Shadbolt, F. L.    |
| Dougan, O. W.         | Power, J.        | Jennings, G. L. | Taplin, E. W.      |
| Moon, P. G. G.        | Smith, H. E.     | Knight, H. S.   | Thomas, J. M.      |
|                       | Williams, P. E.  | Page, H. C.     | Williams, H. R. S. |

#### ORDINARY GRADE.

| First Class.     |                  | Second Class.    |                   |
|------------------|------------------|------------------|-------------------|
| Alderman, S.     | Hamson, E.       | Auty, J.         | Kershaw, J.       |
| Astbury, E.      | Heald, W.        | Ball, A. F.      | Kitson, H.        |
| Bagshaw, A. H.   | Hunter, F. R.    | Barrett, F.      | Lancaster, W. T.  |
| Berry, J.        | Johns, W. H.     | Bissell, A. W.   | Lemmon, N. G.     |
| Branson, A. W.   | Keillor, G.      | Brady, W. J.     | London, T.        |
| Brittle, J.      | Matterface, H.   | Brook, W. E.     | Loveridge, C.     |
| Bunch, H.        | Page, C. W.      | Brown, A. E.     | Manning, F. E. F. |
| Carpenter, S. A. | Paternoster, F.  | Buckley, W.      | Menzies, T.       |
| Clarke, S. J.    | Smith, S. T.     | Caton, W. E.     | Moorhouse, J. L.  |
| Duncan, G.       | Stokes, H.       | Clowes, C. P.    | Newton, W. H.     |
| Emery, J. I.     | Studholme, J. H. | Cross, G. H.     | Nuttall, L. W.    |
| Green, H.        | Taylor, N. J.    | Duff, W.         | Oldfield, F.      |
| Halliwall, S. E. | Wilson, H. F.    | Duxbury, W. T.   | Ousey, T.         |
|                  |                  | Fenton, F.       | Port, H. N.       |
|                  |                  | Gales, P. F.     | Reid, N.          |
|                  |                  | Garlick, R. H.   | Reilly, E. P.     |
|                  |                  | George, W. T.    | Robb, D.          |
|                  |                  | Green, J.        | Robinson, F.      |
|                  |                  | Green, W.        | Ruggles, H. G.    |
|                  |                  | Greenwood, D. A. | Shadbolt, W.      |
|                  |                  | Harwood, B.      | Shaw, E.          |
|                  |                  | Haynes, B. S.    | Thomson, W.       |
|                  |                  | Herdman, G. H.   | Townsend, W. W.   |
|                  |                  | Higginson, F.    | Weaver, A. S.     |
|                  |                  | Hunter, R. W.    | Wellens, E. J.    |
|                  |                  | Hydes, J.        | Wilson, W.        |
|                  |                  | Jackman, J. W.   | Wilson, W. R.     |
|                  |                  | Jackson, P. B.   | Wimhurst, H. R.   |

## MANCHESTER CORPORATION GAS SUPPLY.

### Annual Report and Accounts.

We have received from the Superintendent of the Manchester Corporation Gas Department (Mr. Charles Nickson) a copy of the report of the Gas Committee, with an abstract of the accounts for the year ending March 31 last. The Committee record the progress of the undertaking as follows:—

The number of tons of coal and cannel carbonized, including the equivalents of enriching materials, and the quantity of gas and residual products made per ton carbonized, as compared with the previous year, are as follows:—

|      | Coal and Cannel Carbonized. Tons. | Gas per Ton. Cub. Ft. | Coke per Ton. Cwt. | Coke For Sale. per Ton. Cwt. | Tar per Ton. Gallons. | Am. Liq. per Ton. Galls. (10 oz.). |
|------|-----------------------------------|-----------------------|--------------------|------------------------------|-----------------------|------------------------------------|
| 1898 | 407,236                           | 10,210                | 12'82              | 8'39                         | 12'44                 | 28'06                              |
| 1897 | 408,064                           | 10,243                | 12'51              | 7'65                         | 12'80                 | 29'43                              |

The illuminating power of the gas sent from the works was equivalent to 19'51 standard sperm candles, as against 19'16 for last year.

The high temperature which was experienced during the winter months has affected the consumption of gas. The quantity transmitted from the works shows a decrease of 28,819,000 cubic feet, or 0'69 per cent., as compared with an increase of 419,769,000 cubic feet, or 11'16 per cent., in the previous year. The total output and the quantity unaccounted for, compared with the previous year, are as follows:—

|      | Gas Sent Out. Cub. Ft. | Unaccounted for. Cub. Ft. | Percentage of Loss. |
|------|------------------------|---------------------------|---------------------|
| 1898 | 4,153,520,000          | 148,549,000               | 3'58                |
| 1897 | 4,182,339,000          | 174,952,000               | 4'18                |

The number of gas consumers on the 31st of March, 1897 and 1898, was respectively as follows:—

|      | Within the City. | Beyond the City. | Total.  |
|------|------------------|------------------|---------|
| 1898 | 92,082           | 20,181           | 112,263 |
| 1897 | 82,577           | 18,070           | 100,647 |

Increase in 1898 . . . 9,505 . . . 2,111 . . . 11,616

Increase in 1897 . . . 12,031 . . . 1,374 . . . 13,405

The percentage of private consumption was as follows:—

|                                    | 1898.  | 1897.  |
|------------------------------------|--------|--------|
| Within the city—Ordinary consumers | 82'26  | 84'84  |
| Prepayment                         | 3'05   | 1'28   |
| Outside the city—Ordinary          | 14'51  | 13'82  |
| Prepayment                         | 0'18   | 0'06   |
|                                    | 100'00 | 100'00 |

The use of prepayment meters has greatly extended during the year, and has proved a great boon to the tenants of cottages. The number of



these meters in use at the end of the financial year was 22,761, as compared with 13,959 in the previous year—an increase of 8802, of which 7885 have been fixed in the city and 917 in the out-townships. The quantity of gas consumed by these meters was 117,187,000 cubic feet—an increase of 68,401,000 cubic feet, or 140·21 per cent., on the previous year. A large number of these meters have been in use for a short period only; and it is estimated that during the ensuing year the consumption by these means will be upwards of 200 million cubic feet.

The application of gas for purposes other than lighting continues to increase. The decision of the Committee to fix gas-cookers at a small percentage on the cost has given a great impetus to the use of these appliances. The number of gas fires, cookers, and other appliances on hire on the 31st of March was 5188, and the number of gas-engines in use 1424, as compared with 4094 and 1275 respectively for the year ended March 31, 1897. The quantity of gas used by cookers, fires, and engines is estimated at 285 million cubic feet; being an increase of 14 per cent. on last year's figures.

The total amount of revenue was £553,642, as compared with £552,816 in 1896-7; being an increase of £826. The revenue was derived as follows:—

|                                   | 1898.    | 1897.    |
|-----------------------------------|----------|----------|
| Gas-rentals, &c., within the city | £386,952 | £386,797 |
| Do. beyond the city               | 83,029   | 78,053   |
| Coke                              | 39,668   | 37,604   |
| Tar                               | 24,409   | 31,650   |
| Ammonia water                     | 19,071   | 18,448   |
| Sundry receipts                   | 513      | 264      |
|                                   | £553,642 | £552,816 |

The amount paid for coal, cannel, and oil, including the cost of unloading, was £221,235. The cost of this material per ton carbonized was 10s. 10·38d., against 11s. 5·27d. for the previous year—a gain to the Committee of 6·89d. per ton, which on the total carbonization of 407,236 tons amounts to £11,691. The whole of the works and plant have been kept in a state of thorough repair out of revenue.

The gross profit on the year's working was £112,796 18s. 10d. The sum of £34,193 11s. 4d. was paid for interest; and £22,435 8s. 3d. has been placed to the sinking fund (as required by the Acts of Parliament under which the money is borrowed). The net profit, therefore, amounted to £56,167 19s. 3d. Of this amount £50,700 was paid over to the city fund, and the balance, £5467 19s. 3d., has been placed to the suspense account, on account of the outlay on carburetted water-gas plant to date.

The expenditure on capital and renewals accounts was as follows:—

|                                | Capital.     | Renewals.    |
|--------------------------------|--------------|--------------|
| Gaythorn                       | £11,184 8 4  | £8,164 10 11 |
| Rochdale Road                  | 9,118 0 10   | 9,809 12 7   |
| Bradford Road                  | 34,078 5 1   | 1,528 7 6    |
| Droylsden                      | 655 18 0     | 117 17 6     |
| Street-mains                   | 20,170 15 6  | 9,873 5 8    |
| Service-pipes                  | 9,639 3 8    | 3,213 1 3    |
| Meters                         | 37,008 13 4  | 1,197 11 9   |
| Stoves                         | 7,894 18 9   | 259 12 3     |
| Stoves show-room, Deansgate    | 54 0 0       | —            |
| Oil storage depôt (Mode Wheel) | 3,298 12 1   | —            |
| Cottage property               | 1,529 7 3    | —            |
| Land and property              | 849 3 4      | —            |
|                                | £135,481 6 2 | £34,163 19 5 |

The construction of the inclined retort-settings in No. 1 retort-house at the Gaythorn station has been carried out during the year. Half of the retorts are under fire; and the whole are expected to be ready for work by the ensuing winter. The coal elevating, conveying, and charging machinery is nearly finished; and the coke-conveying plant is also well in hand. It is anticipated that when this installation of inclined retorts, with its accompanying plant and machinery, is completed and fully at work, the economical and satisfactory manufacture of gas will be greatly promoted.

The retort-settings in the "C" retort-house at the Rochdale Road station have been reconstructed on the regenerator system, and are now fully at work. The conversion of the "A" retort-house into a meter and governor house and workshops, as decided upon by the Committee, is being proceeded with.

During the past year, the carburetted water-gas plant at the Bradford Road station was completed and put to work, and has worked satisfactorily. Two cargoes of oil were received under contract during the year—one on July 26, 1897, by the s.s. *Elbruz*, containing 951,791 gallons, and the other by the s.s. *Kasbeck*, on Feb. 17, 1898, containing 956,129 gallons. The arrangements for berthing the ships and transferring the oil to the tanks were carried out satisfactorily. The use of this oil in the manufacture of gas at the Bradford Road works has greatly reduced the necessity for the purchase of expensive cannels for enriching purposes. There has also been used 5292 tons of coke; and to this extent the accumulation and deterioration in the value of the coke has been prevented. There are eight new purifiers in course of erection. A new boiler-house has been erected, with space for three boilers; and two have been placed therein. The purifiers and boilers will be available for work for the ensuing winter.

The inclined retorts at the Droylsden station were extended during the year, and continue to work satisfactorily; and the experimental purifying plant is also producing good results in sending out gas of exceptional purity and high illuminating power.

The work of keeping the street mains and services in good condition has been steadily kept in view during the year. The large increase in the use of prepayment meters, gas-cookers, and gas-fires has added much to the work of the department; and all applications for supply have been attended to as promptly as possible. A new 30-inch independent main has been laid down for transmission of gas from the Bradford Road to the Rochdale Road works, and thence to be distributed into the various districts; thus ensuring a more regular and abundant supply of gas. The total length of mains now laid is 1,351,308 yards, or 767½ miles and 64 yards.

The business done at the stoves show-room in Deansgate has been satisfactory, and gives evidence of an increasing demand for gas for

cooking and heating purposes. The following is a summary of the year's transactions, as compared with the previous year:—

|                                                                     | 1898. | 1897. |
|---------------------------------------------------------------------|-------|-------|
| Number of articles sold                                             | 947   | 1218  |
| New cookers and heaters purchased                                   | 1454  | 437   |
| Stoves issued on ordinary hire (including new stoves and re-issues) | 2312  | 1233  |
| Stoves issued on the hire-purchase system                           | 63    | 34    |
| Stoves cleaned and repaired                                         | 874   | 830   |

Accompanying the report are the accounts and the usual appendices, from which we take the following particulars:—

PROFIT AND LOSS ACCOUNT.

| INCOME.                       |               |
|-------------------------------|---------------|
| Gas-rental—                   |               |
| Ordinary meters               | £407,459 0 0  |
| Prepayment meters             | 19,698 1 9    |
| Public lamps                  | 37,350 12 7   |
| Meter-rents (beyond the city) | 3,175 16 4    |
| Stove-hire                    | 2,297 14 6    |
| Residual products—            |               |
| Coke                          | £39,668 5 5   |
| Tar                           | 24,408 15 8   |
| Ammonia water                 | 19,071 0 11   |
| Rents of cottages, &c.        | 83,148 2 0    |
|                               | 512 7 5       |
|                               | £553,641 14 7 |

| EXPENDITURE.                                                                                              |               |
|-----------------------------------------------------------------------------------------------------------|---------------|
| Cannel and coal (including cost of unloading, &c.)                                                        | £221,235 6 4  |
| Retort men's wages                                                                                        | 42,942 0 9    |
| Retorts, fire-bricks, &c. (including cost of setting)                                                     | 12,975 5 2    |
| Repairs and maintenance of works, mains, &c.                                                              | 61,304 6 11   |
| Renewals of plant, &c.                                                                                    | 34,163 19 5   |
| Purifying material and wages                                                                              | 1,638 5 4     |
| Salaries and wages of clerks in Superintendent's office, rental and inquiry offices, and meter inspectors | 20,616 3 0    |
| Collectors', receivers', and cashiers' salaries                                                           | 8,482 17 4    |
| Rents, rates, and taxes                                                                                   | 30,951 1 4    |
| Bad debts                                                                                                 | 452 15 5      |
| Miscellaneous expenses                                                                                    | 5,399 8 9     |
| Bateman's defalcation account (less £1000 receivable from guarantee fund)                                 | 683 6 0       |
|                                                                                                           | £440,844 15 9 |
|                                                                                                           | 112,796 18 10 |
|                                                                                                           | £553,641 14 7 |

|                                            |                |
|--------------------------------------------|----------------|
| Balance                                    | £34,193 11 4   |
| Interest                                   | 22,435 8 3     |
| Sinking funds                              | 56,167 19 3    |
| Balance (net profit on the year's working) | £112,796 18 10 |

The balance of net profit is applied as follows:—

|                                                                                |              |
|--------------------------------------------------------------------------------|--------------|
| Amount paid over to the city fund account                                      | £50,700 0 0  |
| Suspense account in connection with expenditure on carburetted water-gas plant | 5,467 19 3   |
|                                                                                | £56,167 19 3 |

The appendices following the accounts furnish, as usual, statistics as to the progress of the gas undertaking during the year.

The figures in Appendix A—a statement of the lamp and private rental, including meter and stove rents, derived from within and beyond the city—have already been given in the profit and loss account.

Appendix B is a comparative statement of the gas transmitted from the works in the daytime and during the twenty-four hours, for the past two years. Summarized, the figures are as follows:—

|                                        | Daytime.<br>Cubic Feet.        | Twenty-four Hours.<br>Cubic Feet. |
|----------------------------------------|--------------------------------|-----------------------------------|
| Year ended March 31, 1897.             | 1,136,285,000                  | 4,182,339,000                     |
| Do. do. 1898.                          | 1,103,229,000                  | 4,153,520,000                     |
| Decrease                               | 33,056,000                     | 28,819,000                        |
| Quantity of gas transmitted from works | 4,153,520,000                  |                                   |
| Do. measured and accounted for         | 4,004,971,000                  |                                   |
| Loss (by condensation and leakage)     | 148,549,000, or 3·58 per cent. |                                   |

In Appendix C, particulars are given as to the results of the working from June 24, 1880, to March 31, 1898. The table contains statistics as to the number of tons of coal carbonized, the total make of gas, the percentage unaccounted for, the yield per ton of coal, the illuminating power of the gas, the quantity of residual products, &c., for each year in the above-mentioned period. The particulars for the past financial year are as follows: Coal and cannel carbonized, 407,236 tons; gas made, 4,157,796,000 cubic feet; yield per ton of coal carbonized, 10,210 cubic feet; illuminating power, 19·51 candles; make reduced to 20-candle power, 4,055,930,000 cubic feet; make per ton, 20-candle power, 9960 cubic feet; make of coke, 245,749 tons; do. per ton of coal, 12·82 cwt.; make of tar, 25,160 tons; do. per ton of coal, 12·44 gallons; make of ammoniacal liquor (10-oz. strength), 10,761,957 gallons; do. per ton of coal, 28·06 gallons.

Appendix D shows the number of stoves on hire and of each size of meter in use during the year in the city and out-townships. At the close of the past financial year, there were 3760 stoves on hire within, and 1428 beyond the city—together, 5188, as compared with 2991 and 1103 (together 4094) at the corresponding date in 1897; so that there was an increase of 1094. The number of meters in use was 112,263 in 1898, and 100,647 in 1897. There was last year a net increase of 11,616 on the number for the preceding year. Of the total number at work on March 31 last, 104,752 were on hire, as compared with 92,447 at the close of the financial year 1896-7. The number of prepayment meters on hire on March 31 last was 22,761—an increase of 8802 on the number at the close of the preceding year.

From Appendix E we learn that the gas-mains laid last year within the city amounted to 30,212 yards, and beyond the city to 16,487 yards



—a total of 46,699 yards, or 26½ miles 59 yards. The mains taken up were 11,611 and 3170 yards respectively—a total of 14,781 yards, or 8½ miles 261 yards. The total net increase during the year, therefore, was 31,918 yards, or 18 miles 238 yards. The total length of mains laid at March last was 1,351,308 yards, or 767½ miles 68 yards.

Appendix F consists of a statement showing the amount of gross profit made from the gas undertaking, and the mode of its appropriation, also the amount of borrowed money owing, excess of assets, &c., from 1862 to March 31 last. The figures for the past financial year are as follows: Profit, £112,796; paid over for improvement purposes, £50,700; transfer from contingent fund, £5863; borrowed money owing, £1,058,989; and excess of assets, £1,017,410. The profit of £112,796 is appropriated thus: Interest, £34,193; liquidation of mortgage debt, £22,435—leaving a surplus of £56,168.

The report and accounts came before the City Council at the meeting last Wednesday, when their adoption was moved by the Lord Mayor (Alderman Gibson). Having detailed the chief features of the report, his Lordship remarked that when the Council considered that the price of gas had been reduced to 2s. 3d. per 1000 cubic feet, that they had abolished the charge for meter-rent, and that, notwithstanding that they had a very powerful competitor in the electric light, and an abnormally mild winter, the receipts had been £5151 in excess of those of last year, probably they would not have much to complain of. He pointed also to the saving effected in the matter of carbonizing cannel, and the small amount of leakage, and to the fact that there was an excess of assets over liabilities in respect of the gas undertaking of £1,017,410. These assets included an increase for the present year of £27,000. The Committee had not only put a very respectable sum to the contingent fund, but had set aside £50,000 towards the reduction of the city rates. He trusted the report would be satisfactory to the Council and to the public. Mr. Briggs seconded the motion, and it was carried.

### SALFORD CORPORATION GAS SUPPLY.

At the Meeting of the Salford Borough Council last Wednesday, the Gas Committee presented a report which stated that the business of the department continued to steadily increase; the increase for the year ending March 31 last being equal to 3·77 per cent. over the previous year. The coal and cannel carbonized during the year amounted to 129,016 tons; and the quantity of gas made was 1,346,315,000 cubic feet, of an average illuminating power of 19·02 candles—the parliamentary standard being 18 candles within the borough, and 17 candles, as tested, in the out-districts. The cost of coal was rather less than in the previous year; and the working expenses had been considerably less. The market for residuals had shown improved results for sulphate of ammonia; but the markets for coke and tar products had been depressed, and the revenue from these sources had fluctuated accordingly. The works and plant had been maintained in a thoroughly efficient condition. Considerable enlargements had been made in the trunk mains; and an ample supply could now be given to the out-districts. The Committee also reminded the Council that the price of gas had been reduced during the year; the differential rate having been abolished in the borough of Eccles and the districts of Swinton and Pendlebury, and reduced in other districts. The report was adopted. In proposing the acceptance of tenders for the supply of coal and cannel to the amount of 116,800 tons, Mr. Phillips explained that the Council were paying slightly more for the coal than last year, but less than the average advance in prices represented.

### BURY CORPORATION GAS SUPPLY.

#### A Loss of £1605 on the Year's Working.

At the Meeting of the Bury Town Council last Thursday, Mr. Byrom stated that on the year's working of the Gas Department there had been a loss of £1606; but, in view of pending prosecutions arising out of certain alleged irregularities in the department, he declined to give any reasons for this loss. He added that next year's profit from the gas-works was estimated at £3000, with the same price to consumers. The proceedings of the Gas Committee were confirmed. From the annual report of the Gas Manager (Mr. H. Simmonds) it appears that the quantity of gas made during the last year was 319,149,000 cubic feet, while that sold to private consumers amounted to 278,746,750 cubic feet. The gas used for public lighting aggregated 27,700,000 cubic feet; and 6,482,000 cubic feet were used for public works and clocks. The loss through leakage, condensation, &c., was 7,219,150 cubic feet, which is equal to 2·3 per cent., as against 13,060,650 cubic feet, or 4·03 per cent., in the previous twelve months. During the year, the public lamps had been increased from 2126 to 2170; and there were 275 more gas-stoves and 287 grills in use. The number of prepayment meters fitted is 1060—an increase of 204 on the year.

### ROTHERHAM GAS-WORKS CONTRACTS.

At the Meeting of the Rotherham Town Council last Wednesday, the Gas Committee recommended the acceptance of various tenders relating to the extension of the gas-works, and also for coal at prices ranging from 8s. 10d. to 9s. 6d. per ton. Mr. G. Gummer, in moving the adoption of the recommendations, said they contained some important contracts. One was in connection with the present extensions; and the Committee suggested that it should be let to Messrs. Newton, Chambers, and Co.—including purifying plant, exhausters, and scrubbers—at a cost of £11,200. There were also the contracts for the completion of the retort-house and of the additional six beds of retorts to be erected at the scheduled prices of the contract with Messrs. Dempster. Further contracts referred to foundations and the storage of tar and liquor. As to the contracts for coal, he was sorry to say the additional

cost to the department would exceed £450 a year; and he hoped the members, when they criticized the working of the department at the end of the financial year, would take this into consideration. With regard to tenders for gas-mains, he alluded to the discussion on the subject in other towns, more particularly Glasgow, as to whether tenders for mains should be let to American firms, whose quotations were considerably below those of English makers. So far as Rotherham was concerned, the price for American pipes would be £1899, as against £2318—the lowest of the English makers. In order that there should be no doubt about the quality of the pipes, he had instructed their Engineer to wire to Glasgow; and the Gas Engineer there had answered that he was quite satisfied with the American pipes. Alderman Gummer asked if the pipes were cast in America or in England by American firms. Mr. Gummer replied that they were cast in America and sent to England. The sample and inquiries would have to be perfectly satisfactory before the order was placed with the firm, who were sending a 4-inch pipe as a sample. Mr. Mason suggested it might be advisable to consider offers of coal at less prices than the Committee had recommended. He had moved in Committee that a tender at 7s. 6d. per ton should be accepted; while nearly the whole of the coal was proposed to be taken at 9s. 6d. He was told that by test the coal they had been using had yielded above 11,000 cubic feet of gas per ton, and that the coal at 7s. 6d. would give more than 10,000 cubic feet per ton. The difference of 2s. in the price more than doubly covered the lower production of gas. These remarks led to considerable discussion, among the speakers being Mr. Hirst, who thought it would be better to refer the whole of the contracts back. He argued that the decision of the Corporation some years ago, when it was made a principle to assist the local collieries, had resulted in the formation of a ring among the local coalowners; and the result had been that they had had to pay much higher prices than if there was open competition. The three top prices of the tenders recommended, he thought, furnished proof of the existence of that ring. Was it, he asked, wise to allow this ring to continue? and were the Corporation to pay through the teeth for it? Mr. F. Mason moved an amendment that a tender at 9s. 5d. per ton should be struck out, and that 1500 tons be purchased from the Company who tendered at 7s. 6d. Mr. Gummer objected to any alteration in the recommendations of the Committee. With the exception of Mr. Mason, there was not a single member who had taken part in the discussion who was present at the meeting of the Committee when the tenders were considered. They should be guided by the commercial value of the coal. Mr. Hickmott said he was of opinion that members of the Council who were in any way interested parties in coal pits should be thrown off the Committee. He asserted there was a determination in Committee that the orders for coal should go somewhere, without considering the quality. Mr. Gummer did not think any member had a right to say that persons being interested parties had made up their minds to send contracts for coal in any direction. Alderman Gummer spoke in favour of free trade in coal, and the Council acting on purely commercial principles. They had never had free trade in coal since he had been a member of the Corporation. He asked if there was not something behind this continual fighting over the coal contracts. Mr. Gummer warmly criticized his father's remarks, which he regarded as an insult to the Committee. He denied that members of the Committee were personally interested in the coal contracts; and rather than face a hint of that sort, he would give up his position as Chairman. The Mayor (Alderman G. Neill) did not think there was any personal imputation. Ultimately Mr. Mason's amendment was defeated; but a further proposal to add to the contracts 1000 tons of coal offered at 7s. 6d. was accepted by ten votes to eight.

### DENTON GAS DEPARTMENT.

#### The Annual Accounts.

The accounts of the Gas Department of the Denton Urban District Council for the year ending the 31st of March last, certified by Messrs. Nairne and Son, have been issued. They show that the gas-rents (less allowances) amounted to £8368; the meter-rents to £144; residuals produced £1714 (coke realizing £950); and the total revenue was £10,344. The manufacture of gas cost £4532, of which £2853 was for coal and £1168 for salaries and wages; distribution came to £698; and management to £779. The total expenditure was £6010; leaving a balance of £4334. Of this sum, interest on loans, annuities, and sinking fund charges for the year absorbed £3487; leaving a balance (net profit) of £847. Appended to the accounts are some particulars in regard to the manufacture of gas for the past financial year, furnished by the Manager (Mr. J. Chadwick Smith). The quantity of coal carbonized was 6569 tons; costing 8s. 8·26d. per ton. The make of gas was 71,625,000 cubic feet, of which 64,284,900 cubic feet were sold—a difference of 7,340,100 cubic feet, or 10·24 per cent. loss. Calculated at per 1000 cubic feet, the cost of gas made was 1s. 3·18d.; and gas sold, 1s. 5·52d. The average selling price being 2s. 7·24d., the gross profit was at the rate of 1s. 1·72d. The annuities, interest, and sinking fund charges work out to 1s. 1d. per 1000 cubic feet of gas sold.

**Extensions at the Bangor Gas-Works.**—Last Tuesday week, Mr. W. O. E. Meade-King, one of the Local Government Board Inspectors, held an inquiry at Bangor respecting the application by the City Council for powers to borrow £2500 for the erection of a new gas-holder and £300 for a new scrubber-washer at the gas-works. There was no opposition. The Deputy Town Clerk (Mr. J. A. Rodway) stated that the Council proposed to put up a two-lift gasholder in place of the present single-lift holder; and for this purpose £2500 would be required. The present storage capacity at the gas-works was 112,000 cubic feet, which, by the erection of the proposed new holder, would be increased to 183,000 cubic feet. Evidence in respect of this was given by the Sub-Manager (Mr. J. Smith), who also stated with respect to the sum of £500 required for the erection of a new scrubber-washer that this would be capable of purifying a million cubic feet of gas per day. In reply to the Inspector, the Borough Accountant (Mr. E. Smith Owen) stated that the total amount of the Corporation's outstanding loans was £127,350; the assessable value of the borough being £38,327.



## LOCAL AUTHORITIES AND THE WORKMEN'S COMPENSATION ACT.

### The Question of Insurance.

We have received from the Town Clerk of Stoke-upon-Trent (Mr. J. B. Ashwell) the minutes of proceedings and the resolutions passed at a meeting of representatives of a number of gas-supplying Local Authorities, convened by the Mayor of Stoke (Mr. F. Geen), held at the Westminster Palace Hotel, on the 28th ult. The Lord Mayor of Manchester (the Right Hon. Alderman R. Gibson) presided. After making a few remarks upon the desirability of combination, the Chairman called upon the Mayor of Stoke, who is also the Chairman of the Gas Committee of the Corporation. Mr. Geen explained shortly the objects of the meeting, and said it appeared to him that, under the Act, it was incumbent upon Gas Committees to make provision for claims which were likely to be made, in one of the following ways: (1) To set aside yearly a sum and become their own insurers; (2) to contract with the workmen; (3) to join together and form a mutual insurance fund; (4) to effect an insurance with an Insurance Company. It was then moved: "That we, the representatives of Corporations and Urban District Councils owning their own gas undertakings, having heard the statement of the Mayor of Stoke-upon-Trent, and his proposal for a scheme of mutual insurance against liabilities incurred under the Workmen's Compensation Act, 1897, are of opinion that it would be to the advantage of all such authorities to formulate such a scheme." A general discussion ensued; but no amendment was proposed. The Mayor of Stoke thanked those present for their kind consideration, and replied to all the points raised. He said he considered a premium of 5s. per cent. on the wages of the gas-works workmen and others coming under the Act would be ample; and instead of a differential rate, he suggested that, after providing a sufficient reserve fund, bonuses should be paid to those authorities whose workmen had not received as much out as had been paid in on their account. He further suggested that those Corporations who were not willing to become their own insurers should insure for a period of (say) three or six months, pending the completion of the scheme or otherwise. After some discussion, it was agreed that it would be desirable to include in the scheme "electricity works;" and, by consent, the resolution was altered accordingly. In this form it was unanimously adopted. The following resolutions were then passed: "That, subject to the consent of the authorities represented thereon, a Committee be formed to confer with the Mayor and Town Clerk of Stoke-upon-Trent for the purpose of formulating the scheme, and that such Committee consist of a representative from each of the following authorities—namely, Stockport, Rochdale, and Macclesfield, with Mr. J. W. Wilson, M.P." "That the Town Clerk of Stoke-upon-Trent be requested to forward copies of the resolutions passed, together with a short report, to the Chairman of the Gas Committee of each authority." A cordial vote of thanks was then unanimously accorded to the Mayor of Stoke-upon-Trent for his services; and the proceedings closed with a similar compliment to the Chairman.

Last Wednesday the Gas Committee recommended the Rotherham Town Council to insure under the Workmen's Compensation Act, and advised that the matter be left in the hands of the Chairman and Secretary of the department to deal with. In submitting the minutes, Mr. G. Gummer (the Chairman) remarked that there had been some discussion in Committee on the question of insuring the department against any probable loss through accident; and he had also attended a meeting in London, presided over by the Lord Mayor of Manchester. The general expression of opinion throughout the gas world was that they ought not to run the risk of any accident. Considering that the rates of insurance had been brought down considerably, and within the reach of gas undertakings generally, they ought to protect themselves by insurance. The Committee therefore recommended that they should insure the men, including the clerks and employees inside and outside the works. The cost would not be great. Assuming they had to pay the highest rates quoted, it would not be more than £50 per year; but they anticipated getting the rate reduced to something like £35 per year. He mentioned this because there was strong opposition in the Committee against insuring at present; the idea being that the rates of insurance would be lower later on. The recommendation was passed.

On the recommendation of the Finance Committee, the Leeds County Council last Wednesday decided to defer for six months the question of insuring against risks under the Workmen's Compensation Act through a company; and meanwhile the Sub-Committee were directed to institute inquiries to see whether it would be legal, and if so, if it would be desirable, to join other Corporations in mutually insuring their own risks. A protest against this course was made by Mr. Lowden, who pointed out that the Gas Committee were the largest employers of labour in the Council; and yet for six months they were practically uninsured. For that period the liability for any accidents that might occur was thrust upon them; and he wished to disclaim any responsibility on the part of the Gas Committee. Another matter of a cognate nature came up for discussion at a later stage of the proceedings. Alderman Cooke, the Chairman of the Water Committee, introduced a resolution, which was supported by Mr. Lowden, and which, in the course of the discussion, was amended until finally it was submitted to the vote in the following form:—"That the Council appoint a Permanent Committee, consisting of the Chairmen of all the labour-employing Committees, to advise, in conjunction with the Committees of the Corporation, on the questions of wages and conditions of labour of the whole of the workmen employed by the Corporation; and further, to deal with any matters arising under the provisions of the Workmen's Compensation Act of 1897." The resolution was lost by about 17 votes to 13.

The uncertainty that surrounds the actual financial liability of all employers of labour under the Workmen's Compensation Act has induced the Vestry of St. Margaret and St. John, Westminster, to convene a conference of all the Local Authorities throughout London to consider the desirability of forming an insurance fund with respect to claims which may be made by various classes of their workmen. Pending the selection of a day for the holding of the conference, it is interesting to note that the Islington Vestry have been early in the field of inquiry, and have

already adopted a report from their Parliamentary Committee setting forth the extent to which it is believed the Vestry, in common with others, are liable under the Act. The report states that the Vestry will have to pay compensation for accidents, in accordance with the scale and conditions set out in the first schedule to the Act, to the employees at the Vestry's electric light station. With a view to obtaining information on the subject of the risk, quotations were procured from two Insurance Companies, showing the rates of premium required to be paid to insure against the liability under the Act. In each case the rate per annum was 17s. 6d. per £100 of wages; and in one it covered the whole of the Vestry's employees, with aggregate wages of about £50,000 per annum. The same Company quoted 50s. premium, subject to discounts when the wages exceed £10,000 per annum, for the electricity works' employees only. The London County Council do not intend to take any action under the Act until it is found how cases are decided; and the Islington Vestry have resolved, in view of the high rates of premium quoted to them, to follow their example, and not insure until some experience has been gained of the working of the Act.

## THE INSPECTION OF GAS LIQUOR AND OTHER WORKS UNDER THE ALKALI ACTS.

### The Sub-Inspectors' Reports.

We complete to-day the notice, commenced last week, of the reports of the Sub-Inspectors under the above-named Act.

Reporting upon the district embracing the South-West of England and South Wales, Dr. Fryer states that the number of separate processes under examination last year was 204, of which 61 were carried on in sulphate of ammonia works and 10 in works for the distillation of tar. Some 663 visits were paid to the various establishments, and 658 chemical tests applied in order to ascertain the quantities of noxious gases escaping into the air. There are 64 works registered where the manufacture of muriate and sulphate of ammonia is carried on; and the total quantity of ammoniacal compounds produced during last year amounted to 8859 tons, calculated as ammonium sulphate. Complaints are occasionally made of nuisance caused in the immediate vicinity of one works hemmed in by dwelling-houses, owing to emission of foul gases. Some of these complaints may, Dr. Fryer says, be well founded; for the steam driven off by the evaporating liquors has an unpleasant odour. The pans are covered in, and some effort is made to condense the steam and pass the residue into a hot flue. Still, it is difficult to prevent a portion of the steam escaping at times into the atmosphere. The Coppée ovens are in use for the coal coked at several of the large iron-works in South Wales, and the volatile matter, excluding water, has been estimated in the coal of the district to be about 17 per cent. As yet nothing has been heard of any serious attempt being made to recover the bye-products. Last year the Chief Inspector commented on this fact; adding: "A change may, however, be effected as, by the introduction of coal-washing machinery, the conditions are now so much modified that the opinion is gaining ground that the air admitted in the Coppée oven may be dispensed with without injury to the resulting coke, in which event plant would soon be added for the recovery of tar and ammonia." Dr. Fryer states that the ingenious form of saturator invented by Mr. C. Stafford Ellery, and described in a previous report, is still giving satisfaction at the Bath Gas-Works.\* The top of the saturator is now completely covered in. Mr. Ellery claims that the life of a self-emptying saturator will be longer than that of one subjected to the wear and tear of scooping with wood or metal ladles; that the labour of discharging the saturator is considerably lessened; and that the colour of the salt is better, as it is not brought through the scum which accumulates on the top of the mother liquor. As already mentioned, the total quantity of liquor distilled last year was equivalent to 8859 tons of sulphate of ammonia; the proportion of liquor distilled by the continuous process being 83·2 per cent. The following are the proportions of sulphuretted hydrogen treated by various methods of disposal, in terms of sulphate of ammonia made and per cent. of total make: Claus process, 8·9; oxide of iron purification, 47·6; combustion, 43·5 (mainly from one works). The distillation of tar is carried on at 10 works in Dr. Fryer's district. There has been no alteration in the methods of dealing with the nuisance arising from the gases and vapours escaping from the worm-ends of the condensers and the cooling of the pitch which were described in last year's report.

Dr. Fryer bears testimony to the value of oxygen as a restorative. In several large works in his district, a bottle of compressed oxygen, with reducing-valve and mouthpiece, is now kept in readiness for cases of gaseous poisoning; and he states that several lives have undoubtedly been saved by this valuable restorative. Last year's annual report contained the statement that Mr. William Windus employed compressed oxygen at the Netham Chemical Works, Bristol, as a restorative as early as Oct. 25, 1893. "This, however," says Dr. Fryer, "does not appear to have been the first instance of the use of this excellent remedy for gaseous poisoning; and though Mr. Windus independently discovered the property of oxygen as a resuscitant, he was unaware of the earlier experiments carried on by Mr. Douglas Herman. Some years previously, Mr. Herman had considered this matter; and in April, 1888, he provided an oxygen bottle for use in Messrs. Pilkington's Glass Works at St. Helens. Mr. Herman found it useful on several occasions; and on the 11th and 12th of October, 1893, he applied this remedy in a serious case. Great credit is due to Mr. Herman, who is not only the pioneer in the actual use of oxygen as a restorative, but has been so successful in making a practical use of his discovery."

The separate processes under supervision in the works in Mr. F. Napier Sutton's district, embracing the eastern and south-eastern counties, number 260, of which 76 are connected with the manufacture of sulphate of ammonia, and 19 with the treatment of gas liquor and the distillation of tar. Of the 76 works in which there is plant for the manufacture of sulphate of ammonia, it has not been worked in three. The chief source of the ammoniacal liquor treated is the distillation of coal for gas manufacture. A small portion, however, is derived from the carbonization of bones for animal charcoal manufacture, which produces

\* See "JOURNAL," Vol. LXV., p. 1360.



a very rich liquor. The products consist mainly of sulphate of ammonia; but carbonate and nitrate of ammonia, liquid (refined), and anhydrous ammonia are also made. The total quantity of ammoniacal compounds produced during the past year amounted to 44,141 tons, calculated in terms of sulphate of ammonia. This is an increase of 948 tons on the amount produced in the previous year. Mr. Sutton says the latter figure bears no relation to the increased production of gas made in the district, which has been great; but proportionately less coal has been carbonized owing to the extended use of carburetted water gas. Continued pressure was again brought to bear last year upon the larger works at which the foul gases evolved in the distillation of gas liquor have hitherto been burnt; and some important changes in the method of disposal have resulted or are in course of being carried out.

Reference is made at some length to the proceedings taken against the Commercial Gas Company, which were noticed when dealing with the report of the Chief Inspector. It may be remembered that the case was adjourned for four months, to enable the Company to carry out the completion of the acid works to the satisfaction of the Department; a pledge being given to the Court that the limestone tower for the neutralization of the sulphuretted hydrogen kiln gases would be completed and put in action forthwith. The limestone scrubber was put into use four days later, and has since been continuously in use. It consists of a wooden structure made of 1½-inch tongued and grooved boards, 5 ft. 6 in. square and 21 feet high. Layers of Derbyshire limestone, in good-sized pieces, are supported on five stout wooden gratings; the layers of stone being some 9 inches deep. Manholes for re-charging the trays with fresh stone as this wastes away are provided above each tray. A tumbling-box for flushing with water is fixed inside the scrubber at the top, at which point the neutralized gases leave the apparatus for the draughting chimney. The inlet and outlet pipes are of cast iron; but lead pipes would perhaps be better, for though the acid gases have much less action on cast iron than on wrought iron, some action does occur. The sulphurous acid gases leave the furnace at a very high temperature, and are led by a 9-inch cast-iron pipe to the base of the scrubber. The heat of the gases very rapidly falls by radiation; and in the instance under notice they are quite cold at a distance of 35 feet from the furnace. The acid plant erected at these works was completed and started in November last. The sulphuretted hydrogen will in future be utilized as a source of sulphur for acid manufacture; but the limestone scrubber will be retained in readiness for use again should it be required by reason of temporary stoppage of the plant for repairs.

Mr. Sutton gives the following average figures, obtained from several series of tests, as showing the results accomplished by the use of the scrubber above referred to: Acidity of furnace gases entering the scrubber, 41·40 grains of sulphur trioxide per cubic foot; exit gases from scrubber after neutralization, 0·81 grain; percentage of acid condensed, 98·05. On one occasion, when the sulphate plant was in very full work, and the quantity of gas passing to the kiln was large, the following figures were obtained: Inlet, 61·85 grains; exit gases from scrubber, 0·8 grain; condensation, 98·71 per cent. Mr. Sutton says: "The application of this somewhat novel method for the treatment of the foul gases from sulphate works has thus proved successful, and it has met with the approval of several gas engineers who had under consideration the adoption of other means for the treatment of the foul gases in place of the combustion method *per se* which had been condemned. Limestone scrubbers are now in course of erection at three works at which the gases have in the past been burnt and discharged into the air. . . . Should this neutralization method by these further trials continue to prove an easy and cheap way of getting rid of the troublesome and noxious gases, considerable extension of it may be anticipated in the future, for it is especially applicable to the larger-sized works at which the quantity of sulphuretted hydrogen is too great for economic treatment by oxide purification, and where other approved methods are impracticable, or are thought by the management to be undesirable."

The proportion of liquor distilled by the continuous process in Mr. Sutton's district is 98 per cent. The sulphuretted hydrogen is treated by the following methods: Passed to vitriol chambers, 62·1 per cent.; by Claus process, 13 per cent.; by combustion, 11·2 per cent.; by oxide purification, 7·6 per cent.; by neutralization of the sulphur dioxide (combustion) on being passed to the hydraulic main, 6·1 per cent.

The Claus sulphur-recovery process was used throughout the past year at nine works, and twelve sets of plant exist, though only eleven were employed. Two of these came into use during the past year; and the proportion of gas now treated by this method has increased. All the plants are provided with small limestone towers and oxide purifiers to deal with the sulphur dioxide and sulphuretted hydrogen, which invariably pass away in more or less quantity from the sulphur-depositing chambers. The quantity and proportion of these gases vary considerably according to the way in which the air supply to the kiln is regulated. At some of the works, a careful balance of reaction is aimed at; while at another, preference is given to keeping down the formation of acid compounds to the lowest point. But in most cases a slight excess of air is used in order to maintain the heat of the kiln high, and prevent blockage at that point by solidification of sulphur, and also to guard against over-taxing the terminal catch purifiers.

Oxide purification is in use for the treatment of the foul gases at 43 works; the percentage given above showing a reduction on that of the year 1896 although the number of works using the method is greater. Treatment by oxide is chiefly used at the smaller works, and the production of sulphate at these has not increased so rapidly or in the same proportion as at many of the larger works. At one works, a duplicate purifier has been provided, together with one of Walker's automatic change-valves for the revivification of the oxide *in situ* by chimney draught. Where similar automatic change-valves with chimney connection have been introduced, considerable benefit in prolonging the life of the purifiers has resulted, and their use is accompanied with a minimum of trouble; and mistakes in connection between inlet gases, purifiers, and chimney are rendered impossible. Revivification *in situ* is practised by more primitive means, but with good results, at several other works; but Mr. Sutton says the practice is not so general as it should be.

The use of the hydraulic main for the disposal of the saturator gases with subsequent absorption in the coal-gas purifiers, is practised at three works. This method was used during the past year at one works at which the gases had formerly been burnt in the retort-house flue. The

addition of the saturator gases to the crude coal gas had naturally a considerable effect upon both the lime and oxide purifiers; and the quantity of coal gas passed through each box before these became foul showed considerable diminution. Mr. Sutton states that the present method is only tentative, and it will probably give place to combustion and the use of the limestone tower. The quantity of saturator gases passed to the hydraulic mains, together with that treated by neutralization, amounts to 6·1 per cent. of the total required to be treated in the district.

The balance of 11·2 per cent. of saturator gases is disposed of by the primitive and unsatisfactory method of combustion in special fires and retort and boiler flues, and is in use at 13 works. Mr. Sutton regards it as very satisfactory to find both the number of works and the proportion of gas thus dealt with showing such marked diminution year by year. The reduction of the percentage figure to the extent of 6 per cent. in one year is a very long step in the right direction. Pledges have been given, in the case of several of the larger works, that combustion *per se* will be finally abandoned for more approved methods during this year.

Gas tar is distilled at 16 works in the district, and for this purpose 113 stills of various types and capacity are employed. The largest number in use in any one establishment is 48; while at several of the smallest works from one to three stills only exist. The quantities of tar dealt with daily by each still vary from 2000 gallons in the smallest intermittent pot stills to 24,000 gallons per day treated by the patent continuous still. The distillation of tar was given up during last year at the bye-product works of a provincial gas company at which the tar produced at the company's works was distilled. Mr. Sutton states that this tar was notoriously difficult of distillation, owing to its exceedingly carbonaceous character and the quantity of naphthalene contained in it; and it was a matter of wonder to those who knew its nature by experience how it could be distilled at all by itself. The pitch from the tar latterly became quite unsaleable. It has now been arranged for the tar to be taken by a private firm of distillers, who, by mixing it with other tars at their disposal, will have no difficulty in its treatment.

The permanent gases evolved at the worm ends of the tar-stills continue to be treated as hitherto. In every case except one they are passed to the still or boiler fires; the exception being a set of six stills the gases from which are passed through a washer, and then absorbed in oxide of iron. The draughting appliances and methods of final disposal of the gases are generally satisfactory. Some trouble has been experienced at one of the larger works from the destructive action of the gases on the exhaust engine used for draughting them. It has frequently required repairs, and recently the fan had to be entirely renewed. However, since the use of small water-seals close to the point of entry of the gases to the fires, no case of back-firing has occurred.

It only remains now to notice the report of Mr. W. S. Curphey with reference to Scotland. The number of processes under inspection last year was 204, of which 65 related to the manufacture of sulphate of ammonia, and 44 to the distillation of tar. The quantity of sulphate made was 68,521 tons, as compared with 67,243 tons in 1896. The total production was from the following sources: Shale-works, 37,153 tons; iron-works, 17,379 tons; gas liquor works, 13,989 tons. In the course of the year, 428 visits were paid, and 298 examinations made of the gases passing into the air. In several works improvements were made for the more efficient treatment of the noxious gases given off during manufacturing operations. New or enlarged oxide of iron purifiers were provided in five works; and in one, additional cooling appliances were erected for condensing the accompanying steam before the waste gases are led to the purifier. The number of works in which tar was distilled was 44—an increase of one over 1896. One was started for treating tar from gas-works. The chief feature of interest, as regards these works, was the putting into operation, for the first time in Scotland, of Mr. F. Lennard's continuous system of tar distillation, which has been in use in England for some time, and also on the Continent. This system was described in the "JOURNAL" for Sept. 25, 1894 (p. 604); and Mr. Curphey remarks in regard to it that for large works it presents advantages, among which are a reduction in the possibilities of the escape of noxious gases and vapours, and a greatly lessened danger from fire—a most important consideration in works of this character. For these reasons, its adoption is, he says, of general benefit, apart from the question of reduced cost in manufacture. The Chief Inspector under the Act (Mr. R. Forbes Carpenter) refers to it in commendatory language in his report on Scotland. He says it has been in operation far too short a time to enable those who have introduced it into that part of the United Kingdom to speak with certainty as to its merits from the financial point of view. There is no doubt, however, as to its success technologically; and the perfect control the system gives over the whole series of operations ensures a minimum of escape of noxious and acrid vapours. He adds that the apparatus is so complete a revolution in design that hesitation and caution in its adoption are quite natural. He points out, however, that with it there is much less tar in operation at any given time; so that the liability to the serious consequences which follow on accidents must be lessened in their intensity.

This notice of Mr. Forbes Carpenter's report must not close without mention of his reference to the experiments on fertilizers inaugurated in 1896 by Lord Roseberry on his estate at Dalmeny, in which the County Analyst for Midlothian (Mr. J. Hunter) has taken so prominent a part. Particulars of these experiments appeared in the "JOURNAL" for Feb. 1 last (p. 229). They have attracted very wide notice, in England as well as in Scotland. Many of them were directed, both in 1896 and in 1897, to the comparison of the relative values of sulphate of ammonia and nitrate of soda, especially when used in conjunction with other fertilizers, and with the advantage of the knowledge that has of late years been acquired from the study of soils and of the process of nitrification accomplished by the agency of bacteria. The results on the experimental duplicated plots show that, for hay, potatoes, and turnips, sulphate of ammonia established its superiority over its rival both in the weight and the quality of crop obtained. In oats, however, the difference was not marked; but here the experiments were not strictly comparable, owing to the operation of disturbing causes. Mr. Carpenter says the value to the whole country of these patient and complete experiments, which continue the classic researches at Rothamsted of Sir J. Lawes and Dr. Gilbert, is undoubted.



## METROPOLIS GAS SUPPLY.

## Dr. A. W. Williamson's Quarterly Report.

The following is an extract from the report of Dr. A. W. Williamson, F.R.S., the Chief Gas Examiner for the Metropolis, on the quality of the gas supplied to London during the quarter ended the 30th ult. :—

## Illuminating Power (Candles).

|                                       | Max. | Min. | Aver. |
|---------------------------------------|------|------|-------|
| <i>The Gaslight and Coke Company—</i> |      |      |       |
| Fenchurch Street, E.C.                | 17.0 | 16.3 | 16.6  |
| Kinghorn Street, Cloth Fair           | 17.1 | 16.2 | 16.5  |
| Dorset Buildings, E.C.                | 17.1 | 16.2 | 16.6  |
| Millbank Street, S.W.                 | 17.3 | 16.2 | 16.6  |
| Ladbroke Grove, W.                    | 16.8 | 16.3 | 16.4  |
| Vincent Terrace, N.                   | 17.5 | 16.0 | 16.4  |
| Carlyle Square, Chelsea               | 16.6 | 16.0 | 16.2  |
| Camden Street, N.W.                   | 16.9 | 16.0 | 16.4  |
| Graham Road, Dalston                  | 17.2 | 16.2 | 16.6  |
| Kingsland Road, E.                    | 17.6 | 16.0 | 16.7  |
| Spring Gardens, Charing Cross         | 16.9 | 16.0 | 16.3  |
| Vinery Villas, St. John's Wood        | 16.6 | 15.8 | 16.1  |
| Lambeth Road, S.E.                    | 16.7 | 16.0 | 16.1  |
| Hornsey Road, N.                      | 17.4 | 16.0 | 16.4  |
| George Street, Hampstead              | 17.5 | 16.0 | 16.6  |

## Commercial Gas Company—

|                        |      |      |      |
|------------------------|------|------|------|
| Wellclose Square, E.   | 16.7 | 16.0 | 16.2 |
| Parnell Road, Old Ford | 17.6 | 16.0 | 16.4 |

## South Metropolitan Gas Company—

|                            |      |      |      |
|----------------------------|------|------|------|
| Hill Street, Peckham       | 17.5 | 16.0 | 16.8 |
| Bedford Road, Clapham      | 17.3 | 16.0 | 16.6 |
| Stoney Lane, Tooley Street | 17.7 | 16.0 | 16.4 |
| Lewisham Road, S.E.        | 16.9 | 16.0 | 16.2 |
| Blackfriars Road, S.E.     | 17.3 | 16.0 | 16.5 |
| Burrage Road, S.E.         | 16.8 | 16.0 | 16.4 |

It appears from these results that the average illuminating power of the gas has been higher than the parliamentary standard at all the testing-stations.

## Sulphur (Grains per 100 Cubic Feet of Gas).

|                                       | Max. | Min. | Aver. |
|---------------------------------------|------|------|-------|
| <i>The Gaslight and Coke Company—</i> |      |      |       |
| Fenchurch Street                      | 13.3 | 9.0  | 11.1  |
| Kinghorn Street                       | 14.0 | 8.9  | 11.3  |
| Dorset Buildings                      | 13.1 | 7.8  | 10.6  |
| Millbank Street                       | 10.6 | 6.9  | 9.0   |
| Ladbroke Grove                        | 12.3 | 8.6  | 10.2  |
| Vincent Terrace                       | 17.9 | 11.3 | 14.1  |
| Carlyle Square                        | 18.8 | 7.0  | 10.6  |
| Camden Street                         | 14.1 | 10.7 | 12.1  |
| Graham Road                           | 11.5 | 6.7  | 9.1   |
| Kingsland Road                        | 14.3 | 8.3  | 10.6  |
| Spring Gardens                        | 15.8 | 8.4  | 11.4  |
| Vinery Villas                         | 13.8 | 10.2 | 11.8  |
| Lambeth Road                          | 13.4 | 6.1  | 9.1   |
| Hornsey Road                          | 16.5 | 8.3  | 11.8  |
| George Street                         | 15.1 | 9.8  | 12.5  |

## Commercial Gas Company—

|                  |      |     |     |
|------------------|------|-----|-----|
| Wellclose Square | 10.2 | 6.5 | 8.3 |
| Parnell Road     | 13.3 | 3.9 | 7.1 |

## South Metropolitan Gas Company—

|                  |      |     |      |
|------------------|------|-----|------|
| Hill Street      | 13.7 | 6.7 | 9.8  |
| Bedford Road     | 13.0 | 5.9 | 10.8 |
| Stoney Lane      | 22.6 | 7.7 | 11.4 |
| Lewisham Road    | 13.4 | 8.3 | 10.8 |
| Blackfriars Road | 19.2 | 6.1 | 10.1 |
| Burrage Road     | 12.5 | 8.8 | 10.4 |

The average amount of sulphur present in the gas at all the testing-stations has been considerably less than the quantity permitted: Sulphuretted hydrogen has not been present in the gas at any of the stations.

## SALES OF STOCKS AND SHARES.

Mr. Alfred Richards conducted a very satisfactory sale of stocks and shares at the Mart, Tokenhouse Yard, on Monday last week. There was a good attendance, and the competition was decidedly keen. The first lots consisted of a new issue of ordinary stock of the Guildford Gas Company, £5000 of which was offered. It ranked for a standard dividend of 5 per cent. per annum, subject to the sliding-scale. The average price realized was £120 2s. 7d. per £100 of stock; returning the investor £4 3s. 3d. per cent. The total of the sale was £6006 10s. The next lots were a new issue, by order of the Directors, of £10 shares in the Southend Gas Company. The average price realized was £18 5s. 8d. per share; yielding the investor £4 2s. 1d. per cent. The sale produced £15,543 15s. Some shares in the Dorking Gas Company were next offered. The £25 "A" and "B" shares (10 per cent.) fetched an average of £56 12s. 7d.; returning £4 8s. 3d. per cent.; while a "C" share (7 per cent.) was sold for £41, yielding £4 5s. 4d. per cent. on the investment. The sale closed with a new issue of £10 shares in the Whitechurch and District Gas Company, Limited; the dividend on similar shares being at the rate of 6 per cent. They fetched £11 5s. each; yielding the investor £5 6s. 8d. per cent. The total realized was £1687 10s.

Among recent sales, the following may be noted: Messrs. Sewell and Barnes sold at Norwich some ordinary shares (£20) of the British Gas-light Company, Limited, at £126 to £127, and £53 10s. to £54, respectively. Last Thursday afternoon, Mr. J. Chambers disposed of £400 of original 10 per cent. stock of the Henley Gas Company, which realized on an average £232 10s. for each £100; £240 of 5 per cent. shares in the same Company were sold at an average of £117 for each £100 lot; and £150 of new 7 per cent. stock fetched £234. On the same occasion a £100 debenture bond in the Henley Water Company was purchased for £105.

## ELECTRIC LIGHTING NOTES.

As the result of a report by the Electric Lighting Committee, the Hereford Town Council have decided to proceed with an installation of electric lighting. The Committee have visited various works; and they believe they will be in a position later on to recommend the Council to adopt gas as the motive power for the generating plant.

A report of Mr. Horace L. P. Boot, the Borough Electrical Engineer of Tunbridge Wells, on the second year's working of the electric lighting undertaking shows that a net profit has been made of £1632. He recommends that the profits should go to benefit the undertaking, and not towards a reduction of rates. The question of introducing electric traction into the town is, he added, being mooted; and he can foresee that if such a venture be entered upon, it will provide a very beneficial load to the lighting works in the daytime, when they are practically idle.

Up to the present, the Bedford Corporation have borrowed £49,000 for electric lighting purposes, including buildings, and they have sanction for raising up to £58,650; but this difference is fully exhausted by outstanding liabilities and works in progress. Last Wednesday week, Mr. H. Law, an Inspector of the Local Government Board, held an inquiry in regard to the Corporation's application for sanction to borrow a further sum of £5400 for providing 65 more arc lamps, lighting the market, extending the engine-room, and making numerous additions to the plant. On the 1st inst., a fresh section of the town was lighted for the first time by electricity; about 106 street-lamps being put into regular operation.

The energy with which even the smaller towns are being exploited by the advocates of the electric light is illustrated by the case of Camborne. The District Council of the place received with astonishment a few days ago the information that the Camborne Electric Supply Company intend to apply for a Provisional Order to supply electricity in the district. "I did not know there was such a company in existence," said the Chairman; and everyone else seemed equally ignorant, though one of the members ventured upon the guess that it was a London Company with local representatives. There was a general disposition to give the electric light a hearty welcome, but less unanimity upon the idea of receiving it through a company; some members being of opinion that it could be carried out quite as well by the District Council. In the end the matter was referred to a Committee.

A somewhat singular, and perhaps not unnatural, act of retaliation on the part of the Electric Lighting Companies is proposed as a result of the second reading by the House of Commons of the Bill to confirm the Electric Lighting Provisional Orders granted by the Board of Trade to the Vestries of Marylebone and Bermondsey. The ultimate fate of the Confirmatory Bill, however, has yet to be decided in Committee. The efforts of the Companies have been in no way daunted, since they also intend, if possible, to bring about contemporary competition with the Local Authorities by seeking to avail themselves of the 1st section of the Act, which has so far secured the success of the Vestries. With this object in view, the County of London and Brush Provincial Electric Lighting Company and the Marylebone Electric Supply Company have served notices on the Vestry of Marylebone intimating their intention to apply to the Board of Trade for Provisional Orders for that district. This is not all, since the Metropolitan Electric Supply Company propose to invade Islington, and have given a similar notice to the Vestry of that district. But Bermondsey has been left to the Vestry and the Companies already possessing powers for parts of the parish.

The Luton Town Council decided last Tuesday, by 15 votes to 7, to adopt the electric lighting scheme of Mr. Albion T. Snell, who was authorized to take all necessary steps for completing an installation. The Electric Lighting Committee have made tours of inspection to Brighton, Dewsbury, and Bradford; but their report, as well as that of the expert, has been keenly criticized. Mr. Snell's scheme estimates the demand for private lamps at 6000, and puts the total consumption for the first year at 126,590 units. The estimated revenue on an outlay of £20,000 is £2757, and the cost of maintenance £2796; leaving an estimated deficit on the first year's working of £39. Mr. Snell first included an item of £623 as revenue from motors and heating; but, in deference to strong criticism, he reduced these items to £276, and compensated for this by increasing his estimate for private lamp consumption from £1850 to £2220. During the debate, it was pointed out that the cost of street lighting by the Gas Company in Luton was about £1500, while in Bedford the outlay for gas and electricity was £1000 more. In addition, the Luton Gas Company lighted the streets with great efficiency, and, while charging the Corporation only 2s. 3d. per 1000 cubic feet, made a present to the town of 1,250,000 cubic feet of gas annually. Mr. Snell proposes to light a small street area by electricity; but his estimated cost is £260, against £130, the present cost by gas. The argument of the Chairman of the Electric Lighting Committee that postponement would mean the loss of the order, and that a company were ready and anxious to step in, seemed to turn the majority in favour of adopting the scheme.

The progress of the electric lighting undertaking of the Manchester Corporation is shown by the report of the Electric Lighting Committee for the year ending the 31st of March. The Committee state that the number of consumers at the close of the year was 1981; being an increase of 400 as compared with the previous year. The total number of lamps connected was: Incandescent, 149,176 (of 8-candle power); arc, 1399—as compared with 120,142 incandescent and 1172 arc respectively in 1896-7. There were also 214 motors in use, representing 496-horse power; being an increase on the previous year of 92 motors, equivalent to 279-horse power. The total length of mains now laid is 80,102 yards, or 45 miles 902 yards. The amount of energy measured and accounted for was 3,641,599 units; being 93.11 per cent. of the total generated at the works. The financial results of the year had been satisfactory. The net profit, after defraying all charges for cost of production, &c., providing for renewals, sinking fund, and interest on loans, amounted to £13,522 17s. 4d. On the 30th of September last the price of electric energy was reduced from 6d. to 5d. per unit consumed, and the fixed charge to long-hour consumers was reduced from £9 to £7 per annum per unit of demand. For the purposes of extensions in contemplation, further borrowing powers are necessary; and, in accordance with a resolution of the City Council, application has been made to the Local Government Board for sanction to raise an additional sum of £200,000. The 20th of May, 1897, marked the commencement of arc lighting in the streets, on which



date the electric energy was switched on to the arc lamps in Albert Square, St. Ann's Square, and Piccadilly. In compliance with instructions from the City Council, arc lamps are shortly to be erected in many of the principal thoroughfares of the city.

The Mayor of Nottingham (Dr. E. H. Fraser) made an important speech, at the meeting of the City Council yesterday week, regarding the Bill of the General Power Distributing Company, and its bearing upon the electricity supply undertaking of the Corporation. He described the strenuous opposition which had been offered to the passing of the Bill by the Corporation and others, and complained of the want of exact details as to what the Company proposed to do. That the ratepayers of that city, or of any other city, were to be called upon to assist and take a supply from a Company of that description, in order that a large surrounding district might benefit by their expenditure, was, he thought, a proposition that the Council, or any other Council worthy of the name, was bound to fight to the very last penny they possessed. The proposed powers would constitute an intolerable burden upon the ratepayers. Pointing out the ill-effects of competition by undertakings of this kind, he commended to the notice of those who believed in competition the clause which now appeared in the Bill as it had left the House of Lords. Under that clause, the Corporation had the power to take from the Company a supply in bulk. For that supply, both as to quantity and price, they were to pay arbitration terms; but the distribution of the supply and the cost to the consumer remained in the hands of the Council. Therefore, as regarded the great majority of the consumers under the Bill as it now existed, there could be no competition. It was true that there was an exception made for very large consumers—those taking, he thought, 10,000 units; but they were very few in number. The Council possessed an electric supply undertaking of their own; they had expended upon it about £80,000; they had agreed to expend a further £150,000 in works of extension; and in the near future a very large sum of money—probably a quarter of a million or more—would be spent in the provision of electricity in working of the tramways. They could do everything that the Company would undertake to do; and their charges for electricity were lower than the charges scheduled in the Bill. They claimed that the Bill was an intrusion on their just rights; and having regard to the fact that it proposed to do nothing for them but what they could do for themselves, they said that there was no justification for the foisting of the Company upon them. He therefore moved that the Special Committee be instructed to oppose vigorously the Bill in the House of Commons. Sir John Turney seconded the motion, which was unanimously passed.

#### METROPOLITAN WATER SUPPLY COMMISSION.

Twenty-eighth Day—Monday, July 4.

(Viscount LLANDAFF, Chairman, Sir G. B. BRUCE, M.Inst.C.E., Major-General A. DE COURCY SCOTT, R.E., Rt. Hon. J. W. MELLOR, Q.C., M.P., Mr. A. DE BOCK PORTER, C.B., and Mr. R. LEWIS.)

The sitting took place at the Guildhall, Westminster.

The following Counsel are engaged: Mr. POPE, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., for the New River Company; Mr. LITTLER, Q.C., and Mr. LEWIS COWARD for the Kent Water Company; Mr. PEMBER, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. RICKARDS for the Chelsea Water Company; Lord R. CREIL for the Hertfordshire County Council; Sir JOSEPH LEESE, Q.C., M.P., for the Kent County Council and Kent Local Authorities; Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN, Q.C., for the London County Council; Sir R. NICHOLSON for the Middlesex County Council; and Mr. GABRIEL P. GOLDNEY (Remembrancer) for the Corporation of the City of London. The Southwark and Vauxhall Water Company are represented by Messrs. BIRCHAM AND CO.

Mr. Howard Martin, Chairman of the Water Committee of the County Borough of Croydon, said the Corporation of Croydon had two sets of water-works—viz., four wells at Surrey Street, Croydon, and one well at Addington; all being in the chalk. The latter well was outside the borough. The Surrey Street wells were constructed under the powers of the Public Health Act; and that at Addington, under a Special Act. The total capital expenditure had been £158,000. The population of the borough at present was 124,000; and the increase was at the rate of about 3000 a year. The Corporation powers of supply extended over a radius of two miles from the Town Hall. A portion of the northern part of the borough, beyond the radius of two miles, was supplied by the Lambeth Company; this being an area which the Statute forbade the Corporation supplying. The Corporation furnished water to 94,000 people; and the Lambeth Water Company, to 30,000. The Corporation were unable now to supply these 30,000; and they were therefore contemplating an extension of works, at a cost of £37,000. One site for the extension—the Waddon—was being investigated by the Local Government Board. He asked to be excused mentioning the locality of the second, as some difficulty was anticipated in connection with it. With the contemplated works, the Corporation would be able to supply the whole of the borough, and meet the increase that was taking place. The two-mile radius was not strictly adhered to, because the Lambeth Company supplied parts of 33 roads within the radius. Croydon had always insisted on being allowed to supply itself; and this was the view still entertained. Further, the Corporation held that the Water Companies supplying London should not be allowed to take any water from the district whence Croydon drew its supply. The water obtained from their district, while enough for Croydon, would not be sufficient if the London Water Companies were allowed to draw upon it; and it would be a mere drop in the bucket of the requirements of London. The Lambeth Company had power to sink wells in Croydon, but had never done so; and whoever purchased the Lambeth Company, or whether the Company remained as it was, Croydon would object to the power being exercised. Croydon would very strongly object to any scheme by which the London County Council should supply them in bulk, because they held it was very desirable that the supply should be in the hands of the Local Sanitary Authority. If matters were left absolutely as at present Croydon would not press for any change; but if any alteration were made, Croydon would ask to be allowed to buy the part of the

Lambeth Company's undertaking which was within Croydon. Otherwise, if the Lambeth Company were purchased, more water might be required, and it might be taken from Croydon sources. There had been considerable complaint because one part of the borough was not supplied with as good water as the other. After heavy floods, for instance, the quality of the Lambeth Company's water was not so good as usual. Then Croydon could not make the Company give a constant supply to houses above a certain level, which houses were not at present so supplied. Then some of the mains were laid so shallow that the water froze very easily. The charges of the Corporation averaged 5½ per cent. on the rateable value, whereas those of the Lambeth Company averaged 7½ per cent. In some cases, the Company's charges were 100 per cent. above those of the Corporation. Croydon was strongly opposed to the acquisition of the Metropolitan Water Supply by a single Authority—to any Authority having any jurisdiction there, or enjoying any portion of the supply there. Croydon made a profit on the supply of water, which was applied partly in reduction of the rate, and partly to provide a fund to meet future water expenditure. With the proposed extension, Croydon would be able to give a constant supply where the Lambeth Company did not, and, as Croydon thought, could not give such a supply. On the subject of control, he wished for power to proceed in regard to complaints against the Water Companies as summarily as they could if short weight of bread or coal were given; and also power to take samples of water wherever they liked. On it being pointed out to witness that power to proceed summarily was given under the Act of last year, he said in that case the Act would meet one of his points.

The CHAIRMAN remarked that the Local Authorities never seemed to read or trouble about the Acts of Parliament relating to water. Their ignorance of them made one rather shy about recommending any further enactment.

Witness (continuing) said that with regard to streets inside the two-mile radius supplied by the Lambeth Company, the Corporation had a friendly arrangement under which the Company reduced their charges to about those of the Corporation. The agreement, he thought, did not extend to outside the radius.

By Major-General SCOTT: Sometimes he believed wells in the chalk affected one another, even if a considerable distance apart; sometimes they did not. As a matter of fact, the West Kent wells about a mile from the Croydon wells had not affected the latter; nor had the Croydon wells affected those of the West Kent Company.

Mr. Salter White, Chairman of the Croydon Rural District Council, and formerly Chairman of the Public Health Committee, said the Council comprised a number of parishes lying round the borough of Croydon. Of these parishes, Mitcham and Merton were supplied by the Lambeth Company; Wallington and Beddington, by the Sutton District Water Company; and Purley and the southern portion of the district, by the East Surrey Water Company. The total population was 34,000, of which 17,000 were supplied by the Lambeth Company. In 1895, there was considerable difficulty with the frost in districts supplied by the Lambeth Company; some of the houses in Mitcham remaining without proper water supply till the middle of June, 1896. The Council felt that the Local Authorities, particularly the Sanitary Authorities, should have control over the water supply—especially as to taking samples for analysis from the sources, in order to protect the community against contamination, which they feared might come from surface water percolating into the wells. This was a point which the Council wished to emphasize. The Council favoured the purchase, by the Surrey County Council if possible, of the Lambeth Company—the Croydon Rural District Council to have control, both as to mains and water supply, of the portion of the undertaking which passed through their district, through either a Joint Water Board of the Surrey Authorities or the Surrey County Council. His Council were absolutely opposed to the purchase by an outside body of the Company supplying them with water. They would like to have power to inspect the filter-beds, and to refer to the Local Government Board for settlement any complaints they might make as to the mains. They were opposed to any scheme which would include the London County Council, because they objected to being connected with any plan of bringing a water supply from long distances.

Major-General SCOTT suggested that the Council might find themselves in a difficulty, if they were mistaken in thinking the supply in Surrey was sufficient; but witness, while admitting that the Council had taken no expert advice, adhered to his opinion as to the sufficiency of the supply.

Mr. T. H. Watney, Chairman of the Water Supply Committee of the Richmond Town Council, said that up to 1877 Richmond was supplied by the Southwark and Vauxhall Water Company without parliamentary powers; Richmond being beyond the parliamentary limits of the Company. Richmond complained that the charges were high and the supply insufficient; and in 1877 they established water-works for themselves. The cost so far had been £109,714. At present, 25,700 out of a population of 30,000 were supplied by the Corporation. The borough was extended in 1892; and the extension was the portion now supplied by the Southwark and Vauxhall Company, the Corporation having no power of supply there. The Corporation at present only had sufficient water to satisfy 80 per cent. of the total requirements; the other 20 per cent. being purchased from the Southwark and Vauxhall Company under a clause in the Act of 1884, which compelled the Company to supply Richmond with a quantity not exceeding 1 million gallons a day in bulk at a maximum charge of 1s. per 1000 gallons. The Corporation were taking steps to obtain a further supply, which they were advised would enable them to furnish water to the whole of their district. Richmond wanted to be left alone; being satisfied with the clause in the Act of 1884. If interfered with, Richmond would like to extend their power of supply so as to include the whole of the borough—the outside areas of Kew, North Sheen, and Petersham. The Water Committee were able to pay their way on a rate of 11d. in the pound on the rateable value; receiving payment for water used by the Corporation for municipal purposes at the rate of 6d. per 1000 gallons. Of the 11d., 5d. was due to repayment of loan; but by 1910 this would be reduced to 0.85d. Roughly speaking, the yearly receipts were £10,683, and the expenses £10,453; the latter including interest and repayment of loans. Having regard to the payment of the Corporation for water for municipal purposes, there was practically a rate-in-aid of 2d.; but it was fair for the Corporation to pay, because if a Company were supplying







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## EDITORIAL NOTES.

## Passing of The Gaslight and Coke Company's Bill through the Lords.

THE Gaslight and Coke Company's Bill came before the House of Lords Committee on Wednesday last, and was opposed by the London County Council. The case presented by the promoters was that this is a measure purely for converting and consolidating the Company's unwieldy and multitudinous stocks; while the opposition argued that the operation in question would be so much to the benefit of the Company that they ought to show they had deserved the boon by their treatment of the public. It was the case as submitted to the other House over again, with no material alteration. The promoters pleaded that everything as regards the relations of the undertakers to the consumers or the Local Authorities would remain absolutely unaffected by the Bill. The County Council replied that the measure would enhance the value of the Company's stock, which would affect the ultimate price of the undertaking in the event of purchase. As was said before the Commons Committee, the market price of a gas company's stock is never taken into account in determining the value of the undertaking for its transfer to a local authority; but there is never a transfer arbitration held at which this price is not mentioned. In the result, the present Committee passed the preamble of the Bill; but they inserted a clause to make sure that, in the event of purchase of the undertaking, the market price of the stock shall not be taken into consideration by the arbitrator who values the property for the purpose. This may be regarded as a piece of superfluous caution; but it is an indication of the temper of the Committee that is not to be despised. It is evidently thought that the value of gas property is high enough, without any possible addition by virtue of legislative or financial operations.

## The Report of the Petroleum Committee.

At last, after four years' labour, the Petroleum Committee have reported to the House of Commons. The value of this piece of information, as news, is discounted by the disclosures already made in these columns respecting the nature of the conclusions arrived at by the Committee. It has been known in this way that the Committee were irreconcilably divided into "high-flash" and "low-flash" parties. It has now transpired that the report was only saved for Parliament, at the last meeting, by an expedient which deprives the finding of the Committee, in regard to the desirability of raising the flash-point of burning oil, of the little authority it ever possessed. As the "Daily News" stated it on Thursday: "Those members of the Committee who had agreed with the Chairman in opposing the raising of the flash-point were yesterday in a majority, and could have rejected the report by a majority of two. They still felt unable to support it so long as it contained the recommendation which was inserted some weeks ago. In view, however, of the practical value of other recommendations, especially as to storage and transport of petroleum, and in order that the work of the Committee should not prove futile and without result, two of the majority withdrew from the room to avoid voting when the final question was put, and the Chairman did not vote, which enabled the advocates of the high flash-point to carry the report by a majority of one." And very much good may this hollow victory do the high-flash party. The nature of the vote that saved the report being thus explained, it is possible to discuss the Committee's recommendations in the calm spirit appropriate to their academic character. The Committee recommend the bringing in of a Bill to remedy the defects of the existing law as regards the control of the trade in, and use of, petroleum oil and spirit. It is considered that there should be legislation for the petroleum trade generally, certain heavy oils alone excepted. The flash-point of 100°, Abel close test, is recommended as the dividing-line between petroleum oil and petroleum spirit. With regard to lamps, it is found that the number of lamp accidents has not increased out of proportion to the vast increase of the number of lamps in use, and that ordinary care should be used whether the flash-point be raised or not. If perfect immunity from accidents is to be secured, the evidence shows that it will be necessary to prevent the use of all petroleum below 120°, Abel close test, the effect of which would be to



materially increase the price of oil to the consumer. It is considered that the manufacture of lamps could be regulated in the interest of public safety by the Home Secretary; and the Committee agree with the suggestion that children in elementary schools should be instructed in the proper use and care of lamps.

A letter from Mr. Jesse Collings, the Chairman of the Committee, follows the publication of the substance of the report in last Thursday's "Times." Mr. Collings remarks that he has been visited with a vast amount of misrepresentation, to say nothing of personal abuse, from certain quarters, on account of his known opposition to the raising of the flash-point of lamp oil. He shrewdly observes that, though the Committee was appointed by Parliament in the interests of public safety, this was not the consideration that governed the course of the inquiry. It was trade interests—American, Scottish, and Russian—that occupied the first position. This being the case, it behoved those upon whom rested the chief responsibility for the conduct of the inquiry—especially the Chairman—to see that the Committee were not made the tools of any private and particular interest. For trying to do his duty in this regard, Mr. Collings has been vilified most shamelessly in certain of the low-class newspapers, which, according to the manner of their kind, have persistently misrepresented facts, and repeated false statements with greater effrontery the more often they have been exposed. A favourite lie is that by the Act of 1879 the flash-point was lowered from 100° to 73°; the fact being that all that was done was to substitute a reliable for an unreliable test—the results being absolutely equivalent. Another misstatement is that England is merely the "dumping-ground" for the refuse product of the Standard Oil Company. This assertion has been disproved over and over again; but it is repeated on the general principle that the baldest lie is certain to be believed by some people, if only it is told often enough. Mr. Collings shows that, so far from being opposed to any revision of the flash-point for any purpose, he was willing to raise it to 150°, Abel close test, for the sake of imposing a few simple regulations in the cause of public safety. But this did not suit the Scotch oil interest; and so it was not accepted. Mr. Collings compliments Mr. Ure upon having "championed the Scottish case with conspicuous ability and persistence;" but, as a matter of fact, this championing was a little too strenuous. As a result, the whole report exhales the odour of paraffin oil, which is little admired out of the lowlands of Scotland.

#### Saving the Time of Association Meetings.

It is with much pleasure that we are able to do something to restore the credit of American gas engineering, gravely shaken by the report, to which we have given currency, that labour-saving processes and appliances are not so largely employed in American as they are in British gas-works. Whatever may be the case of American gas-works in this regard, American gas engineers, when assembled in conference, have just perfected a labour and time saving practice which is to be heartily commended to the favourable attention of their English brethren. We allude to the method of dealing with those painful episodes of technical society meetings that belong to the category of "complementary votes and votes of thanks." At the close of every meeting of a professional society, custom ordains that precious time shall be wasted in moving, seconding, and passing a long series of perfunctory votes. Nobody has the courage to protest against this ceremonial thanking of auditors, scrutineers, and other worthy people who have only performed duties which they were perfectly willing to undertake, and for doing which they certainly do not need the formal gratuity of a vote. It often happens that valuable papers have to be taken as read, or helpful discussions remorselessly cut short, for the sake of this painful performance. Now, mark how this waste of time was checked at the recent meeting of the Western Gas Association of America. There was appointed, at the commencement of the proceedings, a Committee on Final Resolutions, who reported at the end of the technical business. This report contained all the polite and pretty commonplaces of which Englishmen deliver themselves with such obvious effort on these occasions. The Mayor of the City was thanked for his courtesy in welcoming the meeting; the member who acknowledged the act of courtesy was remembered; the retiring President was complimented; and everybody received his sugar-plum wrapped up in the

neatest style. The adoption of the report settled the whole thing by a single vote loaded with enthusiasm to the elastic limit! A capital arrangement, ensuring that politeness should not be wanting, nor trench unduly upon the scanty working minutes of the meeting.

#### The Annual Meeting of the Society of Chemical Industry—The Endowment of Research.

THE annual meeting of the Society of Chemical Industry was held in Nottingham last week, under the presidency of Professor Clowes; and a report of the proceedings will be found in another column. There has been a considerable accession to the membership of the Society during the past year; making it the largest organization in the kingdom in connection with chemistry. The Presidential Address was very large, in praise of the Society, in which Dr. Clowes is known to be an enthusiastic believer. He is succeeded in the chair by Mr. George Beilby, well known as a leader of the shale oil industry. The Society's medal was awarded to Dr. Perkin, who returned thanks in a speech warmly defending the cause of research. It is a coincidence that on the very same day Mr. A. J. Balfour, in distributing the prizes to the Guy's Hospital students, spoke eloquently upon the selfsame theme. Everybody agrees that, if knowledge is to increase, it must be added to by those who have nothing else to do. The practitioners of a profession founded upon certain applications of systematized knowledge, which is called science, cannot do much, as Mr. Balfour very truly said, towards the advancement of their science. It is as much as they can do to keep abreast of it. The pure student must carry the lamp into the dark places where Nature keeps her secrets, but rarely her convertible treasures. But the student must live; and the difficulty is to persuade the world that he is worth keeping alive, though he does not contribute anything material to its resources. The endowment of research is a well-worn subject of discussion; but somehow the cause is not making much, if any, progress in this country. Time was when pious benefactors generously endowed learning—founding Chairs and Fellowships at Universities with no expectation that those who benefited by their beneficence would make any practical return for it. Modern millionaires seem to have other views; but the old one was not to be despised.

#### Failure of "Conciliation" in South Wales.

A LITTLE flutter of the "popular" Press was caused last week by the announcement that the Associated Employers had refused to meet Sir Edward Fry, the "Conciliator" appointed by the Board of Trade to deal as best he might with the South Wales coal trouble. On Saturday week, Sir Edward had his first interview with the men's representatives at Cardiff, and arranged to meet a full Committee in the town on Wednesday. This second meeting duly came off; but it transpired that meanwhile Sir Thomas Lewis had seen Sir Edward Fry, and informed him that the Associated Employers declined to recognize his position as Conciliator. Sir Thomas further stated that "the Associated Employers declined to admit any intervention of the Conciliator, or of any other person appointed by the Government or otherwise; but that the Associated Employers are prepared to meet the authorized representatives of the men, but without the presence of the Conciliator." The comment of some newspapers upon this is that, in refusing to have anything to do with the Conciliator, the employers are taking upon themselves a grave responsibility; and they contrast with the refusal of the employers the willingness of the men to accept conciliation. But this is just the confusion of thought in regard to the essential conditions of a settlement into which an outsider with a prejudice for the "democratic" view of the emergency might be expected to fall. When two parties quarrel, it is themselves who must make it up again. All that a mutual friend can do to help forward this process is to act as a go-between for the purpose of bringing them together. The case of the South Wales coalowners is that they have been willing to meet their men all along; while the latter have held aloof. They say informally to Sir Edward Fry that neither he nor anybody else can make them more willing to meet the men than they are at the present time; and therefore they have no use whatever for him. To do them justice, the men seem to understand this better than their newspaper partisans; for they have agreed that their own Secretary



should make overtures to the Coalowners' Secretary for a meeting to discuss a new set of terms. What the precise nature of these terms is has not transpired. It is believed, however, that the men are at length prepared to discuss a sliding-scale of wages; but they cling to the desire for a recognized minimum below which wages are not to fall. All this means that the masters are slowly, but surely, carrying their point. One by one the crude socialistic demands of the strikers are being dropped; and they will come at last to meet the employers upon the plain, straightforward plan of mutual adjustment of wages and prices that has been open for them from the beginning of their ill-advised revolt.

#### Public Opinion and the Report of the Old-Age Pension Committee.

PUBLIC opinion regarding the report of the Committee on Old-Age Pensions seems to be fairly summarized in the observation that people did not want a Committee presided over by Lord Rothschild to tell them that if they could save enough money they would keep out of the workhouse. There seems to be much dissatisfaction at the limitations imposed upon the Committee by, or accepted by them as deducible from, the terms of the reference. We are not singular in feeling disappointed that the Committee were not able to criticize the German system of State-aided insurance of workpeople. Mr. Lionel Holland, M.P., has written to "The Times" complaining that the "unfortunate" decision in regard to the limitations "which were imposed upon the inquiry, 'which tended towards making it' imperfect and nugatory," was aggravated by the neglect of the Committee to petition for a fuller reference. The result has been to waste two years upon a barren inquiry confined to a class of proposals upon which a Royal Commission had already passed judgment.

Speaking for a really important national industry, we are very sorry that the eminent men who composed the Committee left out of consideration the most hopeful class of proposals—those in which employers and employed combine to procure the realization of those provisions which the Committee were charged to investigate with a view to rendering them universal. The great national industries of this country are passing through a crisis which is not the less acute for being spread over a long period of time. There are those who hold that the flowing tide of British prosperity has reached the high-water mark; and that the start which peace at home, good government, early-developed communications, and the first applications of steam power gave this country, is now spent. The United States and the Germanic countries of the European Continent are overhauling us fast on both sides; and British manufacturers and workmen will have to deal with very different trade conditions in the future from anything they have experienced in the past. If we can put our house in order betimes, it will be wisdom to do so; and one of the matters not yet cleared up at home is the relation that should exist for the future between capital and labour in industry. The Workmen's Compensation Act is a step in the direction of this re-settlement; and it has been remarked with great force that the Act is the beginning of poor-law reform.

In the gas industry, there are many wise and far-seeing administrators who would fain make workmen's compensation for accidents part only of a general scheme for charging the profits of the industry with the cost of maintaining its workpeople—using the term in the very widest sense. This is already done in numerous undertakings, for whose employees the poor law is only a name of something outside their sphere of activity. But very much remains to be done in this way; and those who admire English Municipalism so much will do well to take notice that our local authorities do not occupy the foremost place in this movement. The truth of the matter is that modern democracy wants to be educated in economic science—not merely in the dry-as-dust political economy that only has to do with accomplished facts and ascertained statistics, but in that kinetic form of the science which treats of the living forces of trade and industry, and admits the humanity of both employers and employed. Public opinion has to be manufactured and guided to the settlement of these greater questions of industry; and it is because there is so little help in the report of the Old-Age Pension Committee that those who feel that "something must be done" are so disappointed with it. For in the body of the report, as in the case of individuals, when "the faculty" give up a patient, quacks take him in hand—usually with disastrous results.

## WATER AND SANITARY AFFAIRS.

ESSEX, supplemented by Hertfordshire, laid a large amount of evidence before the Royal Commission last week. The Chairman of the Water Supply Committee of the Essex County Council testified to a strong feeling against the London County Council coming over the borders of his county. The policy which prevails among the Outer Authorities generally, not only in Essex but in other counties bordering on the Metropolis, seems to be that of shutting up London to itself, and for the outer districts to keep their water supplies in their own hands. Thus it is held in prospect that London, like a besieged city, will have to seek succour in Wales in order to supply its wants; and this affords an extra inducement to the Outer Authorities to keep clear of Spring Gardens, lest they should have to contribute to the cost of the Welsh scheme. Each locality assumes that its resources are sufficient for its own needs; but in order to maintain that sufficiency they must take care to preserve those sources intact in the face of any administrative change. Sir John Evans, who holds the position of Vice-Chairman of the Hertfordshire County Council, stated that "Herts claimed the whole of the water 'in the county as belonging to Herts.'" Sir John carried his theory of exclusiveness and the *status quo* so far, that the Chairman of the Commission asked what the Companies were to do. If they were to obtain no more water from the Thames or the Lea, or from the wells, where were they to get it from? The answer was simply "Wales." But if London has an abundant source at its own doors, why should it spend millions in going further? In any case, what will the outer areas gain by being separated from the general supply of "Water London?" If there is enough water in Outer London to supply the wants of that territory, it will be there whether the area is divided or not. In other words, the Thames, the Lea, and the wells will furnish, as Lord Balfour's Commission showed, enough water to supply all the districts for a long time to come. If ever there is a failure, the need for a Welsh supply will arise in the outer area, where the population is specially increasing. It is outside the Administrative County of London that the great increase of the population is taking place; and there is abundant reason why the ring should cling to the centre, so as to share in the benefit of any comprehensive scheme. Unfortunately, it is the policy of the Council to shake off the outer area; and this ought to convince the Outer Authorities that such separation would not promote their interests. The fear of a "water famine" expressed by Sir J. Evans may well be entertained if an outlying district with an enormous population is to be left to its own resources. A wide area to draw from is the surest defence against a short supply. If Wales must be resorted to, it must be on account of the outlying districts, who nevertheless wish to stand aloof from any such project. If the Administrative County is to be shut in on itself, it will have no need of Wales until a very remote period. This miserable partitioning policy which the Local Authorities round London seek to carry out, is nothing better than suicidal.

A question put by Major-General Scott during the proceedings of the Royal Commission last week brings to view a contingency which has been almost entirely ignored, though we have heard something of it before, and have commented upon it. The General asked: "What is to prevent the Companies going to Wales also?" Should such a necessity arise, the Companies would assuredly take the requisite action. The ratepayer would then escape all risk. There would be no rate-in-aid, and the consumer would be free from any extra charge. Why not await such an event? In reply to General Scott, Sir J. Evans said: "If the Companies were to join and go to Wales, 'that might be a solution of the difficulty.'" It would be a *quietus* for the Council. But the time has not arrived; and the difficulty has not presented itself. Perhaps the Companies might give some sign that they were ready to go to Wales or anywhere else for water when there was need to do so. If they were to secure a watershed in readiness, so as to hold their own, it would change the situation. It would be amusing to find the County Council protesting against any such prevision. Mr. Andrew Johnston, who appeared before the Commission as the Chairman of the Essex County Council, but who is also the representative of the New River Company on the Staines Reservoirs Committee, said that, if more water was wanted



by the Metropolis generally, Essex would be prepared to pay the cost of bringing it from a distance, "if anybody" could show a better right to Essex water than Essex." Perhaps Mr. Johnston apprehends that Essex may at some time require more water than it can get near at hand. The truth is, a community of interest ought to be felt; and only in that way will a sure guarantee be found against a deficiency in the supply. Much has been said as to the practical importance of effecting a junction between the mains of the several Metropolitan Water Companies. Yet in opposition to this project for giving the whole of "Water London" the command of an undivided supply, there is the notion that the supply all round London should be split up among the several authorities; creating thereby greater diversity and far more of separation than exists at the present time.

The Water Committee have adopted a report to the London County Council, recommending that the Chemist (Dr. Frank Clowes) be authorized to make six examinations per week of the water of each of the eight Water Companies, between the middle of the present month and the end of October. The cost will be £15 a week, or nearly at the rate of £800 per annum. At present there is a weekly charge of £10 for an examination of each water three times in each week. This might be thought a sufficiently heavy charge upon the ratepayers; but, in the judgment of the Council, or at least of the Water Committee, something more is desirable. If all this is necessary on the part of the County Council, why does Sir Edward Frankland report officially every month on the quality of the water? and is there no value in the daily examinations conducted by Sir William Crookes and Professor Dewar? The Water Committee themselves admit that their own Chemist shows a continued improvement in the quality of the London Water Supply. Comparing 1897 with 1891, there is an extensive diminution in the oxidizable matter contained in the water; the river Companies showing in that period a reduction ranging between 57 and 72 per cent. But the Committee have an idea that with an increase of the analyses there will be a further improvement in the water. There will certainly be an increase of expense.

**The Index to Vol. LXXI.** of the "Journal," January to June, 1898, is now ready; and a copy will be forwarded (post free) by the Publisher, on receipt of a post-card from any Subscriber.

**Institution of Junior Engineers.**—The summer meeting of the Institution of Junior Engineers, of which Mr. J. A. F. Aspinall (Lancashire and Yorkshire Railway) is President, is to be held at Liverpool from the 8th to the 13th of August. The President-Elect is Sir William H. White, of the Admiralty.

**The Dividend of The Gaslight and Coke Company.**—We learn from the Secretary and General Manager of The Gaslight and Coke Company, Mr. J. W. Field, that the accounts for the past half year show that (subject to audit) the balance to the credit of the net revenue account will enable the Directors to recommend the payment of a dividend at the statutory rate of 12½ per cent. per annum; carrying forward £51,854 19s. 8d.

**North British Association of Gas Managers.**—The thirty-seventh annual general meeting of the Association will be held in the Merchants' House, Glasgow, on the 28th and 29th inst., under the presidency of Mr. T. Wilson, of Coatbridge. According to the programme issued by the Secretary (Mr. R. S. Carlow, of Arbroath), there will be five papers for the consideration of the members—viz., "Retort Settings and Practical Results Obtained," by Mr. W. Ewing, of Hamilton; "Prepayment Meters," by Mr. A. Wilson, of Perth; "Automatic Manipulation of Coke," by Mr. Gilbert Little, of Smethwick; "Some Notes on the Modern Commercial Gas-Engine," by Mr. W. Carmichael Peebles, of Edinburgh; "The Cowan Pressure System," by Mr. J. Hepworth, of Edinburgh. On the second day of the meeting, the members and lady friends will have an excursion to Lochranza, and dine at the hotel there.

**Illuminating Gas from Sewage.**—At the recent annual conference of the Association of Municipal and County Engineers in Edinburgh, Mr. Duncan Cameron, the City Surveyor of Exeter, the inventor of the septic tank system of sewage treatment, communicated a paper on the subject, in which he stated that one of the most notable points observed in the Exeter tank had been the hitherto unrecognized energy stored in sewage, as evidenced by the production of marsh gas. The works and public baths adjoining at Exeter had been lit with the gas and incandescent mantles. He said he had not had more than ten such lights burning at one time; but it was apparent, even under the conditions of leakage existing, that more than twice this number could be kept constantly alight. This estimate was made during the cold, wet weather of last winter. The gas was innocuous, and could only be detected ordinarily by applying a light.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 166.)

THE dulness and inactivity into which the Stock Exchange had relapsed, as noted in our last issue, continued right through the week just closed. There was a most persistent lack of animation, which refused to yield to the influence of one or two favourable incidents of the period—such as the improved prospects of peace, and the successful flotation of the Indian Loan. Prices pretty well throughout the list have gone back accordingly, with hardly an exception beyond some special gilt-edged securities. Discount rates have kept up steadily, but short money was over-abundant; and the limited demand for the Stock Exchange settlement could make no impression upon the excessive supply. Business in Gas fell away to very light proportions on the whole, although one or two issues showed greater activity than usual. The tendency was decidedly favourable, as testified by the leading issues; but one or two of the minor undertakings were otherwise affected. In Gaslights, the "A" was only moderately active; but it made a nice advance from 295½ on Monday to 300 at the close. The success attending the Company's Bill in the Lords' Committee Room had much to do with this, aided by the subsequent announcement of the dividend-rate and carry over. The Directors are to be congratulated on returning again to a dividend commensurate with the earnings. The increase in the price of gas taking effect in the June Quarter only, they might have recommended a 12½ per cent. rate. Happily they have refrained from doing this, and have laid the foundation of a reserve of undivided profits which we trust may be substantially built up as and when circumstances permit. South Metropolitan was particularly active and firm, and pushed its way from 142 up to 144½. Not much was done in Commercial; but the new stock changed hands at good figures. Suburban and Provincial undertakings were scarcely touched; and no move of any sort was made, except that Brighton went up one day and back the next. The Continentals were quiet generally, though Imperial had a rather lively day on Thursday. The only variation was an advance in Union. Among the rest, the only change was a slight fall in Hong Kong and Oriental new. Business in Water was very quiet, and quite devoid of feature. Quotations were left undisturbed.

The daily operations were: Business opened very lazily in Gas, but all prices tended upward. Brighton and Continental Union rose 2 each; but Hong Kong fell ½. Things were quieter still on Tuesday; and the only move was to put Brighton back again. On Wednesday, business nearly approached the stagnation point. Oriental £4 ros. paid fell ½. Business was much brisker on Thursday—Gaslight issues being in demand, and the "B" 4 per cent. rose 2. On Friday there was less activity, except in South Metropolitan, which was active, and rose 1. Gaslight "A" gained 2½. Saturday was fairly active, and prices were good, although quotations were left unchanged.

### ELECTRIC LIGHTING MEMORANDA.

**Competition in Electricity Supply—Charing Cross to Supply the City of London—Electricity Retailled at a Penny per Unit.**

THE question of competition in electricity supply is still greatly exercising the industry. In this connection, the question of right and wrong appears to be yet in the primitive stage when right is what suits me, and wrong what I do not like. This is a stage of the development of ethics through which, as social philosophers tell us, all civilizations have had to pass. Even now, nations at war invariably regard it as very wrong in "the enemy" to do what they try their best to do themselves. Competition in trade, so economists say, is the modern equivalent of private war. The outcry of certain Metropolitan electricity supply companies against the proposition that parochial electric lighting ventures should be permitted to compete with them has found a strange echo in the proposal of the Charing Cross and Strand Electricity Supply Corporation to invade the City for the purpose of competing with the City of London Company. The arrangements whereby the City was provided with public electric lighting have been much canvassed of late; and it is the fact that private consumers of electricity in this favoured region have had to pay dearly for the benefits enjoyed by the Corporation under the public lighting contracts. The next-door neighbour of the City Company a year ago proposed to make an incursion into the sacred limits, with a view to furnishing the private consumers with a cheaper supply; and though the attack was warded off for the time, the City of London Company were fain to drop their price 1d. per unit. Now another rival has threatened to enter the field. The new-comers offer to serve the City at 5d. per unit, reducible on a sliding-scale to 4d. and even to 2d. Moreover, the supply would be on the low-pressure continuous-current system, which is the only one capable of supplying the needs of customers for power. The City of London Company use the alternating system. As a proposal has been made for the purchase of the City of London



Company's undertaking by the Corporation, the Charing Cross Company declare that the public interest would be better served by letting them in than by the Corporation buying the other Company out.

Here is a pretty tangle for the Board of Trade to unravel. There can be no question that the Charing Cross Company know what they are about, and can do what they promise as regards supplying cheap electricity. They are much undercapitalized as compared with the City undertaking; and they stand upon a better commercial footing. Of course if the new comers are to keep clear of the public lighting, they will have a further advantage over the City Company. On the other hand, the Charing Cross concern is a much smaller affair, and could hardly grapple with the City connection without reconstruction. If they persevere in their onslaught and ever succeed in entering the City, the whole question of competition in electricity supply will enter upon a new phase. Applications for concurrent electric lighting powers will be the order of the day; and Municipalities who fondly imagined themselves to be possessed of a monopoly of electricity supply may find they have been mistaken. Our contemporary the "Electrical Review" has devoted an article to the textual criticism of the important sentence which forms the close of section 1 of the Electric Lighting Act, 1888. In this way it is easy to make nonsense of the clause. It cannot be gainsaid, however, that the natural meaning of the clause has always been taken to be that the existence of one Provisional Order for an electric lighting area is not to be any bar to the grant of a second. Our contemporary, curiously enough, attaches a capital importance to the circumstance that wherever concurrent powers of supply exist, they have been granted at the same time. It seems to argue that while this is all right and proper, the grant of concurrent powers to an undertaking for a district in which another is actually doing business would be all wrong. There is not the smallest justification for so limiting the terms of the Act. There is no time-limit in question.

Certain local authorities having electric lighting undertakings are feeling uneasy in face of the new order of competition with which they are threatened—the competition of electricity generated in bulk at the coalfields, and distributed according to the famous Niagara power scheme. The full truth of the working results of this great experiment has not yet been told; but it is stated with reference to a similar water-power scheme—that of the Lachine Rapids—that power taken only for six hours a day can be supplied at a profit at the amazingly low price of less than 0.2d. per unit. There is no such water power in this country; but correcting the information from this establishment for coal generation at a cheap source, our contemporary the "Electrician" brings it out that the cost of the wholesale supply of electrical energy in England should not exceed 0.3d. per unit at the sub-stations. From these stations the energy could be retailed at less than 1d. per unit. This is a very important statement, which is calculated to arouse interest and attract criticism from a good many quarters. It is hardly too much to say that an unlimited supply of electricity at 1d. per unit delivered would have a great many more effects upon the industrial conditions actually prevailing in this country than that of merely reducing to "scrap" the generating machinery of many a municipal electric light undertaking. There is no great comfort in saying that such a consummation is not yet in sight. If the thing is possible, it will come. Then—? Well, perhaps it will be better to contemplate the idea for awhile before discussing its probable consequences.

#### THE ACETYLENE EXHIBITS AT THE IMPERIAL INSTITUTE.

So little does the casual visitor to the Imperial Institute discriminate between means of illumination—provided they are reasonably efficient—that it is seldom the lighting of the Intermediate Ground Floor Gallery by acetylene attracts the special attention of those who chance to wander through it. Where everything is an exhibit, the least obtrusive, though perchance the most interesting and valuable, escapes notice. In the gallery referred to, the magnificent grain and polish of a rare—but to him impossible—cabinet wood, creates a strong impression on a man's senses; while superb ostrich feathers distract the attention of every woman. The unobtrusive gas-pendants are passed unobserved, or at the most a word of admiration is bestowed on their chaste design in wrought iron and copper. The lights themselves do not attract the notice of the passer by, unless it happens that the placards at the entrances to the gallery have drawn his attention to them. So far as the general public are concerned, the illumination might equally well have been effected by means of coal gas or electricity. Perhaps no better testimony to the general efficiency of the lighting of the gallery by acetylene could be offered than the fact that the method of illumination escapes general notice. Even in the annexe to the North Gallery, where a number of works of art are displayed in the glare of numerous acetylene flames, and notices at every hand proclaim the intention of the authorities to be the exhibition of the value of the new illuminant for showing shades of colour in their natural daylight tints, many visitors heed not the illuminant, but merely admire the pictures and deckings of the room. Only in the North Gallery itself is a

very half-hearted interest shown by the more inquisitive in the generators exhibited. After a preliminary query of an attendant has divulged to the inquirer that the generators in some mysterious manner are capable of furnishing an illuminating agent, doubts as to whether they are not a new form of plant for electric lighting have to be dispelled. Then follows the wearisome explanation as to the merits of acetylene and the partial truths as to its immense superiority to coal gas. To do the visitor justice, he is only a trifle less ignorant of acetylene than some of the stall attendants; but the latter have the advantage of a few weeks' acquaintance with the pamphlet literature with which the makers of generators have freely supplied them.

Nearly every maker of apparatus who is exhibiting at the Imperial Institute appears to have considered it necessary to give some account of the commercial production and properties of calcium carbide and acetylene; and many of the pamphlets and price lists are curious reading. Acetylene is almost universally credited with a practical illuminating power of 240 or 250 candles; and no hint is offered that burners which give it so high a duty are useless after a few hours' work. With regard to comparisons with coal gas, one might suppose that regenerative and incandescent burners did not exist; for makers of acetylene generators have generally found it convenient to ignore them. We should be doing acetylene no greater injustice than several exhibitors do coal gas, were we to state the illuminating power of coal gas at 30 candles per cubic foot, which is the duty afforded by the new Welsbach or the Bandsept burners, and that of acetylene at about the same number of candles per cubic foot, which is the duty the Naphey burner affords. Then if we proceeded to state the cost of coal gas at the by no means excessively low price of 2s. per 1000 cubic feet, and acetylene at the fair price of 40s. per 1000 cubic feet, we should be able to declare that coal gas afforded the same amount of light as acetylene at one-twentieth the cost. The statement would be at least as justifiable and irrefutable as many of those now being promulgated by unscrupulous exhibitors at the Imperial Institute. We will just quote *verbatim* one specimen of the confusing "literature" which the vendors of acetylene generators think good enough to offer to prospective purchasers: "Our Generator is much easier to manipulate than any electrical apparatus or oil-lamps, and much cheaper, as there are no broken glasses nor falling of mantles as with Incandescent, the light also being far superior and much cheaper." Probably the electricians and oil dealers will smile at the reflections apparently cast on incandescent electric and oil lamps in this precious sentence; but we doubt if they will so readily admit the superiority and cheapness of acetylene lighting. Well may those who have the welfare of the acetylene industry at heart pray that it may be saved from its friends.

The Acetylene Illuminating Company, Limited, who manufacture at Foyers the whole of the carbide of calcium used at the exhibition, state the case for acetylene very fairly and plainly; and several exhibitors might advantageously adopt the moderation of tone and caution in asseveration which mark the pamphlet issued by the Company which has by far the largest stake in the acetylene industry in Great Britain. The attitude of this Company is indeed that which the "JOURNAL" has consistently adopted towards acetylene; and we cannot do better than endorse the penultimate sentence of the pamphlet, which runs as follows: "The Acetylene Illuminating Company are satisfied that, by continuing to work with caution in the development of this new industry, avoiding any exaggerated claims, the interests of apparatus makers, of the Acetylene Company, as manufacturers of carbide, as well as of the public, will be the best served." The advice is sound; but so far few makers of apparatus seem to have followed it, for "exaggerated claims" are rampant in nearly all their catalogues.

The exhibition must be deemed to have achieved the main object of its being, in that it has shown, as we have already indicated, that a building may be efficiently lighted by acetylene without accident. It has also proved that a number of generators are on the market, which, if they do not embody all desirable points, at least are capable of performing their work without serious hitch or trouble. The better purification of the gas, and the improvement of the burners, at present appear more urgently to demand attention than does the mere generation. From the flames rise nebulous wreaths, which are not wholly due to the upcurrent of heated air or gaseous products of combustion. This phenomenon pervades nearly all the acetylene flames in the building, and appears to be greatly accentuated in draughty positions. In the comparatively lofty gallery of the exhibition, no inconvenience arises from the products of combustion; but in an ordinary dwelling-room they would almost certainly prove objectionable. It should, moreover, be remembered that all the acetylene burnt at the Imperial Institute is made from the relatively pure carbide produced at Foyers; and a less carefully prepared material would yield acetylene which would give more obnoxious products. On the other hand, the Acetylene Illuminating Company claim to have the right to control the importation and manufacture of carbide in this country, and threaten to exercise it; so it may be that, for a time at least, only the Foyers carbide will reach the consumer. We understand, however, that the Company will be vigorously opposed by several importers and manufacturers of carbide, if any attempt is made to suppress their traffic in the article.



The method of classification of the generators adopted by the Exhibition Committee has already been stated in the "JOURNAL.\*" Automatic generators far outnumber those of the non-automatic pattern; and the drip type of apparatus is more prevalent than the dip type, or that in which carbide is made to fall into water. This is not surprising, seeing that it more readily adapts itself to automatic control within certain limits. Few of the generators exhibited are provided with purifying chambers. The idea that cooling and drying the gas constitute sufficient purification continues to prevail, notwithstanding the weight of expert opinion to the contrary. In some few instances, mysterious chemicals are used, and are alleged to possess uncommon virtues as purifying agents. Our remarks on p. 1375 of the last volume of the "JOURNAL" may be profitably taken to heart by all to whom these mystic materials are offered.

(To be continued.)

#### ANOTHER VIEW OF THE PHILADELPHIA GAS-WORKS LEASE.

THE article by Professor Bemis in the March number of "The Forum," upon the lease of the Philadelphia Gas-Works is a striking testimony to the interest that is being taken by American publicists in this transaction. The writer begins by reminding his readers of the recent Convention of American Mayors, at Columbus, Ohio, when the principle of municipal ownership for electric lighting and gas undertakings was discussed at great length, and accepted as agreeing with public opinion. This convention was mentioned in the "JOURNAL" for Dec. 31, 1897. Again, there was a Convention of the American Federation of Labour, at which a resolution was passed in favour of the substitution of municipal ownership for private property "in all public utilities that are in the nature of monopolies." The discrepancy between these theoretical pronouncements and the practical dealing of the City of Philadelphia with the local gas supply is so glaring that Professor Bemis feels called upon to pass the facts in review. He agrees with Dr. Rowe, whose work has recently been noticed, that the works were inefficiently managed by the City; and that the lease offers considerable benefits to the community for the next few years. But, also in agreement with Dr. Rowe, he contends that the people of Philadelphia were awakening to a sense of the need for better management of this property. If they had been left alone, the people would have supported any feasible scheme for the improvement of the works; but the Councils of the City had their own views as to the necessities of the case. Having voted down a proposal to submit the question of a lease to popular vote, which, it was generally believed, would have been overwhelmingly adverse to the lease, this same governing body accepted what Professor Bemis characterizes as "clearly far from the best lease that was offered." His deliberate opinion of the transaction is therefore that the lease is not to be taken as "evidence of the deliberate turning of the 'City against city' ownership of a great monopoly—which it was not—but as a striking lesson of the benumbing effects on public ownership of its mixture with private ownership, as has been true for ten years; and a lesson, further, of the difficulties that city ownership must face in this country by reason of the 'spoils' system, and the readiness of the masses to follow those party bosses and 'leading citizens' who fatten on the demoralizing relations between weak or corrupt governments and immensely valuable franchises when in private hands."

The financial condition of the Philadelphia gas undertaking, according to the published report for 1896, is given by Professor Bemis as showing a corrected surplus of about \$150,000 on the year's operations. This, however, would have been turned into a deficit of about \$200,000, if the City, instead of buying 40 per cent. of its gas in bulk at the price of 37 c. per 1000 cubic feet, had itself made the whole at the exorbitant cost of 55 c. per 1000 cubic feet, at which it manufactured 60 per cent. of the supply. Professor Bemis recounts the heads of the lease, which we have already given from Dr. Rowe; dismissing as "impracticable" the provision for resumption of city control at the end of ten years.

The lighting power of the gas is to be improved to 22 candles; but it is supposed to have been nearly of this quality before. With regard to the appalling percentage of leakage reported, Professor Bemis declines to believe that the admittedly high proportion of unaccounted-for gas is actually wasted in this way. He believes there is no such leakage, but rather that a large number of consumers' meters have become worthless from old age and want of proper attention. If so, the lessees are probably in for a rich crop of complaints whenever they put the meters in a proper state.

According to Professor Bemis, the gas-works were handicapped while under city control, partly by unbusinesslike methods of purchasing supplies, but chiefly by the failure of the Councils to improve the works as public need demanded, and by the influence of the "spoils" system in local politics. Notwithstanding these disadvantages, it is argued that the majority of the citizens, and the great reform organizations of

the city, decidedly preferred the continuance of public ownership and operation of the undertaking for the following specific reasons: Under such ownership, corrupt and inefficient as was the administration, the price of gas had been lowered during the previous twenty-one years at a much faster rate than it can decline, under the new lease, during the next thirty years. It was believed that gas could have been made at the city works for 40 c. per 1000 cubic feet, under a reformed administration. Gas in Philadelphia, under public ownership, has always been cheaper than gas in New York under private ownership, except at certain times and under conditions which Professor Bemis explains. It was generally believed that the unwillingness of the Councils to improve the works was due to their desire to play into the hands of the United Gas Improvement Company, which was yearly selling more gas to the Municipality in bulk. In brief, this Company and their associates are described as owning the city; so that resistance to their designs upon the gas undertaking was felt to be futile.

Professor Bemis devotes a considerable portion of his article to showing that elsewhere in the United States the public ownership of gas undertakings succeeds, notwithstanding the curse of politics and corporation incompetence in business matters. The instances cited, however, are not numerous; nor, with the single exception of Richmond, Virginia, are the towns large. It is admitted by Professor Bemis that these public undertakings make gas at exorbitant cost; but he argues that this really does not matter to the public, because though the manufacturing expenses of gas companies might be less, they would certainly charge more for the gas. Cheap gas, according to this not very reassuring view, is not out of the reach of the American people. The only hope of improvement in this respect—and it is a thin one—entertained by Professor Bemis is expressed in the sentence: "There is no reason why American cities should not have equal success in public ownership of lighting plants with that existing across the water, as soon as our people are anxious to have such success." The city administrations are corrupt; the leaders are self-seeking; and the people are content to have it so. The picture is not a pleasing one; but it is at least candid.

#### GASHOLDERS ON PEASE'S SYSTEM.

AN illustrated and annotated catalogue of gasholders erected by Messrs. Ashmore, Benson, Pease, and Co., Limited, on Pease's wire-rope system of guiding, deserves fuller notice than the ordinary run of trade publications. Though the idea of the possibility of improving on the old style of external lofty guide framing for gasholders was first suggested in the "JOURNAL," it is due to Mr. Pease to state that the credit of devising and working out what has proved to be the most elastic method of controlling gasholders without guide-framing belongs to him and to his firm alone. The extent of development of this system is exhibited by the fact that the present catalogue deals in consecutive order with: (1) Three-lift cable guided gasholders; (2) telescopic gasholders enlarged by the addition of two lifts; (3) single-lift gasholders enlarged by the addition of two lifts; (4) two-lift cable guided gasholders; (5) single-lift gasholders enlarged by the addition of one lift; (6) telescopic gasholders enlarged by the addition of one lift; (7) single-lift gasholders enlarged by the addition of one lift, the columns being retained; (8) single-lift gasholders in steel tanks; (9) single-lift gasholders. This list appears to cover the whole range of modern gasholder practice; and when the examples collected in this catalogue are glanced at, their number and importance are ample evidence as to the practical value of the cable system. The enlarging of gasholders by the addition of extra lifts has of late years been a most important branch of gasholder construction; and it is claimed that the cable system of control is especially suitable for use in this economical method of increasing gas storage capacity.

The catalogue is prefaced with a brief explanation as to the principles of gasholder guiding. It is shown that all that is necessary in this regard is to secure parallel vertical movement of the gasholder; and this can be perfectly effected by cables. When the system was first introduced, there was no available knowledge as to the actual amount of work performed by the guiding arrangements of a gasholder. It has been ascertained that the strength required to preserve the rectitude of movement and position of gasholders under all the conditions of service, is much less than was once supposed to be necessary. The application of cables for supplying this strength furnished, for the first time, a means of ascertaining the overturning forces acting upon gasholders; and it was found that the strain upon the cables is well within the strength of steel rope in common use. "There is, in fact, a very large margin of safety allowed in every holder designed on these lines, without using cables of greater diameter than from  $\frac{5}{8}$  inch to  $\frac{7}{8}$  inch." In the later examples, the controlling power of each cable is increased on the principle of moveable pulley blocks. This is termed the multiple-power system. The ability to increase the effectiveness of the cables in this way is a great convenience in designing telescopic gasholders. For example, the inner lift may be guided by a series of cables in single purchase; and the same cables when continued to the second lift may be used in double purchase. Or

\* See Vol. LXXI, p. 953.



the two inner lifts may be controlled by single purchase, and the third lift on the treble purchase principle; thus securing the greatest strength where it is most required.

The cables employed are of high quality steel, either galvanized or built up with a waterproofing solution. The attention they require in operation is only a small fraction of the labour and cost entailed in painting columns or standards. An ingenious device of a floating cup of wood, through which the cable passes on entering the tank, protects and automatically oils it. It is stated that the earliest cable-guided holder, erected in 1889, still has the same cables in excellent condition. In ordinary positions, a cable will last well for an almost indefinite period. In some places, the atmosphere or the water tends to deteriorate the metal, which has to be guarded against.

The first example in the catalogue is the Middlesbrough three-lift gasholder, which is 184 feet in diameter, in 30 feet lifts. "Owing to the treacherous nature of the foundations, the tank has sunk in so irregular a manner, that it is certain had any other method been adopted than the cable system, the holder would have been an absolute failure. . . . The holder works perfectly level, although the tank is as much as  $7\frac{1}{2}$  inches out of level." In contrast with the Middlesbrough holder is that at Sligo, which is an old single-lift of 50 feet diameter converted into a three-lift; the columns being removed. It is safe to say that such an enlargement would have been impracticable with column guiding. The holder now rises higher than its diameter. It is fully exposed to the Atlantic gales; and it is interesting to note that a registering device applied to the holder showed in a storm a strain on the cables of 8 cwt. only.

It is unnecessary to multiply references. Not the smallest incidental advantage of the cable system consists in the help it affords for cheap tank construction. In a large number of cases a steel tank on the ground level can now be provided at a considerable saving on a tank for which extensive excavation is required, besides being absolutely tight. Where the cable system is adopted, a small bracket takes the place of the length of guide standard which would otherwise stand beside the tank.

#### OBITUARY.

Mr. T. G. BROWNING, the Secretary and Manager of the Whitstable Gas and Water Companies, has recently died at the age of 69 years.

Mr. D. GRANT, late of the firm of Messrs. David Grant and Co., gas-meter manufacturers, of Edinburgh, died at his residence in that city on the 6th inst., in his 88th year.

We regret to learn of the death, on Sunday, the 10th inst., of Mr. W. H. CATLIN, the Manager of the Kilkenny Gas-Works, under circumstances which leave no doubt that the unfortunate man committed suicide. Deceased was a Freemason, and held an official position in the local lodge.

#### PERSONAL.

Sir JOHN WOLFE-BARRY, K.C.B., F.R.S., has been elected Chairman of the Council of the Society of Arts.

M. MOISSAN has been awarded the grand prize of 12,000 frs. by the French Société d'Encouragement pour l'Industrie Nationale, for his numerous researches in chemistry.

We are asked to state that Mr. L. DE FONBLANQUE and Mr. JULIUS MOELLER have resigned their seats on the Board of the Frank Wright Prepayment Gas-Meter Corporation, Limited.

Mr. T. WHIMSTER has been appointed Manager and Secretary of the Omagh Gas Company, in succession to the late Mr. D. M'Callum, to whom he was assistant. Mr. Whimster is the eldest son of the esteemed Secretary of the North of Ireland Association; and he became associated with Mr. M'Callum rather more than two years ago, on completing his articles with Messrs. R. Laidlaw and Son, of Glasgow.

We learn from the "American Gaslight Journal" that Mr. FORREST E. BARKER, the Chairman of the Massachusetts Board of Gas and Electric Light Commissioners, has been re-appointed by the Governor of the State. Mr. Barker has served longer than any other member, having been continuously a Commissioner since the establishment of the Board in 1886. He is a lawyer by profession; but, by contact with engineers both in America and in other countries, he has acquired an intimate knowledge of the gas business in all its details, and it may be fairly said, without injustice to the other members of the Commission, that much of the success of the Board has been due to his tact and good judgment. That the work of the Board is approved, is shown by the fact that the Legislature, before its recent adjournment, departed from its established precedent, and resolved to increase the salaries of the Commissioners from \$2500 to \$3500; raising that of the Chairman from \$3000 to \$4000 per annum.

Mr. JOHN GILBERT TAPLAY, of The Gaslight and Coke Company, has been appointed Lecturer on "Gas Manufacture" at the Battersea Polytechnic; and will commence his duties in October next. After finishing his education at the Newcastle (Staffs.) Grammar School, Mr. Taplay commenced his career in

the gas profession as pupil of the late Mr. Robert Linging, Engineer of the Potteries station of the British Gaslight Company. Soon after that gentleman's death, Mr. Taplay was appointed Assistant to his father, who was then Engineer and Manager of the Stoke-upon-Trent Corporation Gas-Works, and remained with him till the change of management took place under circumstances which were reported in the "JOURNAL" at the time. In the list of successful candidates in the examinations in "Gas Manufacture," which we published on July 25, 1893, Mr. Taplay was among the few who passed first class with honours. The promise then given of a useful career is being fulfilled; and we cordially wish him continued success.

**Lighthouse Illumination by Incandescent Gas-Burners.**—A Committee of the Elder Brethren of the Trinity House (Captains Vyvyan and Slader) lately visited Yarmouth to inaugurate what may prove to be a most important improvement in coast illumination by the adoption of the incandescent gas-burner at the Caister leading lights, on the Britannia Pier, and at the Sailors' Home. The Committee and Superintendent left Yarmouth by boat, and proceeded as far as the Cockle Light Vessel to view the lights, which were a marked improvement on the old ones, showing clear and distinctly superior to the electric lights by which they were surrounded, and presenting to the mariner an increase of illuminating power from 3000 to 10,000 candles.

**Bartlett's Incandescent Burner Adapter.**—An ingenious arrangement for automatically controlling gas-lighting burners has recently been patented by Mr. F. G. Bartlett, of 4, Elton Road, Bristol. Some particulars as to the invention appeared in the "JOURNAL" for Jan. 4 last (p. 27) and May 31 (p. 1263). The apparatus is made in the form of an adapter, and is primarily designed for use with incandescent burners. It has not hitherto been possible to control from a distance, with certainty, one or a series of burners without a separate pilot-service, or bringing into requisition a more or less lengthy rod with which the lever and chain can be operated. It is recognized by gas engineers that a "missing link" is required to render perfect an installation of incandescent burners in large halls, places of worship, &c. Although attempts to deal with the difficulty have been numerous, we do not think any method so practical and effective as that here referred to has yet been discovered.

**Wynn's Automatic Waste-Preventer for Gas-Stoves.**—Ready as are housewives to acknowledge the advantages of cooking by gas, they not unfrequently complain, as many gas managers are aware, of heavy bills, caused by the wasteful use of the gas by their domestics. As this tendency is one which it has been found very difficult to check, various appliances have been devised for automatically shutting off the gas as soon as it is no longer required. The latest of these is a cooking-stove attachment patented by Mr. J. Wynn, of Cardiff, by the use of which, it is claimed, waste is rendered impossible. A lever with a small roller is fixed just above the bars of the hot-plate, and is fastened to a rod which runs immediately below the bars to the tap. At the other side of the hot-plate is fixed a balance-weight. As the servant puts the kettle or other vessel on the ring burner of the hot-plate, the lever turns on the gas. A part of the patent is an improved gas-tap which is constructed to work in conjunction with the automatic action, which enables the cook to perform the various culinary operations and produce any gradation of heat required without lifting the vessel from the burner. When the vessel is removed entirely, the balance-weight attached to the lever shuts off the gas. Fixed to the side of each burner, in such a position as to be quite out of the way, is a small pilot-light; thus rendering unnecessary the use of matches and spills, which, as is well known, is the cause of an accumulation of dirt. Messrs. John Wright and Co., Limited, are licensed manufacturers of the attachment for Great Britain and the Colonies.

**The Inspection of Steam-Boilers.**—We have received from the Chief Engineer of the Manchester Steam Users' Association (Mr. C. E. Stromeyer) a print of the memorandum presented by him at the annual meeting on the 5th of April, which has just been issued as a pamphlet. The "Advice to Boiler Attendants" which was distributed early in the year, and noticed in the "JOURNAL" for Feb. 22, is reprinted; and a few practical remarks on the best method of cleaning boilers and economizers have been added, as well as somewhat fuller explanations on the injury caused to boilers by incrustation and grease. An appeal is made to steam users to spare their boilers by using less oil in the cylinders. The memorandum also contains a short review of the life of the late Chief Engineer, Mr. Lavington E. Fletcher. Further, a few interesting comparisons are given as to the cost of explosions of boilers other than those approved of by the Association, which was the first institution to establish periodical boiler inspection on a practical basis. The Association record with justifiable pride the fact that they have had only one explosion among the 6000 boilers entrusted to their care. It is pointed out that out of 215 persons killed or injured during the last five years, the large proportion of about one in thirteen were boiler owners or their sons or managers; and steam users are urged, for their own personal safety, to insist on having their boilers properly inspected. The memorandum also refers to the average cost of explosions distributed over the entire number of boilers in the United Kingdom; the calculation being made in view of the increased liabilities imposed upon factory owners by the Workmen's Compensation Act.



## NOTES.

### Testing the Permeability of Paints.

A quick method of testing the permeability of paint by water and gases is proposed by H. Loesner. Small strips of sheet iron, of uniform size, are carefully brightened on one side by rubbing with emery or glass paper and immediately coated with a thin layer of the paint under examination. Four days later another coating is applied, and the slips are allowed to dry for four days longer. They are then laid, paint downwards, over a constant-level water-bath, being supported at a height of 50 mm. above the surface of the boiling water. After fifteen hours' exposure to the ascending steam, the paint is dried at a maximum temperature of 100° C. It is then removed by the aid of aniline and a soft brush, when the surface of the metal should be found free from rust, if the paint is good. The effect of acid vapours may be tested in the same way, except that concentrated (33 per cent.) hydrochloric acid is substituted for the water, and the protective incrustation formed on the surface of the paint is to be rinsed off every hour, the temperature being 20° C., and the time of exposure twelve hours. A good idea of the comparative protecting value of paints and other rust-preventing applications for ironwork may be obtained in this way. Substances sold by the same name are found to differ widely in this quality. Good paint should stand the treatment for a minimum of twelve hours.

### Lighting by Vacuum Tubes.

A novel scheme of interior lighting was shown at the New York Electrical Exhibition by Mr. D. M. F. Moore, whose work in connection with the development of light from vacuum tubes has been more than once mentioned in the "JOURNAL." According to the "Electrical Engineer," Mr. Moore erected in the Exhibition a model chapel, complete in every detail, in which he shows to perfection the manner in which vacuum tube lighting might be carried into practice. The vaulted roof is ribbed with veritable arches of light emanating from long curved glass tubes about 2 inches in diameter, glowing their entire length with a pure white effulgence. Hence the lighting comes from the soffit of the roof arches. It is evident from the account that a good deal of accessory apparatus is required to produce this result from the ordinary street electric lighting service. According to Mr. Moore, his system at its present stage of development is of about equal efficiency with incandescent electric lighting; but he looks for better results with improvement of the tubes. It is stated as one of the recommendations of this system of lighting that it is possible to vary the colour of the light, even to the most delicate shades, by simply changing the degree of vacuum of the tubes; thus making them the ideal source of light for every decorative purpose. In the absence of detailed statements of cost, however, it is impossible to say whether any real progress has been made with this system, which it is hardly necessary to say is upon a very old principle.

### The Commercial Testing of Iron and Steel.

Mr. Kreuzpointner recently read a paper before the Franklin Institute on the practical aspect of the present customary commercial methods of testing structural iron and steel. He points out that the subject of testing structural materials must tend to assume greater importance as time goes on, and nations discover the necessity of using higher economy in the consumption of their material resources. With regard to iron and steel, the tensile test appears to be considered the most important, and is therefore the most widely used. Seeing that the bending or nicking test of a whole bar of metal shows its internal make-up as well as, and often better than, the tensile test of a strip cut from the same bar, it is averred that at present much time and money are spent in the tensile testing of ordinary iron where a nicking testing would be better. The latter, however, makes greater demands upon the knowledge and judgment of the operator. The author criticizes the ordinary tests for elasticity and contraction of area under tension. He declares that while for special grades of steel in short pieces the test for reduction of area has some practical value, it is different with the enormous masses of structural material of all kinds now produced and sold for every-day use. The drop-test is a very practical method of ascertaining the shock-resisting power of the metal, provided the blows are sufficiently heavy. Mr. Kreuzpointner appears to rely above all, however, on nicking and bending tests. "If iron, a nicking test will show whether it is clean or dirty, short-fibred or long-fibred, dry or juicy, coarse crystalline due to cold shortness, or that fine, mushy, silvery granulation so characteristic of burnt iron. In steel, the nicking will show laminations, shortness, and to a certain extent want of uniformity of heating of the material in the mill." The bending test is a reliable measure of ductibility; for if the convex surface has a velvety appearance, without showing the smallest skin cracks, it is fair to conclude that the piece of steel is of good quality.

### "Carbolite"—A Rival of Calcium Carbide.

According to a statement appearing in "The Iron Age," a competitor with calcium carbide as the source of an illuminating gas has been found in a product named "carbolite," into which blast-furnace slag enters as the chief constituent. Mr. Herman L. Hartenstein, of Chicago, is the patentee of a process for utilizing blast-furnace slag in the manufacture of a new product from which ethylene gas is producible, like acetylene from

calcium carbide. "Carbolite" is described as a combination of calcium carbide, aluminium, and silicon. It is produced by the following method: Blast-furnace slag is placed while still fluid into converters similar to those used in making Bessemer steel. The tuyeres of these converters are so arranged that finely-powdered coke can be fed through them with the air-blast. By this means the slag is stated to be thoroughly impregnated with the coke. What follows is somewhat mystifying. It is said that when the mixture of the coke dust with the slag is complete, the converter is turned over so as to allow its contents to flow between a series of carbon bars forming electrodes, through which a powerful electric current passes. "Coke is an excellent conductor of electricity, while slag is a resistant. The result is that the particles of slag in connection with the particles of coke form innumerable electric arcs, producing a most intense heat within the mixture. In the course of about twenty minutes, the mass becomes so superheated that slag is fused or carburetted with the coke. When this fusion is effected, the material is finished. It is then poured into moulds." This is the carbolite, which when cooled has a crystalline nature, with a metallic lustre, and can be kept so long as it is protected from air and moisture. It is to be used for generating ethylene, like calcium carbide for acetylene. The yield of gas is 5 cubic feet per pound. Preparations are being made at Hammond, near South Chicago, for the production of the carbolite by the adaptation for the purpose of a disused Bessemer steel plant.

### The Theoretical Aspects of Acetylene Manufacture.

An article in the "Engineer" discusses the theoretical aspects of acetylene manufacture. It is admitted that until such time as the price of calcium carbide shall be so far reduced that the cost of acetylene lighting is very greatly below that of intelligently burnt coal gas as delivered to consumers in cities—a consummation more to be desired than expected—there is little prospect of the former being adopted by individual urban householders. With reference to the protective office of the odour of the illuminating gases, coal gas and acetylene, it is remarked that "the nose becomes habituated to the smell of coal-gas after a time—fatigued or paralyzed, perhaps—since country people usually affirm that they can detect gas in every town house, just as citizens notice the odour of paraffin in every country village." It is questioned whether fatigue of the nose would occur so soon with acetylene; "for the latter generally causes a distinct headache as well as a sensation of disgust." With regard to the preparation of acetylene from calcium carbide for domestic lighting, it is advised that some sort of purifying arrangement should always be used. Without going deeply into the details of the acetylene generators now being offered to the public, and many of which are described as "automatic," it is observed that the only safe principle to work upon is that of controlling the supply of carbide to the water. "The ordinary plan for governing the make of gas is to admit the second ingredient of the active mixture through a valve worked by the rise and fall of the holder bell;" and as it is obviously easier to treat a liquid in this fashion than a solid, this is the reason why so many generators admit the water to the carbide. This principle is only suited to the smallest-sized apparatus, designed to consume but a few pounds of carbide. It is suggested also that every generator, automatic or not, should be provided with a holder capable of containing 50 per cent. more gas than can be evolved from the weights of the active substances ever brought together at one time.

### Uniform Methods of Conducting and Reporting Engine Tests.—

At the recent meeting of the American Society of Mechanical Engineers, Mr. Bryan Donkin read a paper on the advisability of extending standard uniform methods of conducting and reporting steam-engine tests. He recognized the valuable work done in the United States, and expressed the opinion that more uniformity could be obtained in the future by the adoption of standard methods and more combined action. The above-named Society have formulated instructions to be used for testing not only steam-boilers, but locomotive and water-pumping engines; and Mr. Donkin suggests that similar standard methods of conducting and reporting experiments should be extended to the important branch of marine steam-engines, and also to factory, mill, and agricultural engines and quick-running steam-motors for electrical work. He thinks a Committee of the Society might be appointed to take these questions into consideration, and to standardize a uniform method of testing and reporting on gas and oil engines. As these extremely economical motors give a very much higher heat efficiency than steam-engines, they must have a great future before them. Consequently, Mr. Donkin thinks the sooner such methods of trial are published, the better it will be both for those who make the tests and those who have to compare them. He suggests the use of blank forms and separate instructions, printed on strong paper, in pocket-book size, for the different types of engines. These should be purchasable at a moderate price; and they might be translated into French and German and adapted to the metric system. This matter has been taken up, at Mr. Donkin's suggestion, by the Council of the Institution of Civil Engineers, whose Thermal Efficiencies Committee, of which he is a member, have issued a preliminary report in which they recommend that all steam and heat engine results should be given in thermal units per indicated and brake horse power.



## COMMUNICATED ARTICLES.

## THE WORK OF THE PURIFIERS AND PURIFYING MATERIAL.

By STEPHEN CARPENTER, of East Ham.

At the close of the preceding article,\* I referred to some unusual results attending purification by lime which were made the subject of special investigation. The first thing I did was to prevent atmospheric air from passing into the purifiers from any source whatever. After doing this for several days, the sulphur would be low—about 12 to 15 grains per 100 cubic feet of gas; then for a few days it would be very high, and afterwards for a few days low. Sometimes it would be as high as 50 or 70 grains per 100 feet. When the sulphur was low I had the cover of the purifier lifted, so as to examine the condition of the lime in the purifier. It was found to be very hot, and of a dark green colour. At the same time I was not satisfied with the working of the oxide of iron purifiers; and when the sulphur was again high, the cover was once more lifted, when the lime was found to be white instead of dark green, and there was but little heat in it. When the air was passed direct into the oxide purifiers, they went very well, and continued working much longer before changing. When the air was passed direct into the lime purifiers, the oxygen of the air was used up before it reached the oxide purifiers. By preventing the air from passing into the lime purifiers, and sending it direct into those containing oxide, both kinds worked well.

After the atmospheric air was excluded from the lime purifiers, there were at times fluctuations in the sulphur which gave rise to much trouble. By passing the air direct into the oxide of iron purifiers, it caused the oxide to work well, and last months instead of weeks before changing; but the fluctuations in the lime purifiers entailed much trouble at times, and their cause had to be discovered, so as to bring the lime under such control as to enable it to take out of the gas a part of the bisulphide of carbon. In order to find these fluctuations, the writer thoroughly examined all the apparatus where there was vacuum on; and, to his great surprise, he found a serious leak in the condensers where the air was passing in. He had the leak stopped; but this did not prevent all the fluctuations in the sulphur. He took the temperature of the gas at the inlet of the first lime purifier, and found it very high; he also took it at the inlet and outlet of the condensers, and it was also very high. Knowing there was something wrong, he examined the retorts, and found several small and large holes—some on the bottom, and some on the crown of the retorts. He had all these stopped, and kept a good look-out for them in the future. By preventing air from any source from passing into the lime purifiers, seeing that the retorts are well mended, and not keeping the purifiers too long in action, all anxiety as regards high sulphur in the gas will be at an end, and there will be no trouble with the lime purifiers.

The foregoing has been written especially for gas students or young gas managers, with the view of showing the trouble the writer had when he first commenced experimenting with lime for the removal of the carbonic acid and part of the bisulphide of carbon from the gas. He has pointed out these discrepancies so that managers may know where to look for them if ever they are troubled in this way. If the gas is treated in the manner here described, it will be purified in the best way at present known; and it will be as pure as it can be made. The following are the impurities which require to be removed: Ammonia ( $\text{NH}_3$ ), carbonic acid ( $\text{CO}_2$ ), sulphuretted hydrogen ( $\text{SH}_2$ ), and as much of the bisulphide of carbon ( $\text{CS}_2$ ) as is possible. The gas will then be as pure as it can be made at the present time.

The efficient purification of coal gas depends upon the employment of means for arresting the ammonia in the first instance. It has been said that the power of hydrate of lime is greater when the gas contains ammonia than when the ammonia is previously removed; also that the ammonia increases the chemical action of the lime. The writer has not found it to be so in practice. His experience has been that the hydrate of lime never becomes perfectly saturated or neutralized by the carbonic acid and sulphuretted hydrogen of the gas; but that, on the contrary, a large amount of the lime employed remains in a caustic state. This, in a great measure, is owing to the fact that, the lime being in the form of nodules, the centres of these cannot be brought into contact with the gas without at the same time exposing the outer surfaces of the sulphide of calcium to the action of the carbonic acid of the gas, whereby, of course, decomposition would be induced, and the sulphuretted hydrogen driven from one purifier into another. In order to avoid this, sacrifice of lime is needed; and the only point requiring attention is to see that this sacrifice is not carried too far. As soon as the lime in the first purifier shows that the bisulphide of carbon is as high as it is in the crude gas, the purifier must be thrown out of action. The spent lime should be ventilated or deodorized before it is taken from the purifier; and when it is removed it should be well spread out, and have some water thrown upon it if needed. Turning it over will break open the nodules, and bring them into action; and then the lime can be used for a second time. If it is manipulated in the way here

described, the expense of purifying the gas will be much reduced. The writer is inclined to think that the process of purification by lime has not hitherto been fully appreciated, or worked as it deserved. After the lime has been used the second time and revived, it becomes carbonate and sulphuret of lime, which is a good manure for heavy land; so that after the lime is spent it can be turned to profitable account.

It is indispensable to bear in mind the exact composition of foul lime before it is ventilated or revived. Foul lime as it is removed from the purifier consists of an admixture of several salts. The ferrocyanate, sulphocyanate, and hydrocyanate of lime are in such minute quantities as not to require notice here. But there are others, such as the carbonate and the hydrosulphate of lime; and if the ammonia has not been taken out of the gas, there will be hydrosulphate of ammonia. If the foul lime has not been revived, it is not surprising that, with such a mixture of impurities, an offensive odour should be emitted on exposure to the air; but if the simple process of ventilating the purifier and at the same time revivifying the foul lime has been gone through, there will not be any disagreeable smell when the lime is lifted from the purifier. After the lime has been used a second time, it should be revived before it is taken from the purifier, and then there will not be any offensive odour.

As a great deal has been said about lime as an agent for the purification of coal gas, let us now notice the qualities of this material. It is well known that lime was the first agent employed for the above-named purpose; and recent experiments, conducted with the most scrupulous care and by some of the most experienced manipulators, have shown beyond all question that nothing is so well adapted as dry lime for the complete purification of gas from carbonic acid, bisulphide of carbon, and sulphuretted hydrogen, and nothing tends so much to preserve its illuminating power. Common lime, used in a dry-lime purifier, will purify the gas better than any other agent, if the atmospheric air is excluded from the purifiers. Hence the lime, when fully saturated, or, as it is called, "foul," contains none of the light-giving properties of the gas, for these have passed through untouched. A very different result is witnessed when oxide of iron or other agents are employed. Oxide of iron only removes the sulphuretted hydrogen; leaving the carbonic acid and bisulphide of carbon. The reason is this: Bisulphide of carbon is termed a sulphur acid, while the hydrate of lime is alkaline in its nature, and therefore has a great affinity for an acid. This affinity exists between the hydrogenated sulphide of calcium and the bisulphide of carbon in the gas. A very different result, however, is experienced with oxide of iron, as this material is not of an alkaline, but rather of an acid nature; consequently, there is no affinity for either carbonic acid or bisulphide of carbon. It has been pointed out how much more energetic is the action of lime upon the impurities of coal gas than is that of any metallic salt or oxide whatever. Indeed, it has been shown that this superiority of lime is so decided, that no hesitation has been felt in declaring the complete purification of coal gas to be practically impossible without the free use of this material.

The chemical action of lime is somewhat as follows: When the crude gas is permitted to act on the hydrate of lime in the purifier, the heat of the gas dries up some of the moisture of the lime, and at the same time the temperature of the lime is raised. This prepares the lime for the absorption of the bisulphide of carbon. If the material in the purifier becomes damper instead of drier, the chemical action would be very slight. The writer has found in practice that when the lime has been in its best condition for taking out the impurity in question, it has been so hot as only just to allow of the hand being thrust into it. If it had not reached this temperature, it would have but little affinity for the bisulphide of carbon. If the crude gas is passed through wet lime, or what is called "cream of lime," the bisulphide of carbon will not be removed. The gas being made should be tested for this impurity twice in 24 hours, so as to keep the lime purifiers in good order. The gas taken from the outlets of the lime purifiers to be tested should be passed through a small purifier charged with about half-a-bushel of oxide of iron, in order to remove any sulphuretted hydrogen.

A little knowledge of chemistry is very useful in the manufacture of coal gas; and for the benefit of those young managers who have not had the advantage of instruction in this particular branch of science, the writer will offer a few simple observations on certain matters which he found helpful when he first began to study gas making. He does so in the hope that they may be of service to those for whom they are specially intended. The chemistry necessary in connection with the manufacture of coal gas relates mainly to testing the gas for its impurities. The raw material—coal—is composed of several ingredients, such as carbon, oxygen, hydrogen, nitrogen, sulphur, and iron. When the coal is put into a retort at a bright heat its normal condition is changed; and when its various ingredients are set at liberty, we get these products—coke, carburetted hydrogen, hydrogen, carbonic acid, sulphuretted hydrogen, ammonia, bisulphide of carbon, various basic hydrocarbons containing nitrogen, &c., protosulphuret of iron, tar, and water. After the volatile matter has been driven out of the coal, the excess of carbon remains as coke, which holds the protosulphuret of iron derived from the decomposition of the bisulphuret. These are the impurities. The hydrogen in part remains free, while part combines with the carbon, giving rise to various kinds of

\* See "JOURNAL" for April 19 (p. 882).



hydrocarbons, such as gas, naphtha, and tar. Another portion of the hydrogen combines with part of the bisulphuret of iron and any free sulphur present in the gas to form sulphuretted hydrogen; while the rest unites with oxygen to form water, or with nitrogen to produce ammonia. The remainder of the oxygen is taken up by part of the carbon; and thus carbonic oxide and carbonic acid are generated.

It has been said that the production of the bisulphide of carbon is altogether a secondary action; but the writer has not found it to be so. He has found that as soon as distillation begins, bisulphide of carbon is produced. He took a portion of the gas each hour of the charge, passed it into a small holder, and tested it for this impurity in the first, second, and third hours of the charge. There was very little sulphur in the gas; but the bisulphide of carbon increased each hour, and especially in the last hours of the charge, after the coke was formed, as it is from the coke that much of the bisulphide of carbon comes. When the time came for the removal of this sulphur from the gas, it seemed that no one knew which was the best way to remove it. Up to 1860, no means of any kind had been tried for removing or for steadily reducing and controlling the sulphur in other forms than sulphuretted hydrogen. Several suggestions were made for reducing the sulphur. The first was to pick out the iron pyrites from the coal; but this did not reduce the sulphur. The second was to pass the crude gas through red-hot pipes. This, however, did not remove the sulphur; it only caused a deposit of soot in the pipes, and stopped the passage of the gas. The third suggestion was to mix lime with the coals. None of these proposed remedies had any effect. The bisulphide of carbon had nevertheless to be reduced; and the writer set to work until he found out the way to do it. He has already described his experiments on the purification of coal gas from this impurity, the result of which was the discovery that lime was the best agent for the purpose.

#### PHOTOMETRIC STANDARDS.

By W. GRAFTON, F.C.S., of Beckton.

(Concluded from p. 97.)

##### *The Pentane Air-Gas Standard.*

In all the published results of comparisons with this standard, no data as to barometer and temperature have been given; the latter being most important. The temperature has very much to do with the resulting composition of the carburetted air. The amount of pentane capable of volatilizing at 40° Fahr. is much less than at 60° or 80°. Experiments prove that at low temperatures the 10-candle standard flame gives more light; and the writer believes this may also be the case with the 1-candle standard. But whether or not the combustible material is not of constant composition, unless the temperature of the water and holder is at least above 58°, the 3 oz. of pentane will not wholly volatilize, and mix with the air, until the temperature reaches the before-mentioned figure. In taking the density of the pentanized air below this temperature, it is most difficult to get the same figure twice alike from the same sample; and, besides, the results obtained on one day may not agree with those obtained from a fresh sample of gas on another day. But when the temperature is between 60° and 70°, very concordant results can be easily obtained.

In using this standard for purposes of comparison, it should only be employed between the temperatures of 60° and 70° Fahr.; otherwise the 1-candle light is seriously affected. And it must only be used under similar conditions of temperature and the same kind of atmosphere as regards purity and humidity. This limits to a very great extent its every-day usefulness as a standard of comparison, unless tables of correction are made, which, in the writer's opinion, are inevitably necessary. The power of this standard must be more than any average candle, since the 10-candle standard is shown to be more than an exact multiple of the candle. Yet, according to the observers, agreeing with the 1-candle Harcourt clearly shows that some of the error attributable to the Didbin standard must be attached to the power of the pentane air-gas flame.

Other forms of standards were tried, but with unsatisfactory results. One may be mentioned by which pentane vapour was allowed to descend to the burner by gravitation. Since experimenting, Mr. Harcourt has devised a similar method; but it will not prove satisfactory in practice. The temperature of the liquid and of the surroundings is so variable that the air-laden vapours leaving the carburettor are not of constant composition. The percentage of air to pentane vapour varies greatly day by day, and also by the amount of time allowed the burner to get warm, which is equal to the time allowed for the carburettor to arrive at a constant point of temperature. The central air supply is defective, as it will be found that when the room temperature is greater than 65° Fahr., the quantity of air gravitating to the burner becomes less and less as the temperature rises. This is not to be wondered at, considering that the temperature immediately under and outside the bracket F tube is over 100° Fahr. Consequently the flame is not a perfect one, except perhaps at low temperatures, when the air supply is greater, and the pentanized air not so heavily saturated with pentane vapour.

#### *A Weak Spot in Photometric Apparatus—The Disc.*

The great importance of having good sensitive discs is very essential when experimenting, especially if accurate results are required. But it is equally so for everyday work. Discs have two distinct failings—one being that, when the disc is apparently equally lighted on both sides, it may yet be moved to the extent of three-quarters of a candle without being noticeably altered, since the centre spot is wholly lost; the other being where the centre spot of the disc is not and cannot be lost, but there remain two distinct rings. Like the first description of disc, movement can be made without any observable change, which some might hold entitles an observer to legitimately lean, innocently perhaps, one way or the other—i.e., to read high or low as his mind dictated to him.

This piece of photometric apparatus is the crucial and principal part, and yet very little examination is devoted to it. The proper disc should have a sharp disappearing point—a point which cannot be otherwise than definite, decided, and conclusive, having no observable rings and no long disappearing centre. No amount of movement should be allowed over one-tenth of a candle on the scale. All discs should be passed through the hands of the Gas Referees before the Gas Examiners receive them; and none should be destroyed without their permission. I am aware that this entails work; but it is necessary. The Gas Referees, when they open a new testing-station, certify the instruments therein; and certainly the disc is one of them. This certified disc does not long last good, and is soon rejected by the official in charge of the station. The new one, however good, has not been certified, but simply chosen from a stock box, by choice of the operator, as a fit and proper disc. This should not be; and the examiner should not have the selecting of what might be called an impartial disc unless they are all certified.

#### CONCLUSIONS.

In concluding this prolonged investigation, the writer proves, by experiment and by actual working—

That the Didbin 10-candle standard is not as represented to be.

That the so-called 10-candle standard is really equal to 10.47 certified sperm candles.

That the standard light is not reliable or constant—

(a) It is affected by the percentage of pentane vapour in the air;

(b) It is affected by small differences in the height of the flame;

(c) It is affected greatly by a close atmosphere; and

(d) Moisture largely affects it without going over a great range—the working range in the testing-stations being 50° to 84° Fahr., while occasionally a lower temperature may be found in winter.

That, if adopted, a correction for moisture must be made, and the aperture in the screen reduced by  $3\frac{1}{2}$  mm.—i.e., the opening in the screen above the top of the steatite should be 51 mm. in height.

That the standard requires to burn at least 20 minutes before use, in order to cool the carburettor to a normal point.

That the air is always thoroughly saturated when leaving the carburettor; and by passing it over more pentane of the same temperature no augmentation of pentane vapour takes place.

That when the standards are alike, they agree to within 1 per cent. of each other, irrespective of the end of the photometer in which they may be fixed.

That the quantity of pentane in the carburettor affects the composition of the resulting carburetted air.

That coal gas is practically an equivalent of air as a carrier of pentane vapour at all temperatures above 60° Fahr.; very little difference in light-value being observable. For temperatures under 60° Fahr., less gas is required than air.

That the greater the rate of gas or air, the higher the power of the standard.

#### *Methven Standard.*

That the experiments relating to the Methven screen show that the light passing through the small slot from a portion of a  $2\frac{1}{2}$ -inch pentane-gas flame is equal to 2 average certified sperm candles.

That this standard is reliable and practically constant; showing only  $\frac{1}{2}$  per cent. variation due to temperature and pentane vapour.

That moisture has no appreciable influence upon the portion of the flame used as the standard.

That the difficulty of setting the flame to  $2\frac{1}{2}$  inches is only imaginary when the atmosphere is still, as it is in a properly constructed photometer and room.

That much more delicate readings or observations of the disc can be made by the use of this standard than by one having a higher power.

The principle of the standard, as proved by experiment, is sound, and as near perfection as can be hoped for. No whole or greater part of a flame is or can be constant.

#### *Pentane Air-Gas Standard.*

Experiments show that this standard—the chief substitute for the sperm candle—is only reliable between the temperatures of 60° and 70° Fahr.



That if it agrees with the 10-candle standard having a 2.15 inch opening in the cut-off screen, it must be of greater value than one average certified sperm candle.

*Harcourt Ten-Candle Lamp.*

In its present form, it is not reliable.

It is too greatly affected by temperature, and the central air current is insufficient.

The power of the standard is variable.

Finally, discs as forming part of the apparatus, should be certified, as required from time to time, by the Gas Referees.

## TECHNICAL RECORD.

### SOCIETY OF CHEMICAL INDUSTRY.

#### *Annual Meeting in Nottingham.*

The Annual Meeting of the above-named Society was held in Nottingham last Wednesday and the two following days. The business portion of the proceedings (occupying only part of the first day) was transacted in the Lecture Theatre of University College, under the presidency of Dr. FRANK CLOWES, F.I.C., Chemist and Superintending Gas Examiner to the London County Council, who was for some years Professor of Chemistry and Metallurgy in the College.

The minutes of the annual meeting held in Manchester last year having been passed, the report of the Council was read. It was stated therein that the number of members on the register was 3196, compared with 3037 on the previous occasion. During the year, 311 new members had been elected, compared with 226 in 1896. This was the largest number since 1885, when 345 elections were recorded; though 1890, with 298, ran it close. The loss had been 152; among them being 28 deaths. The excess of revenue over expenditure amounted last year to £737 12s. 5d., compared with £1011 in 1896. The report of the Hon. Treasurer (Mr. E. Rider Cook) showed that last year there were 2818 subscribers, from whom a sum of £3524 12s. 11d. was received; the total receipts being £4738 16s. 9d. Both reports were adopted.

The President then delivered his address. He commenced by pointing out that the Society held their annual meeting in Nottingham in 1890, under the presidency of Sir Lowthian Bell, and the local chairmanship of Sir John Turney; the University College being then, as now, their head-quarters. In acknowledging the courtesy which the Mayor and Town Council had again extended to the Society by permitting the use of the College buildings, the President expressed the members' desire to congratulate the town upon having been raised to the dignity of a city, the present Mayor (Alderman E. H. Fraser, D.C.L., J.P.), upon having received academic distinction, and the Town Clerk (Sir S. G. Johnson) upon having received the honour of knighthood. They believed that the willingness shown by Nottingham to receive the Society must be connected with the progressive and hospitable spirit which the city had always shown, and with the existence in it of a large and successful University and Technical College, and of a flourishing Section of the Society.

In acknowledging the welcome accorded to the Society, the President said it was only natural to compare their present with their past position and their origin. The report of the Council informed them that the membership of the Society had reached a total of more than 3000; and it must be remembered that this large enrolment had been secured in a period of only seventeen years. Towards the end of June, 1881, the first general meeting of the Society was held in London under the presidency of Sir Henry Roscoe. The Society was then only three months old, and numbered about 300 members. It was in every sense a national society; but distinguished Continental chemists were willing to help the young association by taking up its membership. The first President stated that its main object was to bring together at definite intervals those who were interested in, or possessed knowledge concerning the utilization of chemical action on a large scale, and had charge of, or were connected with, those large branches of industry which are dependent upon chemical principles. He remarked that to the interchange of ideas brought about by such personal contact might well be added the publication of the proceedings of the meetings, as well as of information or intelligence interesting to the members. In this way, the Society could not fail to contribute to the advancement of those important branches of national industry which are dependent on chemical principles. Those who had noted, from these early days, the development of the scheme foreshadowed by their first President, could not but see how completely his intentions and predictions had been fulfilled. The Journal referred to by Sir Henry Roscoe had come into existence, and was one of the most complete and valuable records of technical chemistry in the world. Those who were interested in the advancement of applied chemistry in this country had become to a large extent united in their efforts, and therefore more successful in obtaining their objects. The members of the Society valued the organization on account of the information brought together in their Journal. But they had further

advantages afforded them by the increased opportunity of meeting together, owing to the establishment of local Sections. The existence of these Sections was an important and somewhat special feature of the Society. They were now existent and active in London, Manchester, Liverpool, Newcastle, Nottingham, Leeds, Glasgow, and New York. The fact of there being a New York Section was an indication that the importance of the work of the Society was felt outside this country; and this was further proved by the very large number of foreign general members who had been enrolled.

The President then passed on to recognize the important services rendered by the Provincial Colleges in the development of the local Sections of the Society; citing as an instance his own experience in Nottingham of the advantages resulting from the establishment of a local Section with a local College. In 1881, the Town Council of Nottingham, supported by the public spirit of its inhabitants, responded to a challenge thrown out by an anonymous donor; and, by supplementing his handsome gift by public funds, built the stately and convenient buildings in which the members were then assembled. They also appointed a staff of teachers, and founded a curriculum of instruction in the principles and applications of science, which was in a great measure a response to the general demand for the provision of technical instruction throughout the country. It was felt desirable that the provision of general high-class culture should be the main object of University College, but that instruction should also be provided which would be of value to those who were equipping themselves for industrial pursuits in an industrial centre. The teachers in the College had, therefore, always borne in mind that while they taught scientific principles first and foremost as the true foundation of all industrial success, they should also in some considerable measure illustrate their teaching by pointing out the industrial applications of these principles. What could be more suitable and advantageous than the establishment, in connection with the Chemical Department of a College possessed of these aims, of a Section of the newly founded Society of Chemical Industry? In 1885 a little band of chemists of Nottingham and the neighbourhood started the Nottingham Section of the Society; and he (the President) was honoured by being its first Chairman. He had been tempted to speak at some length of the experience of the Nottingham Section not because he desired to place it in an unduly prominent position, but rather because the origin and development of the Section were, he believed, typical, and represented what had already occurred in most, if not in all, of the other Sections. He hoped the Society was destined to see a similar rise and development of new Sections in other important industrial centres of the country.

Having referred to the losses sustained by the Society during the past year through death, the President briefly alluded to two distinguished men connected with science and industry who have lately passed away—viz., Bessemer and Doulton. Their work had, he said, been so long before the world, that it was known not only to the chemists and metallurgists, but also to the general public. Men of their stamp were, he said, peculiarly English. It was the glory of England to have reared such sons; and among them—fortunately he was still hale and hearty, and in active work—must certainly be numbered the man whom the Council had this year selected for the award of its medal. He referred to William Henry Perkin. Like Doulton and Bessemer, Perkin had been the founder of a great and important industry. The production of artificial colouring matters from coal-tar products owed its origin, and in a large measure its development, to Perkin. As industrial chemists, the members would all undoubtedly be able to appreciate the great importance of this department of his work. He was an active supporter of the Society in its foundation and in the critical early years of its existence; and in 1884 he was elected to serve as its President—his immediate predecessors in that office having been Walter Weldon, Sir Frederick Abel, and Sir Henry Roscoe. From his early schooldays he had almost continuously followed scientific research as a recreation—even when he was founding and conducting a large chemical manufactory, and engaging in manufacturing and mercantile pursuits. Perkin went to the City of London School, where he (the President) deemed it an honour to have been associated with him. In 1851, he assisted in the preparation of the chemistry lectures at the school; and two years later, when he was only fifteen years old, he went to the newly instituted Royal College of Chemistry, with the intention of continuing his chemical studies under Dr. A. W. Hofmann. Perkin's rapid advance was marked by the fact that two years later he was acting as assistant to Dr. Hofmann in his research laboratory. The following March, he communicated his first research to the Chemical Society; and during the Easter recess (1856), while he was attempting to produce quinine artificially, he discovered aniline purple, or "mauve"—a discovery which laid the foundation of the extensive coal-tar colour industry of the present time. Experiments made at Pullars' dye-works at Perth, encouraged Perkin, at the early age of eighteen, to devote himself to the development of his discovery, and to extend the laboratory preparation of mauve to an attempt at its manufacture; and the result was that the new dye was sold to the silk dyer in 1857—the year immediately succeeding its discovery. The success achieved by Perkin in making and applying the new dye was rapidly followed by the introduction of additional coal-tar colours, to the discovery and application of which Perkin



himself contributed. The credit remained to him of producing Graebe and Liebermann's artificial alizarine, or madder-dye, by an improved and practicable method, which led to the artificial manufacture of the madder-dye taking the place of its preparation from the cultivated root. In 1859, the Industrial Society of Mulhouse awarded a silver medal, and some time afterwards a gold medal, to Perkin for his discovery of mauve. He was elected to the Chemical Society in 1856, the Royal Society in 1866 (at the early age of 28); to the honorary secretaryship of the Chemical Society in 1869; to the presidency of the Chemical Society in 1883; to the presidency of their own Society in 1884; and to the honorary membership of the German Chemical Society in the same year. Their own Society's medal to Perkin was an addition only to others already in his possession; including the Royal Medal of the Royal Society (1879), the Longstaff Medal of the Chemical Society (1888), the Davy Medal of the Royal Society (1889), the Albert Medal of the Society of Arts (1890), and the Birmingham Medal of The Gas Institute (1892). Academic distinctions had also been accorded to this truly eminent man, and were evidence of the fact that his honours came from widely different sources. The University of Würzburg conferred upon him the title of Ph.D. at its centenary celebration in 1882; and the University of St. Andrews gave him the honorary degree of LL.D. in 1892. This was a long, but he (the President) feared an incomplete, list of the honours conferred upon their medallist of this year.

The President next alluded briefly to some matters of applied science which had of late years come prominently under his notice. First to be mentioned were his researches and experiments for detecting and measuring fire-damp, or methane, in the air of mines. Careful experiments, which were widely extended both in the laboratory and in the mine, led him to infer that no simple and practicable method equalled in these respects the hydrogen flame when safely and suitably applied. The "flame-cap" over the standard hydrogen flame, as seen in the suitably-fitted safety-lamp, not only detected, but measured fire-damp with great precision. This standard test-flame had since been adapted to the detection and measurement of coal gas in air; and, in conjunction with Mr. Boverton Redwood, their newly-elected London Chairman, he had applied it also to the detection and measurement of petroleum vapour in the atmosphere.\*

The next matter noticed was acetylene, concerning which the President remarked that its general adoption for illuminating purposes is being delayed by the feeling that the gas is dangerous. In the liquid condition, acetylene could undoubtedly, owing to its endothermic character, undergo most violent explosive decomposition; yet Raoul Pictet strongly urged that the liquid is safe if suitably prepared and stored. In the gaseous form, Professor Lewes had given the assurance that the gas does not undergo this explosive decomposition when stored under a pressure less than two atmospheres. He further stated that this gas might, if properly prepared, be burnt in such a way as not to rapidly cause obstruction in the burners—a difficulty which had caused trouble in the past. He further stated that while it was not of use for enriching coal gas, it was a valuable enricher of oil gas. It was to be hoped that the public might ultimately receive satisfactory assurance that they could employ acetylene as an illuminant with success and safety under suitable conditions. When mixed in very small proportion with air, acetylene furnished an explosive mixture; but danger arising from this cause must certainly be looked upon as preventable. The enrichment of coal gas, which it was hoped might have been effected by acetylene, was now usually secured by the indirect employment of water gas. The large amount of poisonous carbon monoxide which was thus introduced into the enriched gas had naturally led to apprehension; while the use of carburetted water gas had certainly given rise to serious loss of life. The substitution of a comparatively non-poisonous and highly illuminating gas, such as acetylene, for enriched coal gas might be one of the solutions of the attempt to furnish the public with gas of high illuminating power.

The address closed with some remarks on the disposal of town sewage, the development of the process of treating which by artificial filtration through coke or other suitable substances would, the President said, be watched with interest by those specially concerned with this important problem. Such filtration was known to secure oxidation of the putrescible matter of sewage indirectly through the intervention of bacteria.

On the motion of Mr. G. Beilby (the President-Elect), a hearty vote of thanks was accorded to Dr. Clowes for his address.

The President then, amid loud applause, handed the medal of the Society to Dr. Perkin, who expressed his thanks to the members for the honour they had conferred upon him. He said that from his earliest acquaintance with chemistry, and while a schoolboy, the idea of working at experimental research and the possibility of making scientific discovery, became a leading thought in his mind. Since then he had found practically how important was research, not only from a scientific but also from a technical point of view; so that he had as far as he could sought to impress others with its value and the great importance of cultivating it. One of the greatest fears he had when he was led into technical work was that it might make it impossible for him to continue to follow scientific investigation, though he

determined to do so if possible, because in those days very little research, properly so-called, was carried out in chemical works—very few even possessing laboratories. But now it was gratifying to find that its practical importance was by many manufacturers more fully realized, so that it was getting understood that it is absolutely necessary, if progress is to be made, that a chemical works should be a place of research as well as a factory. This state of things had been brought about by the coal-tar industry, which was the most remarkable evidence of the value of scientific research to technical work that ever existed—in fact, had it not been for research, the very raw materials required in this industry would not have been known. Its birth also took place during the prosecution of research; and its wonderful development had also been due to research. It was very useful to remember that, while this industry had been so greatly benefited by this means, it had, in return, most bountifully furthered science by handing back to it for investigation new materials which could not otherwise have been obtained, and also by bringing forward new problems to be solved, and by doing this had been again enriched with fresh fruit for science. Thus technical and scientific work had gone together, hand-in-hand, to an extent never before experienced. This condition of things had now spread to other chemical industries. There was also another interesting matter connected with the influence of the coal-tar colour industry on technical chemistry, and that was in relation to chemical plant. At the time when this industry was commenced, the plant used in chemical works was mostly of a crude nature; and none of it was suitable for the new industry, where the products were costly, the operations delicate, and in many cases the chemicals used of a very active and corrosive nature. This necessitated the invention of new plant of a much higher order than that in use at that date—requiring for its construction a good knowledge of chemistry and physics, as well as of engineering, &c.; and the use of this higher class of plant in the colour industry had a large influence in improving the character of that now used in chemical works generally. He alluded to these matters because it was a great satisfaction to him to see the wonderful spread of scientific work and the great advance of technical work which had taken place, directly and indirectly, by the development of the coal-tar colour industry, the foundation of which fell to his lot.

The result of the ballot for office-bearers for the ensuing year was then announced; and Mr. Beilby returned thanks for his election as President.

The business then concluded.

Subsequently the members partook of luncheon provided by the Nottingham Section of the Society. At its conclusion, Professor Clowes proposed, and Mr. G. Beilby seconded, a vote of thanks to the Section for their hospitality; and the proposition was most cordially passed. In the afternoon, by the kind invitation of Alderman Sir John Turney, J.P., the members were entertained at a garden party at his residence, "Springfield," Alexandra Park. In the evening, a *conversazione*, given by the Mayor and Mrs. Frazer, was held in the Art Museum at the Castle.

Thursday was fully occupied with visits to local works; the annual dinner of the Society being held in the evening at the Exchange Hall.

On Friday there was an excursion to Lathkill Dale, Haddon Hall, and Chatsworth House; and with this the meeting closed.

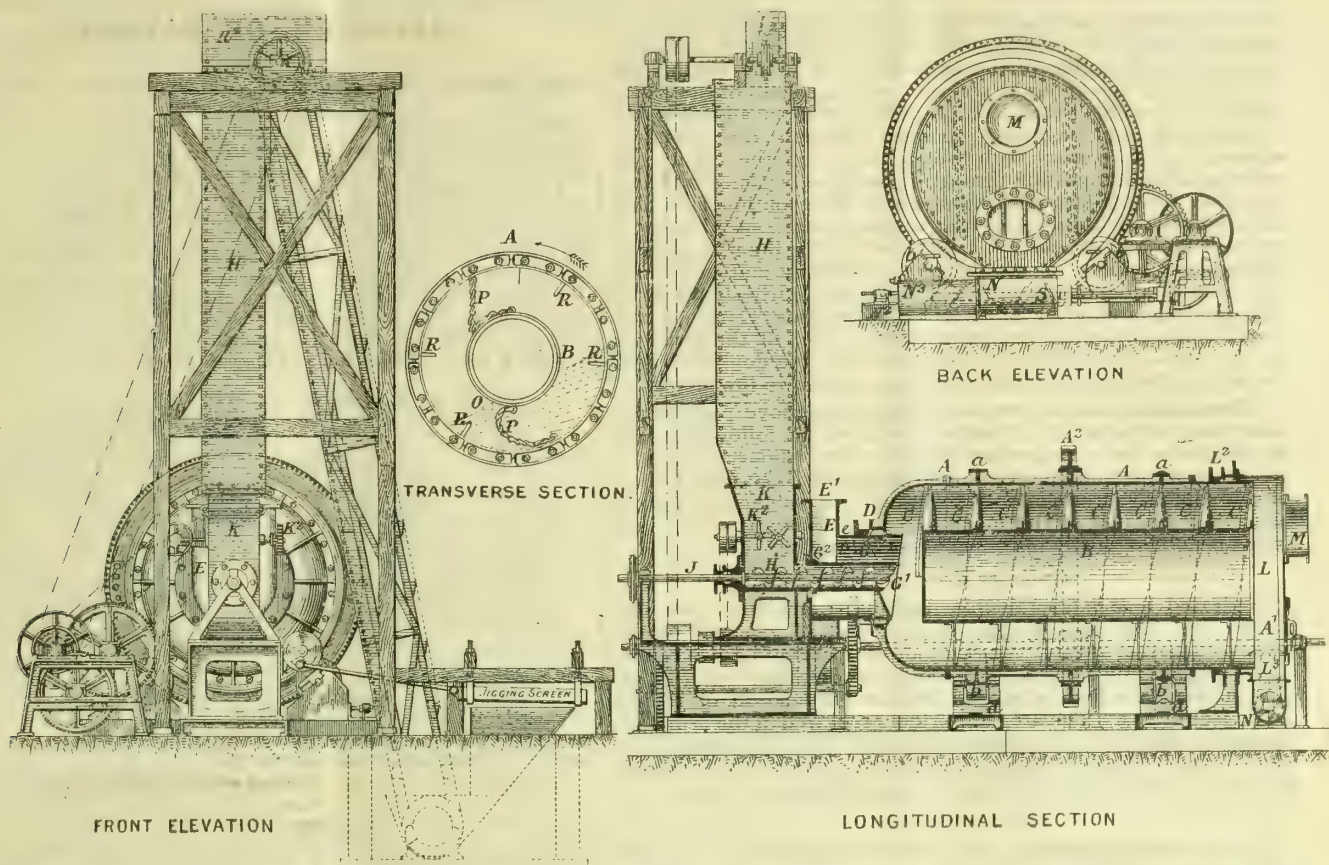
#### YEADON'S MECHANICAL PURIFYING MACHINE.

In the course of his Inaugural Address to the Manchester District Institution of Gas Engineers last February, Mr. W. S. Haddock, the Engineer of the Warrington Corporation Gas-Works, made the following remarks regarding the purification of coal gas: "A new and more satisfactory method of purifying gas than the one now in use is much to be desired. The opening of the purifiers always gives rise to some danger. The work to be performed is of a disagreeable nature, and to some extent objectionable to those living in the neighbourhood of a gas-works. A large area of land is required; and the building and plant are costly both to erect and maintain." Directly on the publication of Mr. Haddock's address, Mr. Yeadon, whose name will be familiar to our readers in connection with the revolving retort he designed some years since, communicated with the "JOURNAL" saying that he was interested in an invention at that time being protected by patent, which he said would to a very large extent meet the views expressed by Mr. Haddock. Mr. Yeadon has since sent us a copy of his specification and the drawings accompanying same, so as to enable us to fully describe to our readers what the proposal is.

The specification points out that the invention "consists in the use or application of a cylinder revolving horizontally on bearing-rollers, having attached within it a continuous internal spiral screw, and fitted with a stationary mouthpiece or box at each end, by means of which the revolving cylinder, lime, oxide of iron, or other analogous materials used for purifying gas can be continuously and automatically conveyed into, through, and out of the cylinder; while at the same time the crude unpurified gas meets with, and passes regularly and continuously through, the purifying material as it passes through the cylinder." The patentees, *inter alia*, claim that the use of

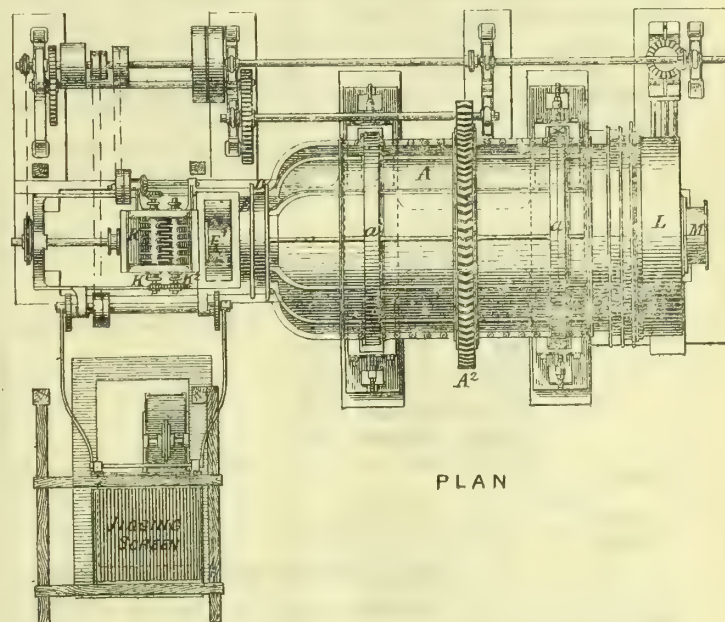
\* These researches have been noticed from time to time in the "JOURNAL."





their invention would serve "to economize labour, ground space, and lime, to save the waste of gas ordinarily lost in the present intermittent method of charging and emptying purifiers, and to prevent the nuisance and danger connected with such method." The patent, which is taken out in the names of Arthur Edward Nield Yeadon and Samuel Nield Yeadon, of Albion Place, Leeds, is No. 2444 of the present year. The patentees state that they prefer to make their cylinders parallel with a horizontal central line, as shown in the engravings; but they can also be made of a conical form, or, again, parallel and sloping.

It will be seen from the engravings that inside the cylinder A, and running nearly the whole length of it, there is a central tube B closed at one or both ends, and of a diameter proportionate to the cylinder. Between the outside circumference of this tube and the internal surface of the cylinder, there is fixed the continuous spiral screw C C, running the whole length of the cylinder; both edges of this screw being fitted with angle iron for securely fixing it to the cylinder and tube, and made perfectly gas-tight. The tube is thus carried by the cylinder to which it is attached by the spiral screw. The feeding end of the cylinder is rounded off as shown at D, and fitted with a gland and stuffing-box, through which passes the front part of the double mouth-piece E; the outside of this being turned true and smooth, at e to work in the revolving gland D. The mouthpiece consists of the external pipe, one end of which is open and extending a little way inside the cylinder, as shown at F; the other end being closed, but having an outlet E<sup>1</sup> on the top or side for the passage of the purified gas. Passing through this external pipe, in any part of it, there is fixed an internal pipe G, for feeding in the fresh lime, which pipe has its delivery end open and extending a little beyond the open end of the external pipe into the cylinder, as shown at G<sup>1</sup>. The other end of this internal feed-pipe passes through the back or closed end of the external pipe at G<sup>2</sup>, and is fitted at the top with a hopper-mouth H<sup>1</sup>; this end being fitted with a gland and stuffing-box to prevent escape of gas. Through these, and working inside the feed-pipe, is a revolving shaft J, driven by any suitable means outside, having fixed on it a spiral screw (as shown) or adjustable blades for conveying the lime into the cylinder. Above the hopper-mouth is fixed a hopper-box K, inside which revolve, at different speeds, two shafts K<sup>2</sup>, fitted with knives for breaking up and regulating the quantity of lime passing through. Above this there is fixed the hopper H, of any suitable height, so that the head of lime may prevent escape of gas; or, if desirable, a valve may be fitted at the top and another at the bottom for the same purpose. The opposite end of the cylinder is open, as shown at A<sup>1</sup>, and revolves in a stationary closed end-box L, which is fitted with a suitable gas-tight gland L<sup>2</sup>, inside which the turned end of the cylinder revolves. M is the inlet-pipe for the crude gas, fixed near or on the top of the end-box, at the bottom of which is an outlet L<sup>3</sup> for the foul lime. Attached to the end-box, and underneath the outlet, can be fixed any suitable arrangement of gas-tight boxes and valves for intermittently discharging the foul lime without waste of gas. But the patentees preferably employ a circular discharge-pipe N, in which revolves a shaft S, fitted with adjustable blades, as shown; and by keeping this shaft shorter than



the end of the discharge-pipe at N<sup>2</sup>, they ensure the end of this pipe at N<sup>3</sup> being tightly filled with the foul lime, thus securing its continuous and automatic discharge without any escape of gas. On any part of the circumference of the cylinder A, there are turned bearing-rings a a, preferably V shaped, to secure it from moving endwise. Each of these rings revolves on suitably shaped bearing-rollers b b underneath, having boxes d d, and tightening screws to regulate the height of the cylinder when working. There are also fixed one or more toothed wheels A<sup>2</sup> on the circumference, to be driven by pinions or other suitable means on any driving shaft which can be fixed in any suitable position as required. The end of the spiral screw C and the open end of the cylinder at A<sup>1</sup> can be suitably arranged, if required, to hold back the lime a little, so that by this means and adjusting the speed of the breaking shafts K<sup>2</sup>, the height or level of the lime in passing through the cylinder shall always be uniformly higher than the central tube, as at O in transverse section; preventing the gas passing over the surface of the lime, instead of through it. By way of breaking up the lime and keeping it open and free from clogging as it passes through the cylinder, there is fixed in each division of the spiral screw one or more slack breaking chains, as shown at P P; also breaking knives R, which can be fixed to the inside of the cylinder or outside the central tube, or both.

In operation, the fresh lime would be delivered by the elevators R<sup>1</sup> into the hopper H, the height of which is regulated so that the "head" of lime is sufficient to prevent any escape of gas through it. As the lime falls into the hopper-box K, the speed of the breaking shafts K<sup>2</sup> regulates the quantity to be passed into the cylinder. The speed of the shaft J is likewise adjusted



so as to pass the lime quickly through the internal feed-pipe G, without pugging or clogging, into the interior of the cylinder. The revolving motion of the cylinder A, with the continuous spiral form of the internal screw C, with the help of the slack chains P P and the knives R R, keeps the lime open and works its continuously and regularly forward through the cylinder, wherein by its contact with the impurities in the crude gas entering at M and passing through it, the lime becomes foul, and falls into the outlet-box N, from which it is continuously and automatically discharged by the rotating shaft and blades S through the outlet-pipe N<sup>a</sup>. The level of the lime in passing through the cylinder is always kept sufficiently and uniformly above the bottom of the central tube B, as clearly shown at O. The crude gas entering at M into the end-box L meets and passes through the lime in the cylinder in each of the divisions of the screw C, and finally escapes through the double mouth-piece E at the outlet E<sup>r</sup>, whence it is conveyed to the meter.

When sending the papers from which the above particulars have been extracted, Mr. Yeadon forwarded the following basis of calculation for a comparison between the ordinary system of gas purification and the Yeadon arrangement. For the latter, of course, the figures can only be assumed, for no accurate data as to the capability of the machine can possibly be given until it has been thoroughly tested on a working scale.

Ordinary Gas Purifiers.

Hydrated lime is (say) double the bulk of quicklime. Of the latter, one cubic foot weighs 56 lbs.; and 80 lbs. will purify 10,000 cubic feet of gas. A cubic foot of hydrated lime is of the same weight (56 lbs.) as a similar bulk of quicklime; but twice the quantity (160 lbs.) is needed for the purification of 10,000 cubic feet of gas. The area of purifiers required in the ordinary system to pass (say) 3½ million cubic feet of gas per day is (say) 7000 square feet for boxes and valves, the cost of which would be £8000; labour costing 3d. per 10,000 cubic feet of gas.

Yeadon Purifier.

For an assumed capacity of 3½ million cubic feet per day, the dimensions would be as follows:—

| Length.                                                                                                                            | Diam. of Shell.                 | Diam. of Tube.          | Pitch of Screw.            |
|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-------------------------|----------------------------|
| 12 feet ...                                                                                                                        | 6 feet ...                      | 3 feet ...              | 1 ft. 6 in.                |
| Speed ...                                                                                                                          | ...                             | ...                     | Four revolutions per hour. |
| Circumferential velocity ...                                                                                                       | ...                             | 1 ft. 6 in. per minute. |                            |
| Diam. of inlet and outlet pipes ...                                                                                                | 20 in. = 314 sq. in. area.      |                         |                            |
| Passage in screw for lime (say) ...                                                                                                | 18 in. by 18 in. = 324 sq. in.  |                         |                            |
| Ground area required (say) ...                                                                                                     | 40 ft. by 25 ft. = 1000 sq. ft. |                         |                            |
| Estimated quantity of quicklime used per day ...                                                                                   | 12½ tons.                       |                         |                            |
| " cost of labour ...                                                                                                               | 1d. per 10,000 c. ft. of gas.   |                         |                            |
| " cost of the purifier complete, including engine, screen, two pairs of elevators, and foundation, delivered and erected (say) ... | £750.                           |                         |                            |

Then—

| Diam.             | Sq. In.                                 |
|-------------------|-----------------------------------------|
| Shell . . 6 ft. = | 4071.51 area.                           |
| Tube . . 3 ft. =  | 1017.87 "                               |
|                   | 3)3053.64 area of lime space all round. |
|                   | 1017.88 " " " " ¼ "                     |

Then—

| Area.                                              | Length. |
|----------------------------------------------------|---------|
| 1017 × 144 = (say) 84 cubic feet, one-third round. |         |
| 1728 = cubic inches per cubic foot.                |         |

Hydrated lime weighs ½ cwt. per cubic foot. Then—  
 $84 \times \frac{1}{2} \text{ cwt.} = 42 \text{ cwt.}$  the "charge" of hydrated lime; say 41 cwt., to allow for blades and angle-irons. The purifier runs (say) eight revolutions in two hours. Then—  
 $8 \text{ rev.} \times \text{screw pitch } 1 \text{ ft. } 6 \text{ in.}$  passes the full charge, 41 cwt. of hydrated lime (length of cylinder, 12 feet) in two hours; say 25 tons per 24 hours (i.e., 12½ tons of quick lime), 160 lbs. of hydrated lime will purify 10,000 cubic feet of gas. Then—  
 $25 \text{ tons} \div 160 \text{ lbs.} = 350 \text{ times.}$   
 $350 \times 10,000 = 3,500,000 \text{ cubic feet of gas purified per 24 hours.}$

Comparison of Cost of the Two Systems.

| Area Required.            | Cost of Plant. | Labour.                    |
|---------------------------|----------------|----------------------------|
| Ordinary . 7000 sq. ft. . | £8000 .        | 3d. per 10,000 cubic feet. |
| Yeadon's . 1000 " " .     | £ " " .        | 1d. " " " "                |

With the Yeadon system, it is claimed that no gas is wasted, as with "changing boxes" in the ordinary system.

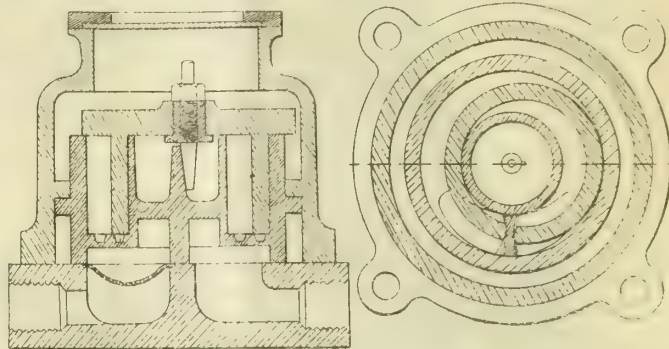
**Heating Calcium in Hydrogen.**—In the current number of the "Comptes Rendus," M. Moissan shows that if pure calcium be heated in hydrogen, the metal takes fire and burns energetically, forming the hydride CaH<sub>2</sub>—a transparent crystalline substance stable at a high temperature. It behaves as a strong reducing agent, and is violently decomposed by cold water; giving off one-seventh of its weight of pure hydrogen gas.

REGISTER OF PATENTS.

**Water-Meters.**—Hill, J. K., of Walton-on-Thames. No. 11,745; May 11, 1897.

This invention relates to water-meters of the oscillating piston type; and its object is to produce a meter having positive action and no dead-point, and one which is self-adjusting as to wear.

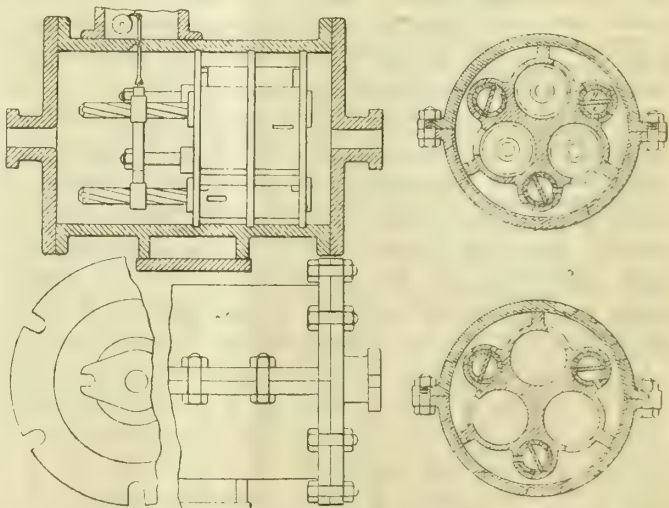
In one arrangement, as shown, there is a circular casing closed at the top, and having within it a cylinder, divided by an internal cylinder, so as to produce an annular piston-space or ring. This ring-space is divided by a transverse vertical partition; and the ports for the admission and the discharge of the water to be measured are arranged on each side of the transverse partition at the bottom of the cylinder. The ports extend within the annular space on both sides of this transverse division; and they are so shaped as to provide gradual opening and closing, as determined by the movement of a ring-shaped piston. The piston has a slot



across its depth, which fits over the transverse partition; and the ends of the piston at the slot are rounded so as to enable the ring to fit with some accuracy to the partition in all the positions of the piston. The ring-shaped piston fits the whole depth of the annular space forming the cylinder; and it is sometimes provided with a cover-plate, which fits over the top of the cylinder so that the top plate rubs upon the upper end of the cylinder while the bottom of the piston rubs on the bottom of the annular cylinder. The water passes in to the annular space on one side of the piston and the other side alternately; so that the expanding space to be filled with the water to be measured is alternately formed between the outside surface of the piston and the cylinder, and the inside surface of the piston and the inner cylinder. The piston is preferably made of vulcanite, and is supplied at the centre of its cover plate with an inwardly projecting conical pin, which works around an opposing conical pin. The piston is caused to describe a path round and round the cylinder; the inside and outside surfaces alternately having bearing contact with the opposing surfaces of the annular cylinder. By this arrangement, the piston so moves as to produce extending and contracting spaces; and the ports are so arranged that no dead-point occurs either in admission or exhaust. In this way, the piston works its own joint top and bottom, and always remains tight.

**Water-Meters.**—Dobbs, A. E., of Lincoln's Inn, W.C. No. 13,516; June 1, 1897.

This meter has three or other larger odd number of cylinders, each fitted with a piston, and each end of each cylinder capable of being put alternately into connection with the supply and with the delivery through suitable valves, in such a way that, when one end of a cylinder is open to the supply, its other end is open to the delivery. The movement of the piston of one cylinder is made to shift the position of the valves of the next cylinder in such a manner that—say, the left-hand end of one cylinder is open to the delivery, and its piston is consequently travelling to the left—the valves operated by this piston will be shifted to such a position that the right-hand end of the next cylinder will be opened to the delivery, and its piston consequently made to travel to the right; and so on in succession.



One way in which this is effected is shown in the engraving. Here a casing, preferably cylindrical, is divided longitudinally so that it can be separated into two halves; the ends being closed, and an inlet or supply pipe leading to one end, and an outlet-pipe passing from the other. Across the casing is fixed a partition plate parallel with the ends. This plate has three cylinders passed through it in such a way that one-half of



each cylinder is on one side of the plate, and the other on the other side. The cylinders are side by side, and preferably equi-distant from one another and from the centre of the partition. Two further partition plates are fixed across the interior of the casing—one on either side of the central partition, and between the ends of the cylinders and the ends of the casing; or the partition plates might themselves form the ends of the cylinders. The space between each of the two plates and the central partition plate is divided radially into three closed compartments. One end of each cylinder opens into one or other of the three closed compartments on one side of the central partition; and the other end of each of the three cylinders opens into one or other of the three closed compartments on the opposite side of the central partition. Through each corresponding pair of closed compartments that are on opposite sides of the central partition, a fixed tube or pair of fixed tubes is made to pass—the tubes pass through all the partition plates, and are open at their ends. Each of the fixed tubes has fitting within it an inner tube, capable of being moved endwise to-and-fro, or of being partially rotated on its axis. If a pair of fixed tubes is used, one inner tube of each pair is closed at one end, the other at the other end. One is, therefore, always open to the inlet end of the casing; the other to the outlet end.

Ports are formed through the sides of the fixed tubes, and through their inner tubes, which (by the movement of the inner tubes) can be brought to coincide with one another or not to coincide. The ports are so placed and the inner tubes so moved that, when one inner tube is open to the compartment on one side of the central partition, the other inner tube is open to the corresponding compartment on the opposite side. Each pair of inner tubes may receive an endway to-and-fro motion from one end of a rock-lever, the other end of which is acted on by the piston-rod of the piston of one of the cylinders—not from the piston of the cylinder which opens into the compartments that the tubes pass through, but from the piston of the preceding cylinder. Thus as the piston of one cylinder travels from one end to the other of the cylinder, it shifts the valves belonging to the next cylinder; and when near the end of the stroke, it brings them into position for causing the piston of this cylinder to travel in the opposite direction from one end of the cylinder to the other, and in so doing to shift the valves for the third cylinder, and so on continuously.

**Gas Pumps or Compressors.**—Keith, J., of Farringdon Avenue, E.C. No. 14,057; June 9, 1897.

This invention—relating to apparatus for increasing the pressure of gas or for forcing air, and having for its object the economy of the water used in working—comprises a pump, which consists of a cylinder provided with an annular water-space, into which a small gasholder dips. The water acts as a seal; and when the holder is moved up and down by means of the water motor forming part of the apparatus, the gas or air is alternately drawn in and expelled above or below the holder or float. The spaces above and below the float are connected by ports to a valve-chamber, having suitable inlet and discharge valves for each space. The annular water-space is kept charged with water from the exhaust of the motor which is led into the bottom of the space, and overflows into the centre of the cylinder. The water fills up the interior of the cylinder to the height of an overflow-pipe situated in the cylinder, and provided with a deep trap to prevent the gas from being blown out; and the overflow water is discharged from the trap at about the level of the overflow in the cylinder. The water in the annular space rises and falls alternately on the inside and outside of the holder, to a height equal to the difference in pressure on the inside and outside of the holder. The water motor is of the double-acting differential type, as described in patent No. 20,573 of 1896; and it acts in a similar manner.

**Purifying and Enriching Acetylene Gas.**—Bean, H. R., of Plaistow, and Ringwood, H., of Poplar. No. 14,700; June 17, 1897.

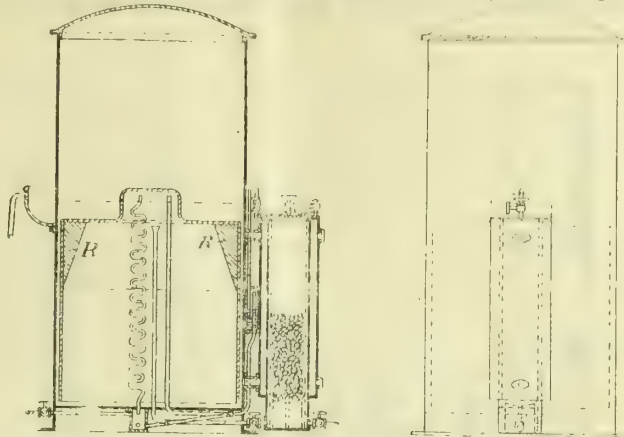
In order to overcome the difficulty experienced in burning acetylene gas—consequent on its poorness in hydrogen—through ordinary gas-burners, the present inventors propose to introduce an alcoholic or spirit vapour, which combines with the acetylene, and imparts to it an element which enables the excess of carbon to be consumed more readily at the burner. There is also said to be another advantage: The gas is filtered or cleaned from any dust or foreign matter that may be intermingled with it on its way from the generator.

A vessel or holder of any convenient shape, of iron or other suitable material, and having a false bottom, is filled with fibrous material—wool or worsted being very suitable. At the lower portion of the vessel, below the perforated bottom, an inlet is made for the gas to enter; and above the fibrous material an outlet is made for the gas to be taken off for use as required. The fibrous material is saturated with methylated spirit, alcohol, or spirits of wine; and the acetylene gas, in passing through it, takes with it a considerable amount of spirit vapour, and becomes as it were impregnated with it, and thus combustion is rendered more perfect and economical."

**Generating Acetylene.**—Scarth, J. W., of Pudsey. No. 15,125; June 24, 1897.

The action of the apparatus shown in the engraving, as constructed according to this invention, is as follows: The cylinder is filled up to the water-level; and the level of the water in the holder reaches close to the top of the water-pipe. On opening the supply-pipe to the burners, the gas in the upper part of the holder passes down through the condenser pipe, and allows the holder to descend. In doing so, the displacer R causes the water to rise in the holder and overflow down the water-pipe to the lower part of the generator; and on coming in contact with the calcium carbide, the water is decomposed, and acetylene generated. The gas as generated passes off from the upper end of the generator to the upper part of the holder; and if the production is more rapid than the consumption, the holder is raised and the water level falls below the mouth of the water-pipe, stopping the water supply and the generation of gas. The generation of gas, however, does not cease immediately, if there is a considerable quantity of water in the pipe; and this suffices to reach the level of the undecomposed carbide. By closing the stopcock, or by a water-lock, the gas generated may be prevented from passing direct to the holder; and exercising a back-pressure on the water in the generator,

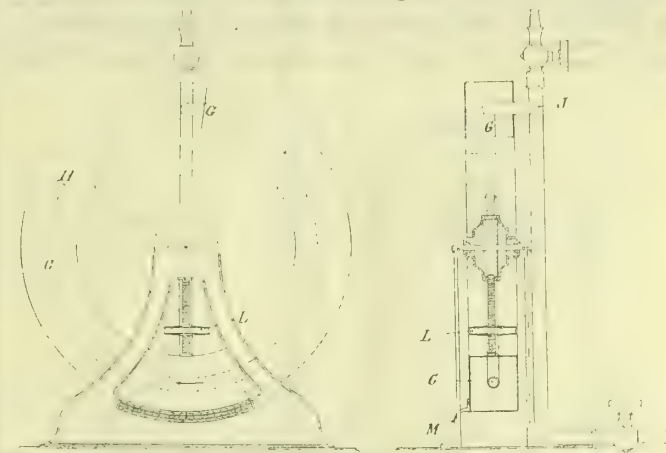
it forces the water back below the undecomposed carbide into the water-pipe. The cock or water-lock also serves the purpose of preventing any



back-flow of gas from the holder to the generator, which provision is necessary to prevent the gas travelling back from the holder when the generator is being recharged.

**Pressure-Gauge.**—O'Connor, H., of Edinburgh. No. 17,351; July 23, 1897.

This invention consists of a tubular chamber (of round, oval, rectangular, hexagonal, or other convenient diametrical section), bent to form about three-fourths of a circle, and made with one end closed. To this tubular chamber are fitted arms or spokes connecting it to a central boss, through which passes an axle; or a complete disc or discs may be fitted to connect the tubular chamber with the axle. The tubular chamber is furnished with an inner tube G, of smaller diametrical section, bent to the same curve, and made to fit inside, so that the tubular chamber may be partially rotated about its axis without touching the inner tube. The upper end of the inner tube is connected to the supply of gas at J; while the opposite end—that nearest the closed end of the tubular chamber—opens into the interior of the latter. When it is desired to put the apparatus into operation, the tubular chamber is partially filled with liquid, (care being taken that such liquid does not rise so high as the open end of the inner tube). The gas being admitted, passes by means of the inner tube through the water and issues at the open end H of the inner tube



into that portion of the tubular chamber above the water-level, exerting pressure in all directions (and causing the water to fall on that side and to rise at the open-ended side of the tubular chamber, at the same time), against the sides of the tubular chamber. Above the level of the water, the pressure upon the closed end of the tubular chamber overcomes its dead-weight (which is greatest at the bottom), and causes it to revolve upon its axis in the direction of its closed end to a greater or less extent, according to the amount of the pressure and the area of the closed end. A pointer M fixed on the circumference of the tubular chamber indicates upon a stationary dial the extent of the revolution, and thereby the amount of the pressure. The registering capacity of the instrument can be increased to indicate higher pressures, either by altering the position—relative to the centre—of a weight L fixed on one of the spokes or on the disc or discs, or by attaching to the lowest portion of the tubular chamber such loose weights as may be necessary to counterbalance the varying pressures.

When it is desired to utilize the apparatus for recording purposes, there is attached to the tubular chamber a pen or pencil inscribing upon a record paper attached to a moving barrel or disc.

**Internal Combustion Engines.**—Rowden, W. T., of Lenzie, N.B. No. 19,910; Aug. 30, 1897.

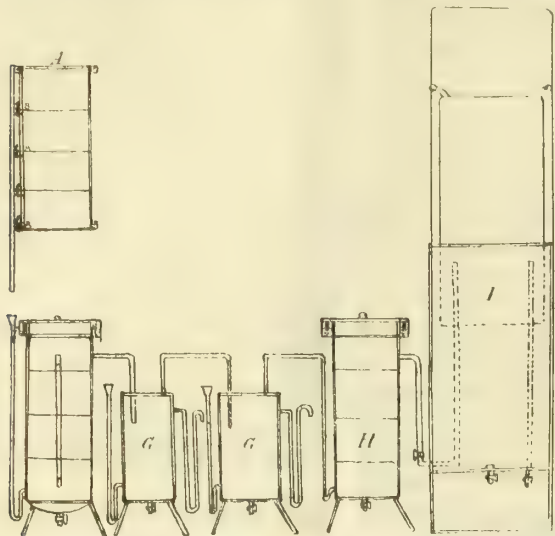
The patentee claims: (1) In an internal combustion engine with tandem cylinders, a method of construction which consists of making the cylinder more distant from the crank-shaft larger than the other by an amount sufficient to pass the undivided cover of the latter. (2) In an internal combustion engine of the Beau de Rochas cycle, with tandem cylinders, the use of a non-working side of one piston and cylinder in one line of cylinders as an air-pump, for providing scavenging charges for the cylinders of another line.

**Manufacturing Acetylene.**—Wigham, J. R., of Dublin. No. 18,971; Aug. 17, 1897.

This invention consists in placing the calcium carbide in cylindrical vessels with internal moveable divisions; and in applying water to each



division in succession (from a cylinder, of precisely the same capacity as that containing the calcium carbide, placed at a higher level), as shown in the engraving, with or without gauges for permitting the process of



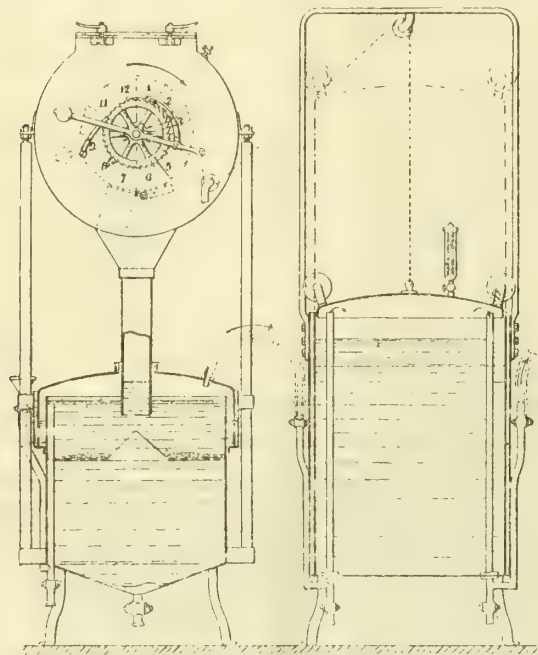
gas manufacture to be watched as it progresses, and with valves by which the process can be arrested at pleasure. The usual washing and drawing-off arrangements are applied; and the gas as it is made is stored in a gasholder of ordinary construction.

Another part of the invention is that the gas-making cylinder is sealed with a lute of mercury; so that the cover may be removed and replaced instantly without the application of screws or such appliances.

The water reservoir A is divided into four parts. G are the washers; H, the purifier; and I, the storage holder for the gas.

**Production of Acetylene Gas.**—Barthez, A. H., of Hamma, Algiers. No. 25,870; Nov. 6, 1897.

This invention relates to "the automatic production of acetylene gas for domestic and industrial purposes," in apparatus such as is described in patent No. 9294 of 1897. The present improvements consist (as shown) in extending the carbide feed-tube or shoot for a certain distance below the surface of the water in the gas generator, and disposing beneath its delivery-orifice a distributing cone, down the side of which the carbide will roll, and be spread upon a grid arranged in the generator. With

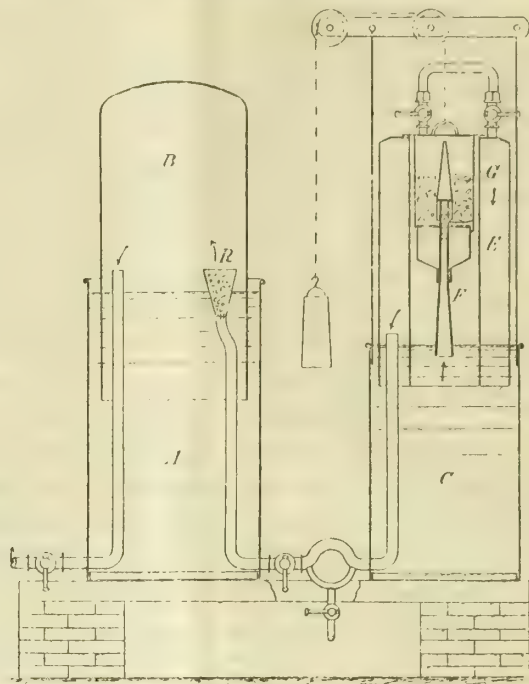


such an arrangement the acetylene disengaged cannot have access (by way of the feed-shoot) to the receiver, which contains the distributing bucket-wheel described in the former patent, so that it becomes unnecessary to hermetically close the receiver, which may be opened for recharging without allowing the acetylene stored in the generator to escape.

**Producing Acetylene Gas.**—Socleel, V., Lauby, A., Drisse, C., and Sneek, A., of Calais. No. 28,439; Dec. 2, 1897.

The apparatus constructed according to this invention consists of a cylinder A containing water, a bell B, and a cylinder C also containing water, in communication with A by a pipe. Further there is a bell E, which contains a truncated cylinder F, which itself encloses another truncated cylinder G, called the "cartridge," and into which is introduced the carbide of calcium. The cartridge is traversed longitudinally by a pipe perforated in the upper part and plain below. This is placed in contact with the water in the cylinder C. The bell E is formed by two concentric cylinders joined together at the top, and open at the bottom; and the cartridge is placed in the central space. The cartridge has at its top a cock giving communication with the bell E. Thus the cylinder E and the cartridge G are connected with the water in the cylinder C. The gas is generated and passes into the cylinder E, and thence into the

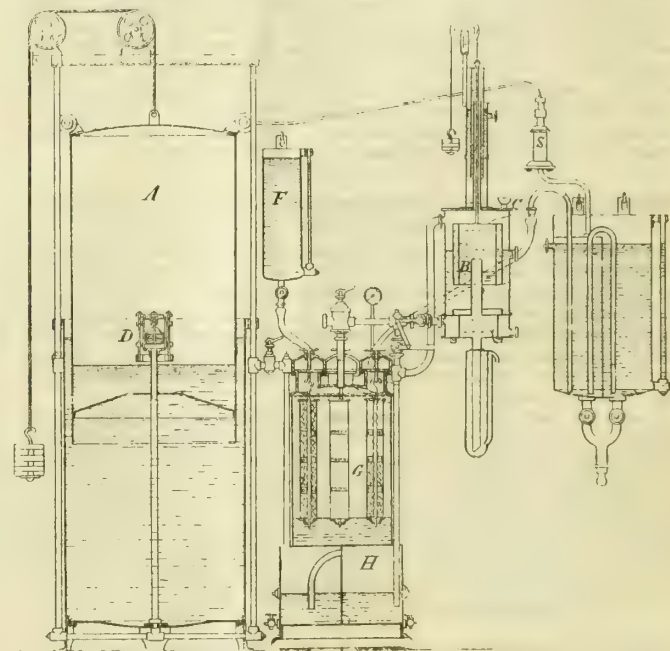
holder B. R is intended to receive materials for purifying and desiccating the gas. The cartridge is divided into two chambers, separated by a



perforated diaphragm. The carbide is in the upper chamber; while the milk of lime resulting from the reaction falls into the lower chamber, from which it can be extracted when renewing the charge.

**Acetylene Generating and Purifying Apparatus.**—Richard, B., of Lyons. No. 28,798; Dec. 6, 1897.

This apparatus is designed to effect the supply of water to the carbide of calcium in proportion to the production of acetylene. The patentees has (like others) found it necessary to make the carbide operate on a sufficient quantity of water, in order to avoid as far as possible the formation of polymerized products under the influence of the heat, which is produced during the chemical reaction. By means of his system, "the lime never covers the carbide; consequently the latter cannot become dry. The carbide of calcium thus produces the maximum volume of acetylene; since the hydrate of lime does not contain any particle of undecomposed carbide of calcium."



A lengthy lettered description of his arrangement of plant is given; the main features of which will be gathered from the subjoined claims advanced for the invention: (1) An automatically closing acetylene gas-holder A (as shown in the engraving), having its closure D disposed interiorly within the receiver. (2) An acetylene generator consisting of a chamber forming one body with a chamber H, divided by a diaphragm into two compartments with a bent tube fixed in place by its mouth in the diaphragm, and constituting a purifier. The chamber G carries besides at the top openings with covers each with a hook in their interior intended for suspending sectioned cartridges filled with carbide of calcium, which will be attacked from beneath by the water coming from a receiver F communicating with the base of the receiver G. (3) A drier B, supplied with a moveable bell, and an annular cylinder C, equally moveable and provided with holes. There are taps to include or exclude at one operation the drying device, and make the acetylene pass directly from the generator through the purifier. (4) An automatic water-feeding receiver formed by a chamber, divided into two compartments by a diaphragm. One of these compartments is closed at its top by a cover, which has fixed in it a syphon, as well as a pipe led from the safety



apparatus S. (5) The tap valve T is automatic or operated by hand at pleasure. The central tube serves as a seat for the valve arranged at pleasure horizontally or vertically. The characteristic of this system is that the valve, although closed, allows free circulation in the receiver of the acetylene produced by one or more generators in action, and *vice versa*. (6) The safety apparatus S is based on the same principle as the safety-tap valve, except that the flexible film of caoutchouc in the safety tap is replaced in the safety apparatus S by a bell, moving in a mercury seal.

#### Treating Calcium Carbide for Use in Acetylene Generators.—Sartig, J., of Cassel, Germany. No. 10,763; May 11, 1898.

The object of this invention is to facilitate the flow or slip of calcium carbide when supplied to an acetylene generator, by preventing it sticking to the walls of the container.

The patentee attains this object by combining or incorporating with the carbide materials which will impart to it great facility to slip or slide. The materials found advantageous for this purpose are tale or lycopodium, "as they have no influence upon the water, nor are they in any way attacked by the gas generated, or by the water." The carbide is treated by grinding with it a suitable proportion of either of the above-named materials; or the "slippery material" may be applied by dusting or sprinkling it over the carbide. The percentage of materials will vary with the apparatus in which the carbide is to be used; but about 3 to 6 per cent. will be sufficient in most cases—a greater proportion will, of course, be required with apparatus in which the discharge outlet is only slightly inclined.

#### APPLICATIONS FOR LETTERS PATENT.

- 14,707.—FORBES, Sir C. S., "Acetylene generators." July 4.  
 14,713.—LAKE, H. H., "Generating acetylene gas." A communication from La Compagnie Continentale D'Incandescence et de Chauffage. July 4.  
 14,722.—WILSON, T. C., "Gas cooking-stoves." July 4.  
 14,729.—GASTALDI, G., "Generating acetylene." July 4.  
 14,823.—THOMPSON, W. P., "Heating and ventilating systems." A communication from the American Incandescent Gas Company. July 5.  
 14,858.—SCARTH, J. E., "Generation of acetylene gas." July 6.  
 14,874.—LESTER, J., "Increasing the illuminating power of incandescent gas-light, and other artificial light-giving bodies." July 6.  
 14,891.—GLOVER, J. G., and MEACOCK, T., "Explosion engines." July 6.  
 14,919.—PRAAG, D. J. VAN, "Neutralizing the smell of calcium carbide and acetylene gas." July 7.  
 14,972.—COUSIN, H. E. A., "Production of acetylene gas." July 7.  
 14,995.—BROWN, J. W., and BUCKTON, T. P., "Carburettors for use on gas and oil engines." July 8.  
 15,000.—SHANNON, W., "Gas-iron." July 8.  
 15,001.—ROSS, J. H., "Acetylene gas-lamps." July 8.  
 15,014.—SUTCLIFFE, H., "Acetylene gas generators." July 8.  
 15,020.—HENRIQUEZ, E., "Acetylene generating apparatus." July 8.  
 15,044.—LANDI, T., "Gas-burners." July 8.  
 15,077.—DUNCAN, J. H., "Incandescence bodies suitable for use with gas and other burners." July 8.  
 15,083.—SIMMANE, J. F., and ABADY, J., "Gas-regulators." July 9.  
 15,084.—SIMMANE, J. F., and ABADY, J., "Water heating by gas." July 9.  
 15,139.—BUFFINGTON, L. S., "Acetylene or like generators and lamps." July 9.

**The Industrial Position in New Zealand.**—We have received from the Secretary of the Free Labour Protection Association (Mr. F. Millar) a letter on the above subject, giving some interesting particulars, extracted from the "New Zealand Herald" of the 9th ult., which show that labour legislation in that colony has done more harm than good. The following are some of the statements made by that paper: £5,654,000 increase in the National Debt, and contingent liability of £5,234,000; £342,000 per annum of increased taxation; an increase last year of 4s. per head of the entire population, with a certainty of a further increase this year; 453 more civil servants to provide for; 2800 more State paupers; and 17,400 unemployed. Mr. Millar asks: "Has the United Kingdom 1,000,000 unemployed—that is, as many in proportion to population as New Zealand; about 4000 fewer people placed in the land; a decrease of £2 4s. 8d. per head in imports and exports; a decrease in the development of the output of local industries of no less than £1,286,935 per annum?"

**Mr. C. Sellers on the Future of Gas.**—At the annual dinner of the employees of the York Gas Company, held at Scarborough, on the 9th inst., Mr. C. Sellers, the Engineer and Secretary, in proposing "Prosperity to the Company they served," referred to the fact that they were face to face with the electric light as a competitor for lighting purposes in York; the Corporation intending to run it on their own account. But nobody who knew anything about the two systems of lighting would, he said, "turn a hair" in his confidence in gas, which had had competitors since it was first ushered into existence. It had competed with candles of tallow and candles of wax; and it had competed with oil-lamps of every variety. But all its competitors had had to "take back seats." From being in its early history only used for lighting, gas had now become—from the great advantages it conferred upon society for cooking and warming and a variety of trade purposes—a real necessity of domestic and commercial life. In these respects its future was assured. All the experience in other great centres of population where gas had been face to face with the electric light amply confirmed these views. The future of gas, too, as a lighting medium, was assured from its growing cheapness, and from its amenability to further scientific developments, the most recent of which was a new burner, the most economical and the most efficient in light-giving power that had ever been invented. Lastly, the future of gas was assured by its growing use as a fuel, which was daily realizing the prediction that gas would be "the fuel of the future." Mr. Sellers added: "We, then, as workers, need have no fear for our industry, while those who have put their money in gas securities may sleep calmly and confidently upon their investments; for if there is a security which in all human probability will weather all financial storms, that security is gas."

## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### The Sulphate of Ammonia Committee.

SIR,—In your last issue you published the report of the above Committee for the year ending the 30th of June. The work accomplished during the year is eminently satisfactory as a commencement, though much of the educational portion—the result of the extensive issue of suitable literature upon the subject of chemical manures—cannot possibly be tabulated. Such information will undoubtedly tell favourably in course of time, though it is unlikely that immediate results will be apparent.

The prizes offered by the Committee have given an interest to the subject that could not otherwise have been secured. Practical interest, in place of apathy and indifference, can only be assured by the hearty and continued allegiance of those who are concerned in the manufacture of sulphate. Now that the utility of the organization has been clearly demonstrated, it behoves manufacturers (especially those in connection with gas-works) who have not united in the movement, to add the weight of their influence to those already engaged, by becoming subscribers and supporters of that which has so desirable an object in view—namely, the placing of sulphate in its legitimate position in the agricultural world.

On numerous occasions you have, through the "JOURNAL," urged the due recognition of the claim of sulphate as a chemical manure, and have also given valuable recipes of the best mixtures for different kinds of soil and crops. Pioneer work is incomplete without the subsequent stages of development. These can only be obtained by careful experiment, which fortunately, through the stimulus of the prizes offered by the Committee, will be forthcoming in due course. The successful experiments made on Lord Rosebery's Dalmeny Park Estate are being confirmed many times over. Much remains to be effected to reduce the exportation of sulphate to a minimum. Of late much has been said concerning the waste products in connection with many manufactures; and the subject has been largely applied to gas-works. It is felt by many that, in the matter of allowing inferior manures to be imported, and sulphate exported, there is considerable waste occurring. It is certainly a subject of the first importance.

Recently I suggested (or, more correctly, re-suggested) the advertising of sulphate of ammonia under a new name—that of "nitros," but it was deemed inadvisable to alter the present one. Although it would perhaps be a mistake to do so, yet "sulphate of ammonia" appears to be too long a title for ordinary use; and I think the word "sulphate" might advantageously be adopted.

The 500-guinea prize for the best essay on "The Utility of Sulphate of Ammonia in Agriculture" will engage the thoughts of many chemists and agriculturists. It is probable that, with such a concentration of ability, new ideas and methods will be the outcome. At all events, it is a wise venture on the part of the Committee.

Huddersfield, July 15, 1898.

E. A. HARMAN.

### The Price Realized for Retort-Oven Tar.

SIR,—In your issue of the 28th ult., you criticize a paper I read before the Iron and Steel Institute, and say the price I put down for tar—viz., 17s. per ton—is 30 per cent. too high. You will notice that I qualified this statement by saying that these prices were necessarily subject to market fluctuations. I am offered at the present time more than 17s. per ton at the works for the whole of my make of tar. Your statement, therefore, is hardly correct.

Brymbo, near Wrexham, July 12, 1898.

JOHN H. DARBY.

### Meeting Extraordinary Claims Out of Reserve Funds.

SIR,—Has a legal definition ever been given of the words "extraordinary claim or demand" in Section 31 of the Gas-Works Clauses Act, 1847. I see in a case referred to on p. 104 of the last number of the "JOURNAL" that they have been applied to "constructing an additional main," the details as to which are not given. This may be a legitimate application of the reserve fund, when the Company's capital is fully paid up. But if the clause can invariably be so interpreted, it will afford an easy way of enabling extensions, properly chargeable to capital, to be paid for indirectly out of profits, because sums so drawn from the reserve are immediately replaceable out of current profit, which comes to the same thing as charging the cost direct to profits. To companies who are earning more than their statutory dividends, and do not wish to increase their paid-up capital, the system would be very acceptable.

July 14, 1898.

INQUIRER.

### The Bandsept and Kern Burners.

SIR,—In the "JOURNAL" for the 28th ult., there appeared a letter signed "Technologist," in which Bandsept's and Kern's patents were mentioned; and it was stated that Kern had anticipated Bandsept. I have looked into the matter, and enclose a few particulars in regard to M. Bandsept's patents. Far from Kern anticipating Bandsept, the latter obtained in Belgium patents for the application of the injector principle, with mixing cones covered by an atomizer, in 1894, and the improvement of the patent of April 19, 1895, masters the Langhans patent, since the international convention grants a time of seven months for filing the English patents.

The following are the dates of patents: Bandsept (England), April 19, 1895; do. (Belgium), Sept. 25, 1895; Langhans, June 14, 1895; Kern, Jan. 5, 1897.

28, Victoria Street, S.W., July 8, 1898.

C. E. MASTERMAN.

#### [ENCLOSURE.]

#### RECAPITULATION OF A. BANDSEPT'S BURNER PATENTS.

##### Specification.

Nov. 4, 1892.—Improvement (No. 101,983) to Patent of July 7, 1892.

Apparatus for utilizing the intense heat obtained by the combustion of intimate mixtures of air and gas. Static and dynamical mixers, the first based on the principle of the injector acting by the lateral drag of one of the fluids and subsequent pulverization of the mixture. Progressive division



of the gaseous mass forced through chicanes; zigzags rendering the mixture intimate.

March 18, 1893.—*Improvement* (No. 103,894).

By ultimate mingling obtained from the three effects, superficial shock in bulk, multiple friction by jets, and molecular laminating, the mixture acquires sufficient homogeneity and stability to give out the greatest sum of chemical reactions in a given space of time.

May 1, 1894.—*Invention* (No. 109,748).

*Self-Mingling Burners.*—Combustion of an intimate and perfectly proportioned mixture of air and gas. Theoretical mixtures conveyed in a nascent state into the flame; the latter becoming chemically solid, and giving rise to calorific effects as powerful as those obtained from blowpipes. Proof of self-burning mixtures by burning them under the surface of water without any other supply of air. Disposition of a self-mingling burner on ordinary gas pressure, composed of an injector entering a conical tuyere surmounted by an expanding tube which is provided with an atomizer; the latter leaving at the top of the burner an annular space covered by a screen of inclined slits. Hollow plugs, through the winding passages of which the mixture is obliged to force its way, act as atomizers; the latter having a perforated crown.

Dec. 8, 1894.—*Improvement* (No. 113,105).

Atomizing of perfectly proportioned mixtures, renewed at the moment of their utilization. Homogeneous and isothermic flames. Absolute utilization of the heat; units disengaged by perfect combustion. Injector with tapered hole inducing a double action, and working in combination with wire gauze partitions at the top of the burner, so arranged as to expel the mixture with sufficient force to cause it to pass through this atomizing structure, according to the speed of the flame. Possibility of adapting to the flames so produced stronger mantles than those in use up to the present.

April 19, 1895.—*Improvement* (No. 115,137).

Dispositions of atomizers and injectors producing chemically homogeneous flames at the highest temperatures. Combination of the injector and atomizer; the latter opposing a certain resistance to the passage of the gases. The whole injector is combined so as to increase the velocity of the issuing jet, and then propel the mixture by progressive dilatation. Thus the two essential parts of the self-mixing burners react usefully one on the other.

June 28, 1895.—*Improvement* (No. 116,306).

Proportions in full size of self-mingling burners specially composed of an injector having a central gas passage tapering to a fine jet orifice, working in a conical frustum surmounted by a divergent approximately double in length, and provided at its extremity with trellis or wire gauze for the purpose of atomizing.

May 5, 1895.—*Improvement* (No. 121,183).

Application of self-mingling and atomizing burners to combustion in water for the purpose of air and gas under pressure. Utilization of these burners in order to ascertain the temperatures furnished by the combustion of gaseous mixtures.

July 29, 1895.—*Invention* (No. 116,746).

*Self-Mingling and Atomizing Burners.*—Recall of the fixed (or moveable) organs at the top of the burners. Injector with superposed tuyeres in order to first lay the gaseous vein and afterwards relieve it so that the column gradually expands as it rises in the burner and saturates with air. At the top, inclined wire gauze, screen of slits, &c., as static atomizer; small rotating wheel as dynamical device.

May 6, 1896.—*Improvement* (No. 121,203).

Self-commingling burners for flat flames, especially with large surface; new kind of incandescent bodies being made out of thread, fillet, small bands.

May 26, 1895.—*Improvement* (No. 121,578).

Form and special proportions of the self-commingling burner.

Nov. 7, 1895.—*Invention* (No. 118,225).

*Atmospheric Burner.*—Injector with tapered hole and air inlet at the base of a conical profile followed by a divergent cone of at least double the length, and with an angle not exceeding 10 degrees; the large part enclosing a plug of trellis, which pulverizes the mixture and conveys it laterally.

Dec. 5, 1896.—*Invention* (No. 124,988).

*Device still Increasing the Speed of the Mixture.*—Central gas passage tapered to a fine jet orifice, and around, at a lower level, other annular jets which draw in air from openings made in the burner and pass with the air through a truncated conical tuyere, while the higher central jet increases the velocity of the mixture passing afterwards through an expanding tube. The top of the latter has a deflector forcing laterally the mixture, which issues through an annular screen.

Dec. 7, 1896.—*Improvement* (No. 125,007).

Other form of the special injector entering the convergent divergent mixing-tube provided with one or more air inlets, and receiving in its enlarged part a deflector placed between the wire gauze in order to convey the pulverized mixture laterally under the mantle. Two superposed air inlets arranged between two truncated cones, the upper one being wide open so that the second stream of air is directed towards the first mixture passing the narrow truncated cone.

July 2, 1897.—*Improvement* (No. 129,205).

A third admission of air under a different angle again is provided, enriching the theoretical mixture still more.

Aug. 30, 1897.—*Improvement* (No. 130,353).

Proportions and dimensions of practical burners with two and three air inlets disposed to check with the object of commingling when resistance is reduced at the top of the burner.

Sept. 25, 1897.—*Improvement* (No. 130,818).

Lengthening of the enlarged part in the mixing-tube; new disposition of the atomizer; helical plates.

**Check to Wasting Natural Gas.**—Owing to the reckless waste of natural gas in some of the districts supplied with this illuminant, proceedings have lately been taken against certain parties, but without effect, in a local Court in Indiana. The Supreme Court, however, has reversed the decision, and declared the waste illegal, as being against the general public good. According to "Cassier's Magazine," the waste of natural gas has been of the most reckless character; the vapour being in some cases burnt as a "flare" from the open ends of pipes, without burners.

## PARLIAMENTARY INTELLIGENCE.

### HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Keighley Corporation Bill, Paignton Improvement Bill, St. Helens Corporation Bill.

Bills reported, with amendments: Clacton-on-Sea Gas and Water Bill, Gaslight and Coke Company Bill, Leyton Urban District Council Bill, Maldon Water Bill, Matlock Urban District Council Bill, Rhymney and Aber Valleys Gas and Water Bill, Southampton Gas Bill.

Bills read the third time and passed: Higham and Hundred of Hoo Water Bill, Matlock Urban District Council Bill, Tottenham and Edmonton Gas Bill.

The opposition to the Wey Valley Water Bill has been withdrawn.

### HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Gas Orders Confirmation Bill, Newcastle and Gateshead Water Bill, Rochdale Corporation Water Bill, Todmorden Corporation Water Bill.

Bills reported, with amendments: Felixstowe and Walton Water Bill, Newtown Water Bill, Paignton Improvement Bill, Tynemouth Corporation Water Bill.

Bills read the third time and passed: Bacup Corporation Water Bill, Halifax Corporation Bill, Keighley Corporation Bill, Liskeard Corporation (Water) Bill, Paignton Improvement Bill, St. Helens Corporation Bill, Stirling Gas Bill.

On Wednesday, Mr. Cohen asked the First Lord of the Treasury when it was proposed to constitute the Select Committee, ordered by resolution of the House on the 22nd ult., on the subject of the prices charged for gas by the various Gas Companies in the Metropolis. Mr. Balfour replied that he understood arrangements were being made for the early appointment of the Committee.

### HOUSE OF LORDS COMMITTEE.

Wednesday, July 13.

(Before Lord CAMPERDOWN, Chairman, Lord DE SAUMAREZ, Lord RAGLAN, Lord HARE, and Lord AMHERST OF HACKNEY.)

#### THE GASLIGHT AND COKE COMPANY BILL.

This Bill, the object of which, as our readers are aware, is the conversion and consolidation of the capital of The Gaslight and Coke Company, came to-day before the above-named Committee. The only opposition to the Bill was on the part of the London County Council, who on their petition sought to raise the question of the price charged for gas by the Company to the consumers in North London, as compared with that of the South Metropolitan Gas Company in South London.

Mr. POPE, Q.C., Mr. BALFOUR BROWNE, Q.C., Mr. CLAUDE BAGGALLAY Q.C., and Mr. DANCKWERTS appeared for the promoters; Mr. WORSLEY TAYLOR, Q.C., and Mr. G. J. TALBOT represented the London County Council.

Mr. POPE, explaining the objects of the Bill to the Committee, said the proposed conversion would make the stock a tangible and useful investment stock for small holders, readily realizable and marketable by them if they should so desire. By fixing the price to be charged for gas by the Company, and applying the sliding-scale in regard to dividends, Parliament had made the consumer the predominant partner with the Company in any economy secured in production. The sliding-scale had operated enormously to the advantage of the consumer, by cheapening gas. If the price was raised, the Company were obliged to decrease their dividend; if the price was lowered, they could increase the dividend above the 10 per cent. fixed in their Bill. The Gaslight and Coke Company, with a standard price of 3s. 9d. per 1000 cubic feet, were now charging 3s.; and their last dividend was at the rate of 12½ per cent. Before the Company were compelled to increase their price to 3s. per 1000 cubic feet, and thereby come under the penalty of a smaller dividend imposed by the sliding-scale, their stocks stood in the market at £312; they now stood at about £275—the difference probably representing the public estimate of the effect of the increased price of gas. Anybody who went into the market and bought £100 of stock, therefore, had to pay, roughly, about £300 for it. It was almost unintelligible to the small investor—whom especially it was desirable to encourage to become a holder in gas undertakings—that, after paying £300, he received a certificate for only £100 of stock. The whole object of the Bill was to convert the stock, by exactly correlative and absolutely proportionate conversion, into one bearing a lower rate of dividend, and therefore commanding a smaller proportionate price in the market. There were at present fifteen different descriptions of the Company's stock on the market. It was proposed to convert these into three stocks and a debenture stock—a 4 per cent. consolidated preference stock, a 3½ per cent. maximum stock, and a 4 per cent. ordinary stock; the consolidated debenture stock bearing 3 per cent. interest. The operation of the sliding-scale would remain unaltered; and the position of the consumer would not be affected one atom. Dealing with the petition, Counsel said the proposed conversion would have no effect on the purchase price of the undertaking, as alleged by the County Council; and he argued that the same relief which had been given to the South Metropolitan Gas Company by their Act of 1896 should be extended to the nearly £12,000,000 capital of The Gaslight and Coke Company. The conversion would to a certain extent be an advantage to the shareholder, because, instead of an unmarketable and high-priced security, it would give him a more marketable and easily disposable property at a lower price and bearing a lower rate of dividend.



The County Council said it would be so much to the advantage of the shareholders that Parliament ought not to give them the advantage unless they in some way bought it. But the question the promoters put before the Committee was how far it was possible or right that they should interfere in this purely domestic matter, to compel the Company to pay the consumer for something which did not do him any harm or affect his interests in any way. Counsel went on to recite precedents, notably the South Metropolitan Gas Act of 1896, which he argued was based on the same principles, and received the sanction of Parliament.

Mr. John W. Field, Secretary and General Manager of the Company, gave evidence as to the capital of the Company, and details as to the manner in which the capital of the various Companies which had been amalgamated with The Gaslight and Coke Company was represented in the existing stock. The Victoria Docks Gas Company (purchased by agreement) involved a capital of £100,000; and there was allotted £100,000 of "A" ordinary stock. The City of London Gas Company had a capital of £400,000; and, owing to exceptional circumstances, the holders were allotted £300,000 of "A" ordinary stock, and £100,000 of "B" 4 per cent. maximum stock. The Western Gaslight Company, with a capital of £600,000, received £600,000 "A" ordinary stock. The Imperial Gas Company, with a capital of £1,560,000, were allotted a like amount of "A" ordinary stock. The Great Central Company, which had a capital of £200,000, by reason of their exceptional position, received £200,000 of 10 per cent. preference stock. The Equitable Company had a capital of £300,000; and for similar reasons they obtained a like amount of 10 per cent. preference stock. The Independent Company, with a capital of £255,000 in various classes of stock, received £165,000 of 10 per cent., £30,000 of 5 per cent., and £60,000 of 7½ per cent. preference stock. Two other amounts of the Imperial Gas Company's capital, of £325,000 and £975,000, received like amounts of 7 per cent. maximum stock. In the latest amalgamation—that of the London Gas Company—£544,000 of capital received £394,000 of 10 per cent., and £150,000 of 6 per cent. preference stock; £26,000 received £26,000 of 6 per cent. preference stock, and £369,000 received 6 per cent. preference stock as regarded £300,000, while the remaining £69,000 received £69,000 of 10 per cent. preference stock. The interest on the substituted capital would be exactly as at present—namely, £151,989 10s.—the debenture stock being converted into 3 per cent. consolidated debenture stock.

Cross-examined by Mr. WORSLEY TAYLOR, witness said there were 280,000 consumers. The Company wanted to get rid of the anomaly of being charged with having a 12½ per cent. stock, when really the investor buying shares under the auction clauses only received 4 per cent., and to render their capital account less cumbrous. It was, in his opinion, doubtful whether the conversion would enhance the market value of the stock. If it should, the present holder would have the advantage, and not the buyer.

The cross-examination taking the line of a comparison between The Gaslight and Coke Company and South Metropolitan Gas Company,

The CHAIRMAN said that whatever reductions of price the two Companies had made, both of them were acting under statutory conditions, which neither had infringed.

Mr. WORSLEY TAYLOR agreed; but he argued that The Gaslight and Coke Company were asking Parliament to do something entirely in their favour. It was, therefore, a material fact to consider whether they had deserved it.

The CHAIRMAN: Did the South Metropolitan Company, in return for being permitted to convert their stock, confer any advantage on the public?

Mr. WORSLEY TAYLOR said they did not, because they had already conferred a benefit on the public by reducing their price. If The Gaslight and Coke Company said they had done as well as the South Metropolitan had done for their consumers, then he admitted there was a precedent; but he contended that in this case there was not.

The CHAIRMAN: Obviously the reason why the South Metropolitan Company made the reduction was to increase their dividend; and they did that before they came to convert. It was not because they were allowed to convert that they did anything.

Mr. WORSLEY TAYLOR said his point was that there had not been the same due care in the management of The Gaslight and Coke Company which existed in the case of the South Metropolitan Company, which entitled them to ask Parliament to vary the terms of the bargain made between themselves and the consumers.

The CHAIRMAN: What that has got to do with the present Bill beats me altogether. I quite understand that the conversion might increase the market value of their stock; but so long as the Company are complying with their statutory conditions and keeping within their statutory limits, I do not see how we can interfere. Do you wish this tribunal to decide whether The Gaslight and Coke Company have conducted their business in an economical way or not? In other words, are we to go back and alter their statutory conditions?

Mr. WORSLEY TAYLOR: Yes, if they seek to have the statutory conditions altered. If they ask your Lordships to revise the statutory conditions in their favour, we ask you to consider our side of the question. The Company wish to be allowed to put £1,800,000, or thereabouts, into their pockets. The only opportunity the consumers have of getting their grievances redressed is when the Company come to Parliament for fresh powers. The Board of Trade could do nothing when approached by the London County Council. We shall seek to show by our witnesses that, if the Company had conducted their business properly, there would have been a reduction in the price of gas. I shall have very great difficulty in putting my case before your Lordships, unless I am allowed to go into the past conduct of the Company.

Witness having been further cross-examined on this question,

Mr. POPE said he would concede the point that the results were not as good on the North of the Thames as they were on the South; but this was owing to different circumstances.

Re-examined by Mr. BALFOUR BROWNE, witness said that for the purpose of any fair comparison between the South Metropolitan and The Gaslight and Coke Companies, all the circumstances of the two undertakings must be taken into account. Among other things, The Gaslight and Coke Company were in keener competition with Electric Lighting Companies than any other Gas Company in existence; while the South Metropolitan Company had little of such competition.

In reply to the CHAIRMAN, witness said he did not know any instance where splitting a stock had not been followed by a rise in its market value; but he could not trace any increase directly attributable to the splitting of stock. In the other House, he submitted a comparison which led him to the conclusion that the increased market price was rather the effect of other causes than stock splitting. His comparison showed that the number of years' purchase had increased in practically the same ratio in the case of Companies where there had been no conversion as in that of Companies where there had been conversion. Personally, he saw no objection to a stipulation being inserted in the Bill that the purchase price should not be based on the market value of the stock.

Mr. H. E. HAWARD, Comptroller to the London County Council, said he thought the proposed conversion would enhance the saleable value of the stock. This had appeared to him to be the sole object of the promoters. It would make the stock more marketable, and therefore increase its price. Taking all the stocks, he estimated the added saleable value would amount to nearly £1,800,000. He gave figures to show that the market price of converted stocks had increased in greater ratio than that of unconverted stocks; and he expressed the opinion that the Stock Exchange value would indirectly affect the award of an arbitrator when fixing the purchase price. Nearly every District Board north of the River Thames had sent in resolutions asking the County Council to oppose the Bill. Under the existing statutes, there was no method of revising the price of gas except when the Company came to Parliament for further powers. The majority on the Council in favour of opposing the Bill was 100 to 4.

Cross-examined by Mr. BALFOUR BROWNE, witness said the Council thought the conversion would be a valuable concession granted to the shareholders, and that the consumers ought to get some benefit. It would be a most improper thing for the Stock Exchange value to be considered by an arbitrator.

Mr. BALFOUR BROWNE said he had never heard of such a thing being done. He should strongly object to a clause being inserted that the market price of the stock was not to be taken into consideration in the event of the sale of the undertaking hereafter, because he did not wish it to be indicated that there was to be such a sale.

Further cross-examined, witness admitted that all undertakings were properly sold upon the maintainable profit.

In answer to the CHAIRMAN, witness said the insertion of such a clause as suggested by him would not meet all the objections of the County Council. The Council felt the conversion was going to be a substantial benefit to the shareholders, and that in return the Company should give the consumers something—especially as the consumers, as they thought, had suffered from the way in which the Company had been managed. Personally, however, he would like to see the clause inserted, as it would be a valuable precedent, which might be used not only against the Gas Companies, but also against the Water Companies.

Mr. TALBOT, in addressing the Committee, said the case of the London County Council had been so well put by the last witness that he need only summarize the points. The first object of the Bill was to disguise the fact of the high dividend paid; and though it would not be paid in immediate return to a purchaser, it was a dividend upon the original stock, and this remained. The other object of the Bill was to enhance the market value of the stock for the benefit of existing shareholders. The County Council were prepared to lay before their Lordships figures showing the grave differences in the price charged for gas and in the capitalization of the Company, which differentiated it from every other Company, and particularly from the South Metropolitan Company. Though The Gaslight and Coke Company were bound to keep below their standard, the price was unduly high. The conversion would confer no corresponding benefit upon the consumers; and on these grounds he asked their Lordships to reject the Bill till relief was promised to the consumers.

Mr. BALFOUR BROWNE, in reply, said it was very doubtful whether there would be any benefit from an enhanced market value.

The CHAIRMAN remarked that Mr. Field could not mention any instance where a rise had not followed a splitting of stock.

Mr. BALFOUR BROWNE (continuing) said there were a hundred circumstances to account for the greater prosperity of the South Metropolitan Company as compared with The Gaslight and Coke Company, who had had to draw very largely on their reserve fund to pay dividends. The only benefit in an improved market value would be to any isolated shareholder who was forced to sell his shares. Counsel ridiculed the idea of an arbitrator taking market value into consideration in fixing the purchase price of an undertaking. Besides "Bulling" and "Bearing," there might be "faked" sales to run up the price. He objected to the suggested Stock Exchange value clause, on the ground that the petitioners might, in coming with a Bill for purchase, say Parliament in 1898 was anticipating purchase, and by the insertion of this clause had therefore practically decided the question. Mr. Haward wanted the clause for the purpose of putting pressure on the Water Companies; but the financial aspect of the purchase of Water Companies was now under consideration by a Royal Commission. He asked the Committee to consider the Bill as a conversion Bill, and nothing else.

After a short deliberation,

The CHAIRMAN said the Committee decided that the Bill might proceed, but with the insertion of a clause to provide that the effect of conversion should not inure to the disadvantage of the public in the event of purchase taking place hereafter.

The following clause was then submitted to, and accepted by, the Committee:—

"Provision in event of Purchase of Company's Undertaking by Public or Local Authority.—"Whereas the conversion by this Act authorized may affect the market prices of the Company's stocks, therefore be it enacted that, in the event of any purchase of the Company's undertaking by a Public or Local Authority, the market prices of the Company's stocks shall not be taken into consideration in determining the price to be paid for the said undertaking."

#### RHYMNEY AND ABER VALLEYS GAS AND WATER BILL.

At an earlier stage of their proceedings, the Committee as originally constituted, under the chairmanship of Lord Clinton, had before them the above-named Bill. Its object is to incorporate a Company to acquire the undertakings of the Rhymney Valley and some other Gas and Water



Companies, construct gas-works, and supply gas and water within certain prescribed limits.

The Bill had already been considered by a Select Committee of the House of Commons in April last, and passed. It was now opposed by the Rhymney Iron Company and the Merthyr District Council. The *locus standi* of the latter, however, was disallowed; and an offer had been made to supply the former with 480,000 gallons of water as compensation for any taken.

The Chairman of the Company (Sir H. Tylor) was called and stated that they had expended about £20,000 on the water-works. The Company did not oppose the Bill in the other House, as they hoped negotiations then in progress would have proved satisfactory. He was willing to sell the undertaking, but did not think arbitration terms were reasonable. The General Manager of the Company (Mr. Smith) said he did not object to the amount—480,000 gallons—of compensation water during the dry months of the year; but he did not believe they could get it. They would not be satisfied with money compensation—nothing but compensation water. Mr. G. F. Deacon and Mr. R. E. Middleton stated that 216,000 gallons of water in dry weather would flow down the stream.

In the end, an agreement was entered into somewhat in the following terms: When only 25,000 gallons of water are coming down the stream, the promoters are not to take any—the Iron Company are to have it all; the compensation water is to be the first charge; and the promoters are to purchase the Iron Company's works, the purchase to be deemed compulsory under the Lands Clauses Act. The Bill was then allowed to proceed; clauses being subsequently arranged. A new clause was brought up providing for the purchase of the Iron Company's works by the promoters, by agreement or arbitration. In another clause, provision was made as follows: Until the completion of the purchase, the Company shall not supply water within the limits of the Rhymney Urban District Council, nor shall they interfere with the waters of the River Rhymney or the Pitgwenllt Brook. A clause was inserted providing that the Company shall for ever maintain a suitable gauge for measuring the 25,000 gallons of water which the promoters bound themselves to supply to the Iron Company as water for the feeder, and in respect of any failure to maintain it a forfeit of £10 was imposed for every day upon which the specified quantity of water was not available. The subject of compensation water was next dealt with; a request being made that the promoters should only be required to send it down on the working days of the week, as it would run to waste and do nobody any good. The Committee decided that the supply should not be limited to six days, and that the whole of the 480,000 gallons should be taken from No. 2 reservoir instead of from No. 1.

These requirements having been carried out in clauses, the Bill was allowed to proceed.

## LEGAL INTELLIGENCE.

### HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, July 8.

(Before Justice KEKEWICH.)

**Southwark and Vauxhall Water Company v. Wandsworth District Board of Works—Water-Mains and the Alteration of Street Levels.**

This was a motion by the plaintiffs for an interim injunction to restrain the defendants from lowering their streets and footways wherever the plaintiffs' pipes and mains were laid, in any manner which would leave such pipes or mains without a sufficient covering of soil or other material to protect them from injury—whether by the passing of traffic, the effect of frost, or otherwise—unless the defendants should first alter the position of the pipes and mains by placing them at a depth below the proposed new surface of such streets or footways, not being less than the depth at which the same then were below the present surface of such streets or footways. It appeared that the defendants contemplated lowering some of their footpaths to such an extent as to leave only a few inches of surface above the plaintiffs' mains. This the defendants maintained they were entitled to do; and they contended that if the mains, for their protection from frost or otherwise, had to be lowered to a proportionate depth, this should certainly have been done by plaintiffs at their own expense.

Mr. WARRINGTON, Q.C. (Mr. GORE BROWNE with him), for the plaintiffs, referred to section 98 of the Metropolitan Local Management Act, 1855, which empowers a District Board to pave and repair streets, "and to cause the ground or soil thereof to be raised or lowered . . . and to alter the position of any mains or pipes in or under any such street; such alteration to be made subject to the approval of the Engineer of the Company to which such mains or pipes belong." They contended that if the defendants exercised their power of altering the level of a street, they must exercise their other power of altering the position of the mains; and that the defendants were not to exercise their powers in such a way as to be injurious to the plaintiffs. All the plaintiffs asked was that the mains should be made as safe as they had been—that is, laid at the same depth as before.

Mr. RENSCHAW, Q.C., with whom was Mr. LYTTELTON CHUBB, on behalf of the defendants, contended that the motion was misconceived—that it sought to compel the defendants to do that which if they did not do would be negligence on their part, and so give rise to a claim for damages. But it had been laid down that turnpike trustees and other public bodies exercising their parliamentary powers were not liable for consequent injury arising therefrom.

Justice KEKEWICH said the Court had a large power in granting an injunction, and he thought this was the exact case in which that power should be exercised, rather than that the Court should wait until the injury was done and leave the plaintiffs to apply for damages. They were therefore entitled to an injunction, though the form asked was too wide. The proper form would be to restrain defendants from altering the location of plaintiffs' mains by placing them in a position in which they would be more liable to injury than they were at present.

### HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Saturday, July 2.

(Before Justices RIDLEY and PHILLIMORE.)

**Mayor and Corporation of Liverpool v. Overseers of Llanwddyn—The Rating of the Liverpool Water-Works.**

This was a special case stated by the Justices of Montgomeryshire, who, in October last year, had before them an appeal by the Liverpool Corporation against the assessment of their water-works by the Assessment Committee of the Llanfyllin Union. The proceedings on that occasion were reported in the "JOURNAL" for Oct. 26, 1897 (p. 903).

Mr. BALFOUR BROWNE, Q.C., and Mr. E. H. LLOYD appeared for the appellants; Mr. F. MARSHALL, Q.C., Mr. ELLIS J. GRIFFITH, M.P., and Mr. T. A. HERBERT represented the respondents.

The special case set forth that, at the Montgomeryshire Quarter Sessions, on the 5th and 21st of October, 1897, an appeal by the Corporation of Liverpool against a certain rate or assessment, purporting to be a rate made for the relief of the poor and other purposes in and for the parish of Llanwddyn, on the ground that they were over-assessed for the premises in their occupation, and upon other grounds, was heard, with the result that the Justices confirmed the rate, and ordered the appellants to pay the costs. The appellants being dissatisfied, the Justices stated a case for the opinion of the High Court. The facts were that on Dec. 1, 1896, the appellants were the occupiers of certain works and premises in the parish of Llanwddyn and other parishes in Montgomeryshire, consisting of a reservoir, embankment, tunnel, and other incidental works, forming part of their water-works. The works were described in the valuation list as of a gross rental of £19,500, and a rateable value of £15,322. In December, 1896, the Overseers of Llanwddyn made a rate of 8½d., and the appellants were charged with this rate upon the net assessment of £15,322 in and for the sum of £542 13s. 1d. The appellants objected before the Assessment Committee of the Llanfyllin Union to the rate and assessment; but the Committee confirmed the rate, and the appellants then appealed to the Quarter Sessions, where it was shown that the cost of the structure of the dam and reservoir in the respondent parish was £646,932, and that the cost of the land upon which the works were constructed was £62,250. The appellants also had, in addition to those amounts, expended on bridges, £8337; on roads, £55,939; on a church, vicarage, and schools in substitution for the buildings which were submerged by the formation of the Vyrnwy reservoir, £13,952. Not any of those hereditaments were, however, now in the occupation of the appellants; but they were provided and constructed by them pursuant to obligations imposed by the Liverpool Corporation Water Works Act, 1880. The reservoir was at present large enough to deliver a daily supply of 52½ million gallons; but the catchment area with which it was connected was only sufficient to provide a daily supply of 41 million gallons. Certain other catchment areas were, however, in the possession of the appellants, and could be connected with the reservoir; and when this was done an additional daily supply of 11½ million gallons would be given. Of that supply, 39 million gallons would be delivered by means of three pipes to Liverpool, and 13½ million gallons would be passed away down the River Vyrnwy as compensation water. At present, of the three lines of pipes which were ultimately destined to form the aqueduct, only one, capable of carrying 13 million gallons of water to Liverpool had been laid. The appellants were in 1896, and had since been, able to borrow money for the purposes of their water-works at from £2 10s. 11d. to £2 11s. 10d. per cent.; but for the Vyrnwy works £1,845,841 of capital was borrowed at 3½ per cent. per annum, and £104,528 at 2½ per cent. The last-mentioned rates of interest were still paid thereon, the money having been borrowed between 1880 and 1889. According to the valuation put in by the appellants, the structural cost of the reservoir works in the respondent parish was £646,932; and the cost of land (1245 acres, at £50 an acre) £62,250—making the total capital cost of reservoir and site £709,182. But as only a portion of the works were in the parish, they put the capital cost there at £617,450. The lake, they said, was now producing only 26,506,850 gallons per day, instead of 52,506,850 gallons, or about one-half, so that the effective capital value, according to the appellants' valuation of the reservoir and site in the parish, would be reduced to £308,725. Then adding the value of the tunnel works in the parish, £9312 (allowing for the fact that only one pipe is laid), and putting the present effective capital value of the works at 2½ per cent., the appellants' valuation brings out the net rateable value of the works in the parish at £8746. Mr. William Marshall also put in a detailed valuation, bringing out the net rateable value at £16,920. It was contended on the part of the appellants that, for the purpose of ascertaining the effective capital value of the undertaking, the amount expended by them on bridges and roads under the compulsory provisions contained in their Acts should not be included; and that, inasmuch as the reservoir itself was now complete, and was capable of dealing with a daily quantity of 52½ million gallons, and that as the daily quantity which was at present required and delivered from the reservoir was only 26½ million gallons, the effective capital value of the reservoir and site was a 26½: 52½ of the total expenditure thereon. Further, it was contended on behalf of the appellants that, in the circumstances set out by them, no higher rent ought to be fixed as the basis of assessment than an amount representing 2½ per cent. per annum upon the effective capital expenditure upon the undertaking.

On behalf of the respondents, it was contended that for the purpose of ascertaining the effective capital value of the undertaking in the respondent parish the expenditure by the appellants upon bridges and roads round the lake should be included, as enhancing the value of the lake; that as, in the present state of completion of the works, the reservoir could not be supplied from the various catchwater areas with more than 4 million gallons of water per day, the effective capital value of the reservoir was 26½: 41 of the total capital expenditure; and that, as under the circumstances, a higher rent ought to be fixed as the basis of assessment than an amount representing 2½ per cent. per annum upon the effective capital expenditure in the parish, having regard to the fact that the Corporation of Liverpool were actually paying 3½ per cent. on the capital expended upon the works.



The Justices submitted the following questions for the opinion of the High Court: (1) Whether we were, for the purpose of ascertaining the rateable value of the reservoir and works, bound to treat such reservoir and works as integral parts of appellants' water undertaking, or whether we were entitled to treat such reservoir and works as severable from the rest of the appellants' undertaking. (2) Whether, if we were right in so holding we were also right in taking into account the other circumstances—the additional outlay which would be necessary in the construction of the works at the present time in consequence of growth of the population, the greater demand for such sites, and the increased cost of material and labour—in addition to the rate of interest at which the appellants could have borrowed money at the date of the making of the rate. (3) Whether, in order to ascertain the effective capital value of the appellants' undertaking, the amounts expended by them on roads, bridges, church, vicarage, and schools, or any and which of them, ought or ought not to be included. (4) Whether the effective capital value of the appellants' reservoir and site ought to be taken as  $26\frac{1}{2}$ : 41 or as  $26\frac{1}{2}$ :  $52\frac{1}{2}$  of the total capital expenditure thereon. (5) Whether the rateable value of the appellants' undertaking ought to be taken at 3 per cent. or  $2\frac{1}{2}$  per cent. per annum on the effective capital value of the undertaking.

Mr. BALFOUR BROWNE, in supporting the contentions made on behalf of the appellants before the Justices, argued, with regard to the rental value of the undertaking, that it ought to be based upon the percentage from which the capital expenditure could now be raised by the Corporation, which was  $2\frac{1}{2}$  per cent. As to the bridges and roads, their construction was forced upon the Corporation in lieu of roads which they had destroyed. But they were public roads and bridges in the hands of the public authorities; and the increased accommodation which they gave had enhanced the value of the land in the neighbourhood, so that the respondents were receiving benefit from them in that way. He submitted, therefore, that the outlay upon them could not be included in the capital expenditure upon the works for the purpose of forming a rating basis. The learned Counsel was proceeding to deal with the question of the church, vicarage, &c., when

Mr. Justice RIDLEY intimated that he need not trouble himself upon that point.

Mr. BALFOUR BROWNE proceeded to contend that the Justices had gone upon a wrong principle in the valuation; that there could be no extra demand, and no growth of population in the watershed in question because the Corporation had purchased it all; and that the effective capital value ought to be taken for present rating purposes at only half the reservoir capacity, because this was, in fact, the proportion which was being utilized.

Mr. MARSHALL put his case higher than the Justices or the respondents had put it, for he said that, as a fact, the whole capacity of the reservoir was being utilized every day. It was constantly full; and as the respondents would be entitled to take into account the whole  $52\frac{1}{2}$  million gallons which it held, they were dealing liberally with the appellants in only putting the figure at 41. As to the interest, the respondents' Valuer put it at  $3\frac{1}{2}$ , and the appellants' in the first instance at  $2\frac{1}{2}$ . It therefore seemed to him that the Justices fixing 3 per cent. as the basis were acting very reasonably. The learned Counsel argued that the roads and bridges were for the accommodation of the appellants; that they could not do without them; and that therefore their outlay ought to be included. When he went on to deal with the church, vicarage, &c.,

Justice RIDLEY (interposing) said the thing was ridiculous.

Mr. MARSHALL did not pursue the matter any further, but argued that the questions at issue were facts for the Justices, and that no questions of law were involved.

Mr. BALFOUR BROWNE having replied,  
Their Lordships reserved judgment.

#### Friday, July 8.

Justice RIDLEY this morning delivered the reserved judgment of the Court. Having referred to the facts set out in the case, he said the appellants and respondents had adopted in principle the same method of arriving at the rateable value of the property; but, in carrying out the principle the differences arose which required, the Court's decision. The Quarter Sessions had submitted five questions. The first was whether the reservoir and works were to be treated as integral parts of the appellants' water undertaking, or as severable from the rest of the undertaking. The Court thought that such part of the water-works as lay within the parish was a separate rateable hereditament in it, and should be rated accordingly upon an estimate of the rent which it would yield after making the statutory deductions. (See *Reg. v. West Middlesex Water Company*.) But it must be taken that the reservoir and works were part of the whole undertaking for the purpose of distributing water as a source of profit; and though they did not directly earn anything in the parish, yet they conduced to earnings elsewhere. The whole undertaking continued in operation, and therefore the owner of the whole must be assumed to pay a contractor adequate remuneration for land and fixed capital vested in these parts of the undertaking, and for the labour and skill required for their construction and maintenance. The contractor stood in the relation of occupying tenant, in the words of the case cited: "The part within the parish is the rateable subject, and the local rateable value is such sum as will pay the rent of the land and the profit on fixed capital therein." The answer, therefore, was that the reservoir and works were integral portions of the undertaking, and, though rateable separately, were not to be valued apart from the rest of the undertaking. The second question was whether there ought to be taken into account the circumstances mentioned in paragraph 24 of the case, in addition to the rate of interest at which the appellants could have borrowed money at the date of making the rate. The Court, in the absence of direct evidence, could not feel certain that the supposed greater demand for sites existed, and that in this case the capital value should be arrived at from the cost of the works as a basis. The third question was whether, in order to ascertain the effective capital value of the undertaking, the amount expended on roads, bridges, church, &c., ought to be included. The Court were clearly of opinion that none of them ought to be included. It had been argued that the amounts expended were part of the cost of the works. It was clear, however, that

they were not, but that they were to be regarded as expenses to which the appellants had been put in carrying out the obligations imposed upon them by Parliament. If they enhanced the value of the lands, as to which there was not sufficient evidence, this must be taken into account in the rateable value of the lands enhanced. The fourth question was as to whether the value of the reservoir and site ought to be as  $26\frac{1}{2}$ : 41 or as  $26\frac{1}{2}$ :  $52\frac{1}{2}$  of the total capital expenditure. At present, the daily supply was only about one-half of the complete or total possible supply. *Prima facie*, therefore, the effective capital value was also one-half of the total. But, on behalf of the respondents, it was said that the total now received into the reservoir being only 41 million gallons a day, and the total supply being  $26\frac{1}{2}$  millions a day, the proper fraction to be used in the calculations was  $26\frac{1}{2}$ : 41. In other words, though the supply was only one-half of the intended amount, the rateable value of the effective capital was to be taken at more than one-half. It was also contended that the appellants should, in order to justify their contention, add to the capital value the cost of including the additional catchment area which was required to bring the daily supply into the reservoir to the amount of  $52\frac{1}{2}$  million gallons. But it was the reservoir and works which were here rated, not the works which had not been carried out; and, though it was true that the proportion between the number of gallons supplied out of the reservoir and those actually received into it was at the time as  $26\frac{1}{2}$ : 41, this proportion did not represent the true relation between the effective capital value and the total cost of construction. The reservoir was large enough to receive  $52\frac{1}{2}$  million gallons daily, and had been constructed and completed for these dimensions. But it did actually only supply one-half of this quantity. For the purpose of the rate, the Court thought that the comparison supplied the true proportion. The case of *Reg. v. South Staffordshire Water-Works Company*\* was relied upon as showing that the cost of connecting the additional catchment area with the reservoir ought to be added to the capital value. But in that case the works had been completed and formed part of the undertaking. As to the last question—whether the rateable value ought to be taken at 3 per cent. or  $2\frac{1}{2}$  per cent. on the effective value of the undertaking—this was largely a question of fact, as to which the Court would not interfere with the decision of Quarter Sessions. The principle on which the capital value was to be calculated had been stated. The Court thought the percentage upon it ought not to be higher than the necessary rate of interest at which the money could be borrowed. At the same time, when all the circumstances were considered, the Court could not say that the percentage had been wrongly fixed at 3 per cent., though it was higher than the rate at which the money could now be raised. The order of Quarter Sessions ought to be quashed, and the rate reduced in accordance with the opinion of the Court.

Mr. MARSHALL asked for leave to appeal, and that costs, which had been reserved by Quarter Sessions, should abide the event.

Mr. LLOYD said it was impossible now to say what the rate, as amended by their Lordships, would be. As far as he could judge from a hasty calculation, he should say that the amendments in the order of Quarter Sessions would have the effect of reducing the rateable value from £15,000 odd to about £10,000.

Justice PHILLIMORE: You ought to agree to the figures to-day, and submit them to Master Mellor, so that they appear as part of the order of the Court.

Mr. LLOYD said this should be done; but as to the costs, he submitted that the appellants were entitled to have them.

Mr. MARSHALL thought the costs ought to abide the result; the Court of Appeal might, he said, vary their Lordships' order.

Justice RIDLEY: You insisted upon a wrong rate, and you ought to pay the costs here and at Quarter Sessions. If the Court of Appeal should vary the order, they can vary it also as to costs. The order will be that the costs of this Court and of the Court of Quarter Sessions be paid by the respondents.

Judgment was ordered to be entered for the appellants accordingly; and leave was granted to appeal. The order of the Court, however, will not be finally drawn up till the parties have agreed upon the figures.

#### The Ballynahinch Gas Explosion.

In the "JOURNAL" for the 26th of April last we reported a case in which two men, named Hughes and Roy, sought to recover damages, laid at £100, from the Ballynahinch Gas Company, for personal injuries alleged to have been sustained by them through a gas explosion caused by the negligence of the Company's servants. The plaintiffs failed in their action in the County Court; but they appealed against the decision, and the matter was tried at the Ulster Summer Assizes last week. The result was in the appellants' favour; judgment being given for £30 each, with costs, the expenses of the witnesses, and the doctors' fees.

#### A Small Fine for a Large Waste of Water.

At the Newcastle-under-Lyme County Police Court yesterday week, Mary Brindley was summoned as the owner of a number of houses at Cross Heath, Newcastle, for allowing the water of the Staffordshire Potteries Water Company to be wasted. Mr. D. K. Johnson, on behalf of the prosecutors, proved that a pipe supplying a number of houses had been running to waste from May 15 to June 9, though the attention of the owner's agent had been called to it. The estimated waste of water during the time was 214,000 gallons; representing a loss to the Company of £7. A fine of 40s. and costs was imposed.

**Extensions at the Burton-on-Trent Gas and Electric Light Works.**—The Burton-on-Trent Town Council last Wednesday authorized the Finance Committee to apply to the Local Government Board for permission to borrow £50,140 for the purchase of property and for extending the gas and electric light works.

\* See "JOURNAL," Vol. VIII., p. 104.

\* See "JOURNAL," Vol. XLVI., p. 1017.



## MISCELLANEOUS NEWS.

### THE GAS PROVISIONAL ORDERS OF THE SESSION.

The Board of Trade have issued memoranda stating the nature of the proposals contained in the Provisional Orders included in the two Gas Orders Confirmation Bills of the present session.

The first Bill contains Orders relating to Budleigh Salterton, Coatbridge, Great Marlow, King's Lynn, and Whitchurch. The first-named Order is to empower the Budleigh Salterton Gas Company, Limited, to maintain and continue gas-works, to construct additional works, and to manufacture and supply gas. The share capital is £13,000, consisting of £3000 of original and £10,000 of further capital; and £3250 may be raised by loan. The Order authorizes the sale of gas in bulk by agreement beyond the limits of supply, and fixes the maximum price to be charged for gas at 5s. per 1000 cubic feet, with power to the Board of Trade, after the expiration of three years, to alter the maximum price or to substitute a standard price with a sliding-scale of price and dividend. The Coatbridge Order is to authorize the Coatbridge Gas Company to raise additional capital not exceeding £20,000 by shares or stock, and £5000 by loan; and to fix the standard price of gas at 2s. 6d. per 1000 cubic feet for increase of dividend, and 2s. 11d. for reduction of dividend, for the purposes of the sliding-scale. The Great Marlow Order is to give authority to the Great Marlow Gas Company, Limited, to maintain and continue gas-works, to construct new works, and to manufacture and supply gas in Great Marlow and the neighbourhood, in the counties of Berks and Buckingham. The amount of capital is limited to £24,000 by shares, consisting of £9000 of original, and £15,000 of additional capital and £6000 by loan. Sale of gas in bulk by agreement beyond the limits of supply is authorized; and the maximum price to be charged for gas is fixed at 4s. 10d. per 1000 cubic feet, with power to the Board of Trade, after three years, to alter that price, or substitute a standard price with a sliding-scale as to price and dividend. The King's Lynn Order is to empower the King's Lynn Gas Company to raise further capital not exceeding £6400 by shares or stock, and £1600 by loan, and to construct additional works. The Whitchurch Order is to authorize the Whitchurch (Salop) Gas Company, Limited, to maintain and continue gas-works, and to manufacture and supply gas in the parish of Whitchurch. The amount of capital is limited to £25,000 by shares, consisting of £20,500 of original, and £4500 of additional capital, and £6250 by loan. Authority is given to sell gas in bulk by agreement beyond the limits of supply. The maximum price to be charged for gas is fixed at 4s. 7d. per 1000 cubic feet, with power to the Board of Trade, after three years, to alter it as in the other cases.

The second Bill contains Orders relating to Cannock, Colwall, Crossgates, and Slough. The Cannock Order is to empower the Cannock, Hednesford, and District Gas Company, Limited, to maintain and continue gas-works, and to manufacture and supply gas within the parishes of Cannock, Cheslyn Hay, and Great Wyrley, in the county of Stafford. The amount of capital is limited to £40,000 by shares consisting of £35,000 of original, and £5000 of additional capital and £10,000 by loan. The new share capital and the mortgages are to be subject to the auction clauses. The sale of gas in bulk by agreement beyond the limits of supply is authorized. The minimum illuminating power of the gas to be supplied is fixed at 14 candles, and the maximum price to be charged for gas at 4s. 6d. per 1000 cubic feet, with power to the Board of Trade, after three years, to alter it, or to substitute a standard price with a sliding scale. Provision is made for the sale of the undertaking, under certain circumstances, to the Cannock Urban District Council. The Colwall Order is to authorize the Colwall Gas Company, Limited, to maintain and continue gas-works, and to manufacture and supply gas within the parishes of Colwall and Coddington, in the county of Hereford. The amount of capital is limited to £8000 by shares, consisting of £5000 of original, and £3000 of additional capital, and £2000 by loan. The sale of gas in bulk by agreement beyond the limits of supply is sanctioned. The maximum price to be charged for gas is fixed at 5s. 8d. per 1000 cubic feet, with similar power to the Board of Trade as in the other cases. The Crossgates Order is to empower the Crossgates, Halton, and Seacroft Gas Company, Limited, to maintain and continue gas-works, and to manufacture and supply gas in the parish of Seacroft, and the hamlets of Halton, Colton, Whitkirk, Crossgates, Manston, Stanks, and Scholes, in the West Riding of York. The amount of capital is limited to £9410 by shares, consisting of £7410 of original, and £2000 of additional share capital and £2352 by loan. The sale of gas in bulk by agreement beyond the limits of supply is authorized. The maximum price is fixed at 4s. 6d. per 1000 cubic feet, with the usual power to the Board of Trade. The Slough Order is to enable the Slough Gas and Coke Company to construct and maintain additional gas-works. The standard price of gas is fixed at 4s. 5d. per 1000 cubic feet within the authorized limits of supply other than the parish of Datchet, and 4s. 8d. within the parish, with a sliding-scale.

### THE WIDNES GAS AND WATER UNDERTAKINGS.

#### An Appreciation of Mr. Isaac Carr's Management.

At the Meeting of the Widnes Town Council last Tuesday, the minutes presented by the Gas and Water Committee contained the following recommendation: "That, having regard to the success of the gas and water undertakings for the last financial year, which, in the opinion of this Committee, is largely attributable to the careful and able management of Mr. Isaac Carr, Assoc.M.Inst.C.E., a bonus of £60 be voted to him for his special services during the year.

Alderman TIMMIS, the Chairman of the Committee, in moving the adoption of the minutes, explained that the course recommended was necessitated by the fact that the Council at the last meeting declined to suspend the Standing Orders so as to consider a proposal to increase Mr. Carr's salary. He believed they unanimously agreed with the proposed increase; but there was a difference of opinion as to when it should be

carried into effect. It was suggested that the proposal to suspend the Standing Orders was a precedent that should not be set; and it was suggested that the Engineer should be given a bonus for his services, and the question of salary deferred until February next. In consequence, the Committee carefully considered the question at their last meeting, and finally decided to recommend the Council to grant the bonus named, which represented what they wished to give as salary. At the last meeting it was stated that were they to sell the gas at the price of their neighbours—that was to say, at 2s. 8d. and 3s. per 1000 cubic feet—the consumers of Widnes would pay £15,000 per annum more than they were now asked to pay for the same quantity of gas. It was further emphasized that Widnes was in the exceptional position that the gas consumers and ratepayers were practically one and the same; and that, therefore, any benefit conferred by the manufacture of gas was conferred upon the people of the town. It was the common practice almost throughout the country (with the exception of very large towns) for Consulting Engineers to be called in when extensions became necessary. At Widnes, however, Mr. Carr had not only designed the building and plant of their large and important extensions, but had also, for the most part, carried out the work with the Corporation's own workmen, and this at an exceedingly low cost. Those who had seen the works knew that they were good and substantial in appearance; and the excellent profits that were being made from year to year testified to their efficiency. Though the works had been practically reconstructed, the aggregate capital stood at only 7s. per 1000 cubic feet; and when the works were making up to their full capacity, the figure would be but 4s.—thus proving the low cost at which the extensions had been carried out. The above figures appealed with greater force when taken in comparison with the capital of other corporation gas-works, where it amounted in one case to as much as 17s. 3d., and in many others to little short of that. It was contended that many thousands of pounds had been saved in the reconstruction of the gas-works when compared with what was expended on similar works in other towns. The retort-house building cost £1500, or 1-61d. per cubic foot of contents, which was an exceedingly low figure. With regard to the retort-bench, the standard cost of similar work was £46 per mouthpiece, without a building. The cost at Widnes was £26 per mouthpiece, representing a total saving on the 112 mouthpieces of £2240 in this instance alone—£20 per mouthpiece. The cost of the whole work was, however, £4500, or £40 per mouthpiece, with the building and coal-shed included. The annual saving arising from the working of the new retort-house would be £600 on the present production, due to economy of coke used in the furnaces, and to improved facilities arranged by Mr. Carr for carrying out the work. The total capital expended on the gas-works extensions, including the new gas-holder at Ditton, was less than £22,000. Comparing the cost of gas making and maintenance of works at Widnes with the cost of other corporation gas-works similarly situated as regarded proximity to coal-fields and quality of gas supplied, the results showed in favour of Widnes to the amount of 5-4d. per 1000 cubic feet, or, on the Widnes make, £4375 per annum. There were no capital charges in these figures—they were simply a comparison of the cost of manufacture of gas and maintenance of works; and the difference represented the value of the Widnes management over the others. The expense of manufacture in Widnes might be increased by this amount, and still the excuse might be made that the cost was only the same as some others, and even less than a great many, had they a less competent Manager. The recent achievement at Stocks Well—i.e., the successful completion of the work in connection with No. 2 well—was an instance where plant costing about £20,000, which was in danger of total collapse, and which many engineers would have abandoned as hopeless, had been rendered equally permanent and more efficient than it ever was previously; thus saving the enormous outlay that would have been necessary to replace it. He did not know of any other two works of the size of those at Widnes which were being managed for the same amount, because it was not possible to compare their town with others of similar population. Their consumers were more approximate to a town of 100,000 inhabitants. At Widnes they were in the happy position of having gas and water at exceptional prices largely owing to the ability of their Engineer.

Alderman GOSSAGE seconded the motion; and, after a few remarks by members of the Council, it was carried unanimously.

### SOUTHPORT CORPORATION GAS SUPPLY.

#### The Gas Engineer's Report.

The Engineer and Manager of the Southport Corporation Gas-Works (Mr. John Booth) has presented to the Gas Committee his report on the working of the Gas Department during the financial year ending the 31st of March. He notes at the outset that the make and sale of gas have not kept pace with those of former years. This fact, he says, is to be attributed to two causes—the substitution of the electric light for gas for private lighting, and the mildness of the past winter. During the history of the Southport Gas-Works, covering a period of 48 years, there are only two occasions where a decreased make of gas is shown; these being the years 1879-80 and 1897-8. The total increase in the gas made during the seventeen years ending 1896-7 was more than 121 per cent.; the average annual increase being upwards of 7 per cent. After such an annual increase, Mr. Booth says it is a new experience to find a decrease. But it is due to the electric light having, during the last three years, replaced gas in the premises of many of the larger consumers; and the loss of these has not been made up by new consumers of equal capacity or numbers. The total quantity of gas made during the past financial year was 368,694,000 cubic feet; the decrease on the make in the previous year being 764,000 cubic feet, or 0-2 per cent. For each of the previous three years the increased make of gas was as follows: 1894-5, 11-47 per cent.; 1895-6, 1-88 per cent.; 1896-7, 3-34 per cent. The total quantity of gas sold was 358,257,700 cubic feet—an increase of 1,616,900 cubic feet, or 0-45 per cent. For lighting there was a decrease of 18,204,500 cubic feet; and 1,058,600 cubic feet less gas was burnt in the public lamps—together, 19,263,100 cubic feet. On the other hand, there was an increase of 20,874,400 cubic feet used for cooking purposes. There were 2,574,600 cubic feet of gas consumed in the works and offices and supplied free; and 7,861,700 cubic feet were



unaccounted for, or 2.13 per cent. The gross profit for the year is £15,154. After paying interest on loans and stock, amounting to £5854, also the sinking fund apportionment, £2584, there remains a net profit of £6716. Of this amount, £200 is added to the reserve fund; leaving an available balance of £6516. Compared with last year, the net profit shows a decrease of £2322. Mr. Booth emphasized the fact that the past year was an exceptional one; showing a decrease in the total quantity of gas made, and a decreased revenue from the gas sold for lighting purposes amounting to £2795. The revenue from gas sold for other than lighting purposes shows an increase of £2677. But this gas was supplied during the year at practically cost price; and as there was a decreased consumption of profitable gas, the profits of past years could not be maintained. In the past year also there was, for the first time, a total absence of meter-rents, which were equal to about £1300 per annum, or 1d. per 1000 cubic feet of gas sold. During the past three or four years a large outlay has been incurred on revenue account in relaying and enlarging the mains. This having now been completed, a reduced expenditure under this head may be looked for in the future. Taking into consideration all the facts, Mr. Booth says the financial results of the past year's working must be considered satisfactory.

The report above noticed was upon the minutes presented by the Gas Committee at the meeting of the Town Council last Tuesday, but when moving their adoption, the Chairman of the Committee (Mr. Dimond) asked permission to withdraw the report—at the same time expressing his pleasure at being able to announce an increased delivery of gas to the extent of 5 million cubic feet since the 1st of April. Alderman Unwin having seconded the motion, Mr. Travis said he thought some reason should be given for the withdrawal of the report. Mr. Dimond said he did not know till that afternoon that it was to be withdrawn. He was prepared to discuss the whole question at the proper time; but seeing that an explanation was required on a matter which did not appear on the report, it was deemed advisable by the Committee that it should be withdrawn. There was nothing he feared to discuss in connection with the minutes, and he should perhaps be able to prove that the gas estate was in a very satisfactory condition. The Mayor (Alderman Booth) remarked that the report could not be withdrawn unless the Council sanctioned it. The Town Clerk (Dr. J. Davies Williams) said the report constituted a portion of the minutes. The Chairman of the Committee, by the instructions of that body, wished to withdraw the report. As a matter of strict order, no doubt the Council had a right to be consulted as to whether this course should be adopted, but he had never known a case where, when a Committee had decided to ask their Chairman to withdraw a portion of the minutes, the Council had objected. This was the strict position. Alderman Vaughan then moved that the Council allow the report to be withdrawn; and the motion was carried. This led to the withdrawal by Dr. Weaver of the following motion standing in his name upon the agenda: "That a first-class expert be engaged to report upon the gas estate, with instructions to recommend to this Council any improvements which, in his opinion, would be likely to result in an increased profit." He, however, gave notice that he would bring it forward at the next meeting.

## METROPOLITAN WATER SUPPLY COMMISSION.

### Twenty-ninth Day—Monday, July 11.

(Viscount LLANDAFF, Chairman, Major General A. DE COURCY SCOTT, Mr. A. DE BOCK PORTER, C.B., and Mr. R. LEWIS.)

The sitting took place at the Guildhall, Westminster.

The following Counsel are engaged: Mr. POPE, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., for the New River Company; Mr. LITTLER, Q.C., and Mr. LEWIS COWARD for the Kent Water Company; Mr. PEMBER, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. RICKARDS for the Chelsea Water Company; Lord R. CECIL for the Hertfordshire County Council; Sir JOSEPH LEESE, Q.C., M.P., for the Kent County Council and Kent Local Authorities; Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN, Q.C., for the London County Council; Sir R. NICHOLSON for the Middlesex County Council; and Mr. GABRIEL P. GOLDNEY (Remembrancer) for the Corporation of the City of London. The Southwark and Vauxhall Water Company are represented by Messrs. BIRCHAM and Co.

Mr. Andrew Johnston, Chairman of the Essex County Council, examined by the CHAIRMAN, said he was a Director of the New River Company, but merely as representing another Company; and he was the representative of the New River Company on the Staines Reservoirs Committee. He gave evidence as representing the Essex County Council. The geographical county, including West Ham, had a population, according to the census of 1891, of 785,444; and the administrative county, of 578,471. The population of the district of the county served by the Metropolitan Companies was estimated to be now 295,393, which represented ten Local Authorities. The rateable value of the water district in 1897 was £1,043,993.

The CHAIRMAN: Have your Council supported or opposed the London County Council Transfer Bills?

Witness: Well, it is rather difficult to say. They have always petitioned against them. They have, however, been willing to agree to them on certain terms; and an agreement has been come to virtually in the last year, though it was never signed or sealed, because the Bills collapsed in the meantime. The terms were settled.

May I take it that the terms were to hand over to the county the supply and the distribution of water in the county?—Yes; roughly speaking that was the agreement.

Can you tell us why your Council are opposed to the London County Council purchasing and supplying in bulk?—I do not think we are opposed. It is a question of price. The Essex supply is much cheaper than in the rest of London; and the Council are afraid that if they took their supply in bulk, they would be obliged to pay the average of the whole of London. Essex pays something over 4d. per 1000 gallons as against more than 7d. paid by the rest of London. The Essex County Council, as a whole, have little, and did not wish to have anything, to do with the water question, unless upon terms which would guarantee them from pecuniary liability of any sort. I never knew the Council to take the slightest

interest in the subject; they have left it to the Councils affected. I cannot say what resolutions the local Councils have come to on the subject of each being constituted a separate Water Authority. The only chance of efficient management would be to have a Water Authority for the whole of the portion of Essex now supplied by the Metropolitan Companies.

How would you constitute it?—In the first place, we are met with the initial difficulty that the County Council have no powers to promote a Bill of any sort to constitute a Water Authority; and the districts themselves would find it very difficult to secure unity for that or any other purpose. The primary essential, therefore, would be for the Government, or some other body, to get an Act passed to constitute an Essex Metropolitan Water Authority. We have provided for this to some extent in our agreement with the London County Council. I think they promised to introduce clauses which would give the Essex County Council power to introduce a Bill for the purpose, and pay the expenses in the first instance out of the county fund.

In answer to further questions, witness said there was no provision in the agreement with the Essex County Council as to taking water in bulk. The agreement with London and the resolutions of the Essex Local Authorities were all governed by the condition that the division of the East London Company's works and sources of supply into two separate and independent establishments was not only possible in an engineering sense, but could be effected without any serious increase of expense or diminution of efficiency, and that this should be proved to the satisfaction of the Commission. Sir Alexander Binnie gave it as his opinion that the division would be extravagant; and witness concurred in this view. The sources of supply which Essex contemplated getting from London were as much of the wells and intakes of the East London Company—the only Metropolitan Company supplying in Essex—as would be sufficient, not only for the present, but for the future population of the district, which would be three or four times as great as at present, assuming the same rate of increase to continue. Essex had not sought expert advice as to whether they had sufficient water in the county for future increase in population. Essex wished to guard against the danger of being put to great expense in going a long distance for a new supply. Essex at present had the water, and ought to have the right to take it even if doing so caused London to go to Wales.

Mr. PEMBER, in reply to the Chairman, said roughly about one-third of the East London Company's water went to Essex.

Witness (continuing) said if more water was wanted by the Metropolis generally, Essex would be prepared to pay the cost of bringing it from a distance—if anybody could show a better right to Essex water than Essex. The quantity of water used by Essex was, very roughly, about 11 million gallons daily.

Some conversation passed as to the capacity of the wells of the East London Company, in the course of which Mr. Pember stated that the Company were now pumping daily from a well at Waltham 1½ million gallons; from a well at Chingford, 2 million gallons; from a well at Walthamstow, 4 million gallons; and from a well at Lea Bridge, 3 million gallons—a total of 10½ million gallons. Owing to improvements being made in the adits, the 2 million gallons from Chingford were being turned into the Lea, so that the present supply from the wells was only 8 million gallons a day. In wet weather, when plenty of water was otherwise obtainable, the Company did not pump to the full amount.

Examination continued: The Council did not think the question of purchase was ripe enough to consider what its results would be.

Upon the whole is Essex against purchase by any body?—He did not think they had had any expression of opinion that would give him the right to say whether Essex was against purchase by any body. As to each Local Authority taking water in bulk and controlling only the distribution pipes, the difficulty was that pipes seldom ran through one parish or one district only. The Essex County Council would not, if they could avoid it, become a Water Authority; but the constitution by Parliament of an Essex Water Authority would be a most satisfactory body to deal with the purchase of water in bulk from (say) the London County Council. This body would be representative of the districts concerned, and would levy a uniform rate over the whole area. The portion of Essex not served by the Metropolitan Companies was supplied in all sorts of ways—from horseponds to local companies. If Essex purchased the portion of the East London undertaking in Essex, the County Council would wish to throw the cost on the district benefited—not on the whole county. Witness personally was perfectly content with the present supply, as regarded quality, quantity, and price. His Council were indifferent on the subject. If there were any change the consumers would have to pay more. As regarded control, he said there was a cry from one district that the constancy of the supply should be assured. The 1897 Act had never been applied to attaining this end.

By Mr. H. L. CRIPPS (for the London County Council): As to which county had the prior right to water—the one above or the one below the intake—he held this to be a question for a casuist. If he lived above, he should say the county above; if he lived below, he should say the county below.

Mr. W. B. WHITTINGHAM, Chairman of the Water Supply Committee of the Essex County Council, which consisted of representatives of the Council and of the ten Local Authorities in Essex concerned in the Metropolitan Water Supply, said the Committee were not averse to the utilization of the water of the East London Company; but they were not agreed in promoting purchase. There was a strong feeling against the London County Council coming over the borders of Essex. The supplies being derived from Essex, they held that if these were to be purchased, Essex or some representative body should undertake it; but there was no great desire to purchase. The ten Local Authorities were not altogether satisfied with the *status quo*. The supply ran short recently; and with regard to cottages where there were no cisterns, they held that there should be a constant supply. No steps had, however, been taken under the Act of last year, to secure such a supply. While Essex would ask for the whole of the well and river sources, they would not want, for some time, to utilize all of them; some share of the river water might be left for London. The supply from the wells was very rapidly increasing; and no complaints had been received of diminution of the flow of other wells or rivers in consequence. The charges of the East London Company were based, he believed, on net rateable value, with very large additions for high service and other extras.



By Mr. PEMBER: It might be that out of 195,000 houses in the East London district, 193,400 had a constant supply.

Mr. William Ivey, Mayor of West Ham, put in a table showing that both in population and rateable value the borough had developed enormously. The increase of recent years had not been so rapid; but he thought the population would grow eventually to 600,000. The East London Company was the only one supplying in the borough, which contained 39,000 houses besides numerous factories, dockyards, &c. In 1894-5-6, the supply was short, owing to drought and frost; but he supposed they were no worse off than other districts. On the basis of 35 gallons a head, the daily domestic consumption would be about 9½ million gallons, which, with the requirements of the ten other Essex Local Authorities supplied by the East London Company, made a total of about 19 million gallons daily. The population of the East London Company's area inside London, he should say, was about stationary. Subject to the Water-Rate Definition Act of 1895 being applied to West Ham and the surrounding districts, and a constant and sufficient service being guaranteed, his district was fairly well satisfied with the present water supply.

The CHAIRMAN: Do the East London Company in West Ham base their charges on the gross or the net rateable value?

Witness: There is no standard that we know of on which the Company base their charges. It is really the gross and more; it is not the net, as it is in the Metropolis. The borough had asked to be charged on the net.

The CHAIRMAN, on referring to the Company's Act, said that they were authorized to charge on the annual value of the house, which in Dobbs's case meant net annual value.

Witness said they had not taken the case to the Courts. As to purchase by the London County Council, he said if this body were prepared to give all West Ham asked—the matters he had already referred to, and which were practically embodied in the agreement between West Ham and the Council—West Ham would not object. West Ham had not considered what portion of the East London Company's sources of supply would be required for Essex. London had some claim on them; and he suggested that if they were equally divided, Essex would have sufficient, especially if there were more water to be obtained in Essex. After purchase, he should not expect that the charges would be increased. Looking to the magnitude of the question, he thought the State might well effect the purchase; settling the question of management afterwards. There would then be an absolute guarantee that the water was pure, and less trouble, less dispute, and more likelihood of a complete settlement, than if the London County Council were the purchasing body. The undertakings could then be easily split up among the various local bodies. West Ham was quite willing to join with Essex in the matter of water supply, and was prepared to face a rate-in-aid, or whatever was fair.

By Mr. POPE, for the East London Water Company: There was a clause in the Company's Act of 1894 giving West Ham a constant supply; but occasionally complaints were received. As regarded the Water-Rate Definition Act, he complained that it did not apply to West Ham.

Mr. POPE: Is not the whole question this—that everybody was agreed upon the principle on which the charge should be made, but that you, not having made the Valuation Act of 1869 apply to West Ham, could make your rateable value what you liked. Is not that the difficulty discussed in 1894 between yourselves and West Ham?—Yes. The borough asked to have a clause inserted in the Company's Act making the basis of charge "net annual value," and it was refused; the Company saying that if the borough was valued as other portions of the Metropolis were valued, they would supply on that basis. Still, witness held that the borough had offered to put a new column in their list, so that the net rateable value should be on the same basis as in the rest of London.

By Mr. H. L. CRIPPS: The borough did not object to buying in bulk from London, if the agreement were maintained.

Mr. Frederic Harris, Treasurer of the County Borough of West Ham, handed in a table showing the actual charges of the East London Company in West Ham.

The CHAIRMAN: Is the water-rate actually charged higher than their statutory charge on the rateable value, as fixed by the Local Authority?

Witness: Yes.

Is it higher than the water-rate charged in London?—Considerably. On 29,000 cottages in the borough, the assessment was exactly the same as in the remainder of London. The grievance was that the Company themselves fixed the net annual value, and that this differed from the rest of London—being, in the case of small property, from 6 to 25 per cent. in excess, and in the case of larger house property from 3½ to 10 per cent. in excess. Practically the assessments were the same in West Ham as in the rest of London—save as to houses of £40 and upwards, in regard to which West Ham took off one-fifth, whereas in London they took off only one-sixth. Personally, witness would be glad to see the Metropolis Valuation Act made applicable to the whole Union. For an ordinary cottage of 8s. a week, the Company's charge in West Ham would be 12s. 6d., as against 11s. in the rest of London. He knew no reason justifying the excessive charge in West Ham.

Mr. DE BOCK PORTER: If you adopted the Rating Act, you might have these charges reduced?

Witness: Yes.

Why do you not adopt it?—We have not power. It applies only to the Metropolis. The Company take from West Ham about £3000 a year to which they are not entitled.

Mr. POPE said the Corporation had not been able, or willing, to accept the Act of 1869; and the Company therefore had fixed the rateable value under the Water-Works Clauses Act.

The CHAIRMAN remarked that, according to witness, the assessments were perfectly fairly made; and there was no difference between them and those of the rest of London.

Mr. POPE said the Company would be content with the valuation under the Act of 1869; but they were not with the present method.

Witness said the borough had offered to insert in the rate-book a column giving exactly what the Company wanted.

Mr. W. K. Marriott, Chairman of the Barking Urban District Council, said the Council were within the area of the East London Company, but

were entirely served by the South Essex Water-Works Company, whose supply was indifferent and dear, though their charges were within their statutory powers. The Council had not required the East London Company to supply, because the Company were sinking wells in Barking, and the Council were waiting the result. Barking would join with other Essex Local Authorities to form an Essex Water Authority. At present, they were paying 10d. per 1000 gallons for water for street watering, as against 4d. charged by the East London Company in other parts of Essex. The present domestic charge was 7½ per cent. on the net rateable value of houses at £30 and under; and 6 per cent. on houses above this value. Barking rather objected to the Essex County Council being constituted a Water Authority. They wanted a Board representative of all Essex, to buy from London the Essex portion of the East London Company, by which means they thought they could secure a better and cheaper supply. They had not, however, gone into details as to cost. If the terms were satisfactory, they would also be content to take water in bulk from the London County Council.

Mr. Alfred Plant, Accountant to the East Ham Urban District Council, which is solely served by the East London Water Company, said the district had been very rapidly developing; but it was now advancing, and would continue to advance, he thought, at a slower rate. The district was in the same Union as West Ham; and practically the same difficulty as to charging arose as in West Ham.

Mr. T. L. Knight, Chairman of the East Ham Urban District Council, also gave evidence on behalf of East Ham. If the East London Water Company were to be broken up or taken over, witness said his Council considered they should have control of their portion.

Mr. Musgrave, formerly Chairman of the Leyton Urban District Council, said the district, which was growing very rapidly, was entirely supplied by the East London Company. He complained of shortness of supply, especially during periods of drought and frost. All the houses were supposed to have a constant supply, but it was not so in fact. The Council had complaints, but had taken no action, because they were advised they were not a Local Authority under the Act of last year. The Council thought the undertaking should be placed in the hands of a popularly elected body, on which they would be represented and bear their share of the burden. If this could not be done, they were prepared to take water in bulk from (say) the County Council, provided they received the same quantity and at the same price per head as other localities. Very much the same rating difficulty arose in Leyton as in East and West Ham.

Sir John Evans, Vice-Chairman of the Hertfordshire County Council, examined by the CHAIRMAN, said the amount of water supplied in the county by a Metropolitan Company was small; but the abstraction by the New River Company was large. There were so few parishes in the area of a Metropolitan Company, and the number of inhabitants of these parishes was so few, that Herts thought it would not be worth while to purchase the undertakings. Purchase by the London County Council would be worse, because the tendency would be to take more water from Herts. He was not aware that there was any desire in Herts to buy the Herts portion of the Companies' concerns. Herts claimed the whole of the water in the county, as belonging to Herts. On the whole, the county was hostile to purchase by the London County Council, which body had stated that they had a statutory right to take all the water they desired from Herts. Their statutory right depended on the statute; but they seemed to be straining it. The bulk, too, if not the whole, of the wells sunk by the New River Company had been sunk without parliamentary sanction. Witness believed that all the wells in Herts rested upon the ordinary rights of landowners, and not on any special sanction. The complaint of the county was that the ordinary or common-law right of an owner had been strained, so as to enable one person to drain all the water of a district, and take it away to London for his own profit. There could not be a common-law right enabling a man to purchase a quarter of an acre of land, and pump 10 million gallons of water daily for the use of London, as had actually been done.

Major-General SCOTT: You mean this: The Companies have obtained the right by parliamentary statute to lay mains and levy rates for water, and they have applied these rights to water obtained without a Parliamentary Bill?

Witness: Yes. The pumping that has gone on has seriously affected other wells and springs in the county. At Cheshunt the New River Company, though their pipes pass through the locality, refuse to supply.

The CHAIRMAN: I see the Balfour Commission took the view opposed to that which you are now expressing?

Witness: Yes, and opposed to that of their own Commissioner.

In answer to further questions, witness said that, regarding control, the Act of 1897 went in the right direction. He would, however, vest the control under the Act in the Local Authority, with possibly a reference to the County Council. He agreed that, as to the quality of the water, the consumers should be the persons to complain. Then power should be given to compel a Company to give a supply of water to a district through which they passed. Thus Cheshunt was without water, though it was in the area of the New River Company. The Company had been called on to supply; but they refused, except at a price which was so exorbitant that the locality sought a private supply.

Mr. POPE said Cheshunt had a supply of its own; and he believed there was something in the Company's Act of 1852 which relieved them of the obligation to supply where the district was supplying itself.

Witness (continuing) said the supply at Cheshunt was diminishing, in consequence of the pumping of the New River Company. Provided parishes were willing to comply with the requisitions of the law, they ought to have a first claim on water, before it was carried away from them. He thought, also, it would be a great advantage if all the Water-Works Acts were consolidated, so that everyone concerned could know where they were.

The CHAIRMAN: There we are all with you.

Witness went on to urge a change in the law as to the charges leviable, whereby if a man's rating were raised, unless he increased his consumption of water, his water-rate should not be raised. The principle of charging on rateable value was bad; the charge should be by meter. To meet the case of poor houses, there should be some provision similar



to that prevailing now in some localities—viz., that houses of a certain rateable value should be supplied at not more than (say) 2d. a week. He did not think the charges were likely to be reduced by purchase; and if purchase were carried out, the liability to famine of the increasing outside areas would be materially increased. The owners of the water undertakings should be restricted to abstracting from present sources what they were now taking, or something less; and if more water was needed, the London County Council or some other wealthy body, should bring it from Wales, and the Companies be compelled to buy it in bulk. "The draught upon the Lea and underground supplies was greater than these sources could bear; and unless something was done, there was great danger of a water famine. Purchase might come afterwards. The wealthy body would sell water to the Companies at a profit; but whether the Companies would be able to make a profit, he did not know."

**Major-General Scott:** What is to prevent the Companies going to Wales also?

**Witness:** If the Companies were to join and go to Wales, that might be a solution of the difficulty. Further control with regard to underground water is needed.

**The Chairman:** What is the sort of control you desire?

**Witness:** First, we say no Company should sink any well for the purpose of their undertaking without the express authority of Parliament inserted in their Special Act.

That is to say that you think Companies who are carrying on the business of selling water ought not to have the ordinary rights of landowners?—Yes. The private owner of underground water has no right to sell it in large quantities. Still I would not prevent the brewer or maker of aerated waters from selling the water obtained from his own land as beer or aerated water. The General Act which I suggest should also require that the amount of water proposed to be abstracted from any well by a Company should be inserted in the Special Act authorizing the construction of the well; and this quantity should bear a direct relation to the discharge of the river basin. In other words, no one should be able to sink a well beside a river and abstract its flow. The Act should further provide that all companies proposing to construct and obtain their supplies of water from wells, should be under obligation to afford supplies of water to any persons or authorities in the neighbourhood of the proposed wells whose water supplies may be affected by their pumping. No water company should contract with any individual or company having a well for the supply to such water company of water from such well for any of the purposes of their undertaking.

**The Chairman:** What are the Companies to do. You say they are to obtain no more water from the Thames or the Lea or from the wells. Where are they to get it from?—Wales. In every instance where a river has been taken and a reservoir formed, compensation has been given; but with underground water, there is no compensation.

The truth is your quarrel is with the English law as to underground water?—It is to some extent. Where a well is constructed in the basin of a river or stream, a record should be kept of the effect on the flow of the stream. The result of pumping is first to stop the flow of a river, and perhaps ultimately to draw water which the stream brings from other sources.

We understand there are new wells being sunk by the East London Company?—I am afraid there are.

Is that under statutory authority?—I believe not.

Are there any wells constructed by the New River Company without parliamentary power to raise capital for the purpose?—All of them.

**Lord R. Cecil:** I understand the great mass of the wells have been sunk out of revenue.

**By Major-General Scott:** County Councils should have power to inspect sources of supply, and Local Authorities to inspect the domestic plant, mains, &c. He agreed it was a matter that would require much consideration, seeing the large number of Authorities in each Company's area. The Local Authorities should also have power to analyze the water, because what was good in one district might not be in another.

The Commission then adjourned for a week.

The thirtieth sitting of the Commission was held yesterday, at the Guildhall, Westminster—Lord Llandaff presiding. The first witness called was Mr. Henry Weeden, Vice-Chairman of the Ilford Urban District Council, who stated that the Ilford district was enormously increasing both as regarded rateable value and population. The water supply was derived from the East London and South Essex Companies; both Companies having concurrent powers over the whole area. They had, however, partitioned the district—he presumed by agreement. The result was not satisfactory, because the East London Company's supply was in every respect superior to that of the South Essex Company.

**Hexham Gas Company.**—The shareholders of this Company last Wednesday authorized the Directors to raise £6000 additional capital. The continuous increase in consumption has necessitated the construction of a new gasholder and the carrying out of other improvements.

**Isle of Wight Rural District Council and the Bembridge Gas and Water Undertakings.**—A draft agreement to purchase the gas and water undertakings at Bembridge was submitted for the consideration of the Isle of Wight Rural District Council last Thursday. The purchase money, it was stated, has been fixed at £3060. The Council decided to complete the purchase one month after the consent of the Local Government Board had been obtained.

**New Joint-Stock Companies.**—The Irish Calcium Carbide Company, Limited, has been formed with a capital of £60,000, in £1 shares, to acquire and take over the Campbell Mills and Water Powers at Collooney, County Sligo; to enter into and carry into effect an agreement between Anna Icardi Alexandrina Sim and Alexander Sim of the one part and James Fitzgerald, on behalf of the Company; and to carry on the business of manufacturers of, and dealers in, calcium carbide and other materials for the manufacture or supply of acetylene or other gases. The Kinsey Acetylene Gas Company, Limited, has been formed with a capital of £2000, in £1 shares, to acquire, develop, and deal with a patent connected with the manufacture and storage of acetylene gas, and to adopt an agreement with H. Kinsey.

## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The following official statement regarding the result of the year's working of the Glasgow Corporation Gas Department, was published on Thursday: "The accounts of the Glasgow Gas Department were submitted to the Finance Committee yesterday. They showed a surplus of £69,574; the income being £631,654, and the expenditure, including depreciation, £562,070. The balance goes to sinking fund, interest on loans, &c. In the previous year the income was £607,622, and the expenditure £539,325—a balance of £68,297." These figures do not, on the face of them, disclose the enormous growth of the business of the department. The increased rental derived from gas is £15,538; and as the price at which the gas was sold was 2s. 2d. per 1000 cubic feet, the increased output must have been about 140 million cubic feet. The year just closed has, however, been by no means in all respects the most notable. The gross revenue is the highest which has ever been received; the next highest having been in 1894-5, when, with gas selling at 2s. 6d. per 1000 cubic feet, £629,362 was received. But in the matter of increase of business, the past year does not compare well with the year preceding, when the increased output of gas was reported to have been 366 million cubic feet. It may be that the community of Glasgow, having gone in very largely in previous years for the use of gas for cooking and heating, there is not now so good a field for expansion as in other towns which took later to this outlet for gas. In this case, gas increases in Glasgow would have to depend almost entirely upon the extension of the city; and I do not know that this will be quite so rapid in the near future as it has been. In the first place, Dumbarton has been put into possession of a competitive railway; then the town of Renfrew has obtained from the House of Commons a Bill for the construction of a large dock, and may also persuade the House of Lords to pass the measure; and, lastly, I observed the other day that one of the leading Railway Companies was charged with boycotting the port of Glasgow, and promoting the port of Ardrossan. These are all forces which will have to be reckoned with in estimating the expansion of the city of Glasgow. Of course, the advancement of these places, or either of them, would not necessarily mean the decay of Glasgow, but merely a check to its development; and in this the gas consumption would be involved.

The Glasgow gas coal contract has led to an incident of an unpleasant nature. On Thursday last, the "Glasgow Herald" made the following announcement: "The Glasgow Gas Corporation have just purchased a portion of the supplies of fuel for which tenders were recently invited. At this time of the year, the Corporation generally buy between 500,000 and 600,000 tons of all classes for delivery during the ensuing twelve months; but on this occasion they have so far bought only a comparatively small proportion of their requirements. We understand they have taken about 150,000 tons of cannel coals—one lot of seconds at 9d. per ton advance on last year's price, and two lots of 20,000 tons at the price paid a year ago. Third-class cannels were tendered at 1s. per ton advance, and have been met with a counter offer from the Corporation at 9d. advance. With regard to splint coal, it is stated that the Corporation have so far not bought any of this description, but have purchased from 25,000 to 50,000 tons of main coal from the Cambuslang district at 8s. a ton delivered—2s. advance on last year—and have offered to buy the best splint at the same price. Coalmasters will not accept this figure, which is considerably under the prices current in the market for some weeks past." Yesterday the same newspaper published the following: "We have received the following letter from Mr. John Bowers, Deputy Town Clerk of Glasgow: The paragraph which appears in the commercial news of the 'Herald' of this morning, with reference to the purchase of coal by the Corporation for the gas-works, has been brought under the notice of the Chairman of the Gas Committee. No one had any authority on behalf of the Corporation to convey to the newspapers any information in regard to this matter; and I am directed to say that the statements contained in the paragraph are quite erroneous and misleading. Our information was obtained from quarters in which we had reason to put confidence." The Committee evidently desire that their action in the matter should not be disclosed in the meantime; and I am therefore precluded from giving the statement of the "Herald" as authoritative, or from commenting upon it.

The Glasgow Gas Committee have appointed a Sub-Committee to consider the propriety of the Corporation themselves undertaking the making of meters for use in the business of the department. This is an announcement which may be expected to produce some consternation among meter makers; but they will be powerless to resist the action of the Corporation, should it be resolved to go on with the proposal.

It is greatly to the credit of those who have been leading the agitation in the Peebles Town Council in the matter of acquiring the undertaking of the Peebles Gaslight Company, Limited, that they have allowed themselves to be persuaded by Mr. W. Young as to the terms on which the transfer may be made. They took up an attitude which was, to say the least of it, harsh towards the Gas Company, in their proposal to at once terminate the Company's existence by forcible means, and to pay the shareholders £157 10s. for each £100 of stock. Mr. Young's proposal was that the Corporation should take over the undertaking on the footing of paying 10 per cent. terminable annuities. There is every appearance that the Committee arrived at their decision without due consideration. But when confronted with facts, upon which nobody was better able to inform them than Mr. Young, they have come to see that they must either withdraw the proposal to acquire the Company, or offer better terms. I say again that it was to their credit that the Committee kept an open mind on the subject, and that they listened to the reasoning of Mr. Young. In his speech to the Town Council on Monday evening, Treasurer Williamson magnanimously admitted Mr. Young's large experience in gas matters, and went further in expressing the hope that he might continue to place his knowledge at the service of the Town Council in the event of a purchase being carried through. The recommendation of the Finance Committee was that they should acquire the Company on the basis of paying 10 per cent. annuities to the shareholders for 35 years, and that then they should redeem the annuities at the price of £157 10s. for each £100 of stock. Inquiries, the Committee reported, had shown that while in most of the recent cases



in which local gas companies had been acquired by corporations, a very high price had been paid (one much in excess of the market value of the shares), yet in every instance had the purchase proved advantageous to the community. This is a further admission—and a spontaneous one—as to the value of experience in such matters, because it was the very foundation of Mr. Young's position that, if the transfer went to arbitration, the shareholders would get more than the Corporation offered. Well, the result was that, Treasurer Williamson having spoken in favour of the recommendation of the Committee, and others having supported it, the Town Council adopted it unanimously. The threatened conflict has thus, it may already be said, been avoided; for the Directors of the Gas Company have considered the proposal, and resolved to recommend the shareholders to approve of it. It is a pleasure to witness the spectacle of people living together prepared to give and take in a matter of this nature, instead of persisting in menace or proceeding to hostilities, as was threatened but a few weeks ago. Both parties will benefit by the compromise. I use the expression "compromise" advisedly; for the Company, if they accept the offer—as there is every reason to believe they will—will agree to take less than they would have obtained had the terms been fixed by arbitration. I see—and it is the only point on which I differ from them—that the Corporation Committee say they regard the purchase price as a full one, and that arbitration might have resulted in the shareholders getting a smaller value for their shares. Now there is a parallel upon this point, which is conclusive of the matter, and is against the view of the Committee. In the case of the Edinburgh transfer, the annuities were fixed at a continuation of a 10 per cent. dividend; and they were made redeemable, after 20 years from the date of transfer, upon the basis of 28½ years' purchase. That is to say, that for every £10 annuity in Edinburgh, the Gas Commission will have to pay £285; whereas, in Peebles, a £10 annuity will be redeemable for £157 10s., or 15½ years' purchase. And in the case of Edinburgh, the Company had a reserve fund of £50,000, which they took with them; while in Peebles the reserve fund of £3000 goes to the Corporation. But for all this, when it is considered that by the acceptance of the offer the costs of litigation and arbitration are avoided, the terms are quite fair; and both parties will be well advised if they accept them. The Town Council have meanwhile resolved that, in the event of the Company accepting the offer, the transfer will be held to have taken place as at May 26 last; the Company to continue to manage the business until the Corporation have adopted the Burghs Gas Supply Act. In the event of the offer not being accepted, or the community not adopting the Act, the rights of both parties are reserved. I may add that this happy state of matters has been arrived at after negotiation with Mr. Young, with whom the Provost and Treasurer put themselves into informal communication, with a view to arriving at an understanding. The credit is thus not confined to one side, but is shared by both parties.

The final meeting of the shareholders of the old unincorporated Stirling Gaslight Company was held on Tuesday. The Chairman (Mr. J. Johnston) read a long statement as to the course of the late parliamentary fight and its origin. He claimed that the Company had reason

to be satisfied, and wound up by announcing that, owing to the expense of the parliamentary struggle, the price of gas could not be reduced for some time. Mr. Chrystal, one of the Company's Solicitors, afterwards made a lengthy statement. He denied absolutely that the Company had tried to sell their works to the Corporation. The Corporation came, he said, to the Company, who had always been equally willing to sell or not to sell. He threw upon the Corporation the onus of the parliamentary fight. Both Messrs. Chrystal and Morris and the Chairman were thanked for the care they had bestowed upon the Bill. The annual meeting of the Company was held on the same day, when the accounts (now prepared in accordance with the provisions of the Gas-Works Clauses Acts) were submitted and approved of. It was explained that the reserve fund, amounting to £1500, and the balance at the credit of the revenue account, were to be carried to the credit of the account for renewals now being executed. This means that of the £5000 which, by their new Act, the Company are to pay out of revenue, in improving their works, they have already upwards of £2500 in hand. The Company have thus come out of their conflict with the Corporation in a quite satisfactory way.

The Falkirk Corporation Gas Department have closed their financial year with a deficit of £220. This result, the Convener of the Works Committee (Mr. Cook Rennie) explained at a meeting on Tuesday, had arisen, not on account of any miscalculation or mismanagement; for the estimates made up last year had been so carefully prepared that they would have had a considerable balance had everything gone right. But after the estimates were made up, the Burgh Assessor so raised the valuation of the works, that additional taxation was thrown upon them. They had also had a claim of £253 as royalty upon oil used. This matter of the royalty was sent to a Committee to consider whether it should be redeemed, and whether they could not place it to capital. As to coal, the Convener said they expected that it would cost from 1s. to, perhaps, 1s. 9d. per ton more than last year. They anticipated, however, that, with this against them, they would be able to pull through, and that it would not be necessary to raise the price of gas. The report was adopted.

The Denny Gas Commissioners last year sold 10,191,800 cubic feet of gas—a decrease of 1½ million cubic feet. The revenue from gas amounted to £1915; the total revenue being £2181. The balance of profit for the year was £255. At a meeting of the Commissioners this week, at which the annual accounts were presented, satisfaction was expressed at the manner in which the works are managed by Mr. J. McDonald. Last year the price of gas was reduced by 5d. per 1000 cubic feet.

The annual meeting of the Irvine Gas Company was held on Tuesday. A dividend at the rate of 10 per cent. was declared; £450 was carried to the reserve fund; and the price of gas was continued at 3s. 9d. per 1000 cubic feet. In reply to a communication by the Corporation regarding the proposed acquisition by them of the Company's undertaking, it was unanimously resolved to authorize the Directors to negotiate with the Corporation for the transfer, on the understanding that the price should be fixed by arbiters to be mutually chosen, subject to approval by the shareholders at a special meeting.

## GAS AND WATER COMPANIES STOCK AND SHARE LIST.

Referred to on p. 144.

| Issue.         | Share. | When<br>ex-<br>Dividend. | Dividend<br>or Dividend<br>& Bonus. | NAME.                       | Closing<br>Prices. | Rise<br>or<br>Fall<br>in<br>Wk. | Yield<br>upon<br>Invest-<br>ment. | Issue.           | Share. | When<br>ex-<br>Dividend. | Dividend<br>or Dividend<br>& Bonus. | NAME.                                   | Closing<br>Prices. | Rise<br>or<br>Fall<br>in<br>Wk. | Yield<br>upon<br>Invest-<br>ment. |
|----------------|--------|--------------------------|-------------------------------------|-----------------------------|--------------------|---------------------------------|-----------------------------------|------------------|--------|--------------------------|-------------------------------------|-----------------------------------------|--------------------|---------------------------------|-----------------------------------|
| £              |        |                          | p. c.                               |                             |                    |                                 | £ s. d.                           | £                |        |                          | p. c.                               |                                         |                    |                                 | £ s. d.                           |
| GAS COMPANIES. |        |                          |                                     |                             |                    |                                 |                                   |                  |        |                          |                                     |                                         |                    |                                 |                                   |
| 590,000        | 10     | Apr. 15                  | 104                                 | Alliance & Dublin 10 p. c.  | 23½-24½            | ..                              | 4 5 9                             | 75,000           | 5      | June 29                  | 6                                   | Malta & Medn., Ltd.                     | 43-5½              | ..                              | 5 14 3                            |
| 100,000        | 10     | "                        | 7½                                  | Do. 7 p. c.                 | 16-17              | ..                              | 4 8 3                             | 541,920          | 20     | June 10                  | 5                                   | Monte Video, Ltd.                       | 14-15              | ..                              | 6 13 1                            |
| 800,000        | 100    | July 1                   | 5                                   | Australian 5 p. c. Db.      | 105-107            | ..                              | 4 13 6                            | 617,946          | Stk.   | Feb. 24                  | 93                                  | Newcastle & Gateshead Con.              | 235-240            | ..                              | 4 1 3                             |
| 200,000        | 5      | May 26                   | 6                                   | Bombay, Ltd.                | 6-6½               | ..                              | 4 12 4                            | 252,355          | Stk.   | Jan. 3                   | 3½                                  | Do. 3½ p. c. Db. Stk.                   | 115-120            | ..                              | 2 18 4                            |
| 40,000         | 5      | "                        | 6                                   | Do. New, £4 paid.           | 4½-5               | ..                              | 4 16 0                            | 150,000          | 5      | May 26                   | 8                                   | Oriental, Ltd.                          | 7½-75              | ..                              | 5 9 3                             |
| 880,000        | Stk.   | Feb. 24                  | 12                                  | Brentford Consolidated      | 280-285            | ..                              | 4 4 3                             | 135,000          | 5      | "                        | 8                                   | Do. New, £410s. pd.                     | 6-6½               | ..                              | 5 10 9                            |
| 240,000        | "      | "                        | 9                                   | Do. New                     | 210-220            | ..                              | 4 1 10                            | 15,000           | 5      | "                        | 8                                   | Do. do. 1879, £1 pd.                    | 1½-1½              | ..                              | 4 11 5                            |
| 50,000         | "      | "                        | 5                                   | Do. 5 p. c. Prf.            | 140-145            | ..                              | 3 9 0                             | 60,000           | 5      | Mar. 11                  | 7                                   | Ottoman, Ltd.                           | 6-6½               | ..                              | 6 6 2                             |
| 159,375        | "      | June 10                  | "                                   | Do. 4 p. c. Db. Stk.        | 190-195            | ..                              | 2 19 3                            | 500,000          | 100    | June 1                   | 6                                   | People's Gas & 2nd M.<br>of Chicago Bd. | 103-108            | ..                              | 5 11 1                            |
| 220,000        | Stk.   | Mar. 30                  | 11½                                 | Brighton & Hove Orig.       | 268-273            | ..                              | 4 4 3                             | 848,070          | 10     | May 26                   | 6                                   | River Plate Ord.                        | 9-9½               | ..                              | 6 6 4                             |
| 218,820        | "      | "                        | 8½                                  | Do. A. Ord. Stk.            | 195-200            | ..                              | 4 5 0                             | 250,000          | Stk.   | June 29                  | 4                                   | Do. 4 p. c. Db. Stk.                    | 96-98              | ..                              | 4 1 8                             |
| 938,500        | Stk.   | Feb. 24                  | 5                                   | Bristol, 5 p. c. max.       | 127-132            | ..                              | 3 15 9                            | 250,000          | 10     | Apr. 29                  | 10                                  | San Paulo, Ltd.                         | 15½-16½            | ..                              | 6 1 3                             |
| 420,000        | 20     | Ma. 30                   | 11½                                 | British                     | 53-55              | ..                              | 4 1 9                             | 135,000          | Stk.   | Mar. 30                  | 10                                  | Sheffield A.                            | 245-248            | ..                              | 4 0 8                             |
| 50,000         | 10     | Mar. 11                  | 11½                                 | Bromley, Ord. 10 p. c.      | 25-27              | ..                              | 4 5 2                             | 209,053          | "      | "                        | 10                                  | Do. B.                                  | 245-248            | ..                              | 4 0 8                             |
| 75,000         | 10     | "                        | 8½                                  | Do. 7 p. c.                 | 20-22              | ..                              | 3 17 3                            | 447,427          | "      | "                        | 10                                  | Do. C.                                  | 245-248            | ..                              | 4 0 8                             |
| 500,000        | 10     | Apr. 29                  | 6                                   | Buenos Ayres (New) Ltd      | 9-9½               | ..                              | 6 6 4                             | 5,531,250        | Stk.   | Feb. 24                  | 5½                                  | South Metrop. 4 p. c. Ord.              | 142-145            | +1                              | 3 12 5                            |
| 98,122         | Stk.   | June 29                  | 4                                   | Do. 4 p. c. Db. Stk.        | 98-100             | ..                              | 4 0 0                             | 1,460,000        | Stk.   | July 14                  | 3                                   | Do. 3 p. c. Db. Stk.                    | 100-103            | ..                              | 2 18 3                            |
| 150,000        | 20     | July 14                  | 8½                                  | Cagliari, Ltd.              | 30-31              | ..                              | 5 6 5                             | 60,000           | Stk.   | Mar. 11                  | 12                                  | Tottenham & A.                          | 285-295            | ..                              | 4 1 4                             |
| 100,000        | 10     | June 10                  | 7                                   | Cape Town & Dis., Ltd.      | 15-16              | ..                              | 4 7 6                             | 60,000           | "      | "                        | 9                                   | Edmonton J. B.                          | 205-215            | ..                              | 4 3 9                             |
| 50,000         | 50     | May 3                    | 6                                   | Do. 6 p. c. 1st Mort.       | 58-60              | ..                              | 5 0 0                             | 182,880          | 10     | June 10                  | 7                                   | Tuscan, Ltd.                            | 13-14              | ..                              | 5 0 0                             |
| 550,000        | Stk.   | Apr. 15                  | 13½                                 | Commercial Old Stock.       | 315-325            | ..                              | 4 3 1                             | 149,900          | 10     | July 1                   | 5                                   | Do. 5 p. c. Dbs. Red.                   | 100-103            | ..                              | 4 17 1                            |
| 200,750        | "      | "                        | 10½                                 | Do. New do.                 | 252-257            | ..                              | 4 1 8                             | WATER COMPANIES. |        |                          |                                     |                                         |                    |                                 |                                   |
| 200,750        | "      | June 10                  | 4½                                  | Do. 4½ p. c. Db. dc.        | 148-153            | ..                              | 2 18 10                           | 746,164          | Stk.   | June 29                  | 10½                                 | Chelsea, Ord.                           | 313-318            | ..                              | 3 6 0                             |
| 800,000        | Stk.   | June 10                  | 12                                  | Continental Union, Ltd.     | 207-212            | +2                              | 5 13 2                            | 150,000          | "      | "                        | 5                                   | Do. 5 p. c. Prf.                        | 170-175            | ..                              | 2 17 2                            |
| 200,000        | "      | "                        | 9                                   | Do. 7 p. c. Prf.            | 192-197            | ..                              | 4 11 5                            | 160,000          | "      | "                        | 4½                                  | Do. 4½ p. c. Prf. Stk., 1875            | 148-152            | ..                              | 2 19 3                            |
| 51,600         | Stk.   | Feb. 24                  | 14                                  | Croydon A. 10 p. c.         | 310-315            | ..                              | 4 8 11                            | 175,785          | "      | Mar. 30                  | 4½                                  | Do. 4½ p. c. Db. Stk.                   | 157-162            | ..                              | 2 15 7                            |
| 168,400        | "      | "                        | 11                                  | Do. B. 7 p. c.              | 255-265            | ..                              | 4 3 0                             | 1,720,560        | Stk.   | Apr. 15                  | 8                                   | East London, Ord.                       | 225-230            | ..                              | 3 9 7                             |
| 635,000        | Stk.   | Feb. 24                  | 5½                                  | Crystal Palace Ord. 5 p. c. | 125-130            | ..                              | 4 0 9                             | 654,740          | "      | June 29                  | 4½                                  | Do. 4½ p. c. Db. Stk.                   | 157-160            | ..                              | 2 16 3                            |
| 60,000         | "      | "                        | 5                                   | Do. 5 p. c. Prf.            | 142-145            | ..                              | 3 9 0                             | 390,000          | "      | "                        | 3                                   | Do. 4½ p. c. Db. Stk.                   | 103-105            | ..                              | 2 17 2                            |
| 486,090        | 10     | Jan. 27                  | 11                                  | European, Ltd.              | 23½-24½            | ..                              | 4 9 9                             | 700,000          | 50     | June 29                  | 7½                                  | G'd Junction, 10 p. c. max.             | 115-118            | ..                              | 3 3 7                             |
| 354,060        | 10     | "                        | 11                                  | Do. £7 10s. paid.           | 17-18              | ..                              | 4 11 9                            | 310,000          | Stk.   | Mar. 30                  | 4                                   | Do. 4 p. c. Db. Stk.                    | 140-145            | ..                              | 2 15 2                            |
| 5,922,110      | Stk.   | Feb. 10                  | 12½                                 | Gaslight & Coke, A. Ord.    | 297-302            | +2½                             | 4 1 1                             | 708,000          | Stk.   | Feb. 10                  | 13                                  | Kent                                    | 860-865            | ..                              | 3 11 2                            |
| 100,000        | "      | "                        | 4                                   | Do. B. 4 p. c. max.         | 120-125            | +2                              | 3 4 0                             | 1,043,800        | 100    | June 29                  | 10                                  | Do. New, 7 p. c. max.                   | 213-218            | ..                              | 3 4 8                             |
| 665,000        | "      | "                        | 10                                  | Do. C, D, E, 10 p. c. Prf.  | 503-513            | ..                              | 3 3 11                            | 406,200          | 100    | "                        | 7½                                  | Lambeth, 10 p. c. max.                  | 298-308            | ..                              | 3 6 0                             |
| 30,000         | "      | "                        | 5                                   | Do. F, 5 p. c. Prf.         | 154-158            | ..                              | 3 3 3                             | 350,000          | Stk.   | Mar. 30                  | 4                                   | Do. 7½ p. c. max.                       | 225-230            | ..                              | 3 5 3                             |
| 60,000         | "      | "                        | 7½                                  | Do. G, 7½ p. c. do.         | 230-240            | ..                              | 3 2 6                             | 500,000          | 100    | Feb. 10                  | 13                                  | Do. 4 p. c. Db. Stk.                    | 140-145            | ..                              | 2 15 2                            |
| 1,300,000      | "      | "                        | 7                                   | Do. H, 7 p. c. max.         | 195-200            | ..                              | 3 10 0                            | 1,000,000        | Stk.   | Jan. 27                  | 4                                   | New River, New Shares                   | 432-437            | ..                              | 2 19 6                            |
| 463,000        | "      | "                        | 10                                  | Do. J, 10 p. c. Prf.        | 308-313            | ..                              | 3 3 11                            | 992,300          | Stk.   | June 29                  | 6                                   | Do. 4 p. c. Db. Stk.                    | 141-146            | ..                              | 2 14 10                           |
| 476,000        | "      | "                        | 6                                   | Do. K, 6 p. c. Prf.         | 184-188            | ..                              | 3 3 10                            | 126,500          | 100    | "                        | 6                                   | Southw'k & V. Hall, Ord.                | 163-168            | ..                              | 3 11 5                            |
| 1,064,150      | "      | June 10                  | 4                                   | Do. L, 10 p. c. Db. Stk.    | 131-133            | ..                              | 3 0 2                             | 489,200          | Stk.   | "                        | 5                                   | Do. do. 7½ p. c. max.                   | 155-160            | ..                              | 3 15 0                            |
| 294,850        | "      | "                        | 4½                                  | Do. 4½ p. c. do.            | 143-153            | ..                              | 2 18 10                           | 1,019,525        | "      | Apr. 15                  | 4                                   | Do. do. 5 p. c. Prf.                    | 148-172            | ..                              | 2 18 2                            |
| 958,000        | "      | "                        | 6                                   | Do. 6 p. c. do.             | 138-203            | ..                              | 2 19 1                            | 1,155,066        | Stk.   | June 10                  | 10                                  | Do. 4 p. c. A. Db. Stk.                 | 141-144            | ..                              | 2 15 7                            |
| 70,000         | 10     | May 12                   | 8                                   | Hongkong & China, Ltd.      | 13-14              | ..                              | 5 14 4                            | 200,000          | "      | "                        | 4½                                  | West Middlesex                          | 297-302            | ..                              | 3 6 3                             |
| 8,300,000      | Stk.   | Feb. 1                   | 10                                  | Imperial Continental        | 210-215            | ..                              | 4 13 0                            | "                | "      | "                        | 4                                   | Do. 4½ p. c. Db. Stk.                   | 162-165            | ..                              | 2 14 7                            |
| 376,400        | 100    | Feb. 1                   | 4                                   | Do. 4 p. c. Dbs. Red.       | 98-101             | ..                              | 3 19 3                            | 200,000          | "      | Mar. 11                  | 8                                   | Do. 3 p. c. Db. Stk.                    | 104-106            | ..                              | 2 16 7                            |
| 473,600        | Stk.   | Feb. 10                  | 3½                                  | Do. 3½ p. c. Db. Stk.       | 103-106            | ..                              | 3 6 0                             | * Ex div.        |        |                          |                                     |                                         |                    |                                 |                                   |
| 550,000        | 100    | Apr. 1                   | 5                                   | Met. of Mel- 5 p. c. Db.    | 110-112            | ..                              | 4 9 3                             |                  |        |                          |                                     |                                         |                    |                                 |                                   |
| 250,000        | 100    | "                        | 4½                                  | bourne 4½ p. c. Db.         | 107-109            | ..                              | 4 2 7                             |                  |        |                          |                                     |                                         |                    |                                 |                                   |

† Next dividend will be at this rate.



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WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

## EDITORIAL NOTES.

## Lamp Accidents and the Flash-Point.

AN instructive commentary on the findings of the Petroleum Committee is supplied by the newspaper reports of a lamp accident that happened last week in Birmingham. The victim this time was a poor old woman, who before going to bed turned down the light of her lamp and blew down the chimney to extinguish it. The result was that the flame struck back into the glass reservoir, which exploded, and the woman was terribly burnt. It was ascertained on subsequent examination that the oil had a flash-point of 84° Fahr.; and that the wick was not large enough for its tube; thus leaving a touch-hole through which the flame was blown down into the reservoir. Verdict—"Accidental death." The official evidence tendered at the inquest, having established these facts, went on to commit itself to the opinion that the flash-point of oil should be raised to 100°; and that there would have been no explosion if the reservoir had been of metal instead of glass. Neither of these expressions of opinion is worth anything. We do not know what the temperature of the reservoir, or of the oil in it, was at the critical moment; and it seems idle to talk of these things in face of what is known concerning the wick. The newspaper statement goes on to explain that non-fitting wicks, in the opinion of the Birmingham lamp makers, are responsible for more lamp accidents than the flash-point of the oil or anything else. In this the trade opinion is more likely to be correct than the official judgment. One of the expert witnesses at the Petroleum Inquiry, after giving statistics of lamp explosions, was fain to confess that, though he had often tried, he had never succeeded in causing a lamp reservoir to explode. Here are the conditions defined—supposing the Birmingham accident to have been a true explosion: Given a lamp that has been burning all the evening, in which, therefore, the reservoir is nearly empty, and hot. The temperature of the air is also that of summer. The wick does not fit the tube, so that air and petroleum vapour already fill the space in the reservoir above the oil. Lastly, blow sharply down the chimney, while the light is turned low. If the curious expert who repeats the experiment begins with oil at 150° flash-point, and, in the event of failure to produce an explosion, goes on with successive reductions of this point until he arrives at success, we shall learn more about the connection between flash-points and lamp explosions than is known at present.

It is curious that Lord Kelvin, who has written to "The Times" upon the report of the Petroleum Committee, takes the Scottish view of the saving quality of a flash-point of 100°. Dismissing the risk of explosion of lamps as insignificant, except in the case of lamps with glass reservoirs, and dwelling upon the commoner case of lamp oil escaping from a broken or overturned lamp and igniting, Lord Kelvin remarks that, "with the 73° Abel close test or 100° open test, oil escaping from the lamp at perhaps 100° in the lamp, or a little more or a little less, falling on a wooden floor near a fire will have many more chances of taking fire and causing the death of a poor woman or child if the flash-point is 100° open test than if it is 20° or 30° higher." Another correspondent declares that the increased safety, under such conditions, of oil at 100° flash-point, as compared with 73° oil, is of no practical importance. Whatever the flash-point of the oil, it is giving off vapour fraught with possibilities of danger after having been in a lighted lamp for an hour. The main point is to ensure that under no conditions shall the oil escape from the lamp. "If lamps are so constructed that oil cannot flow from the reservoir, it does not matter what oil is inside it. There can be no fire due to the oil. If the lamps are not so constructed, then every outflow of oil may produce a fire, though in some circumstances one oil may be a little more likely to produce it than another." It is remarkable how few of the participants in this controversy are able to divide their favours between the lamp and the oil. Most of them try to fix upon one or the other partners of the firm all the responsibility for causing accidents.

## The London County Council and the Petroleum Committee.

The London County Council have not lost any time in framing and uttering an official opinion on the finding of the Petroleum Committee. The agenda for to-day's meeting of the Council contains a report of the Public Control



Committee in which reference is made to the circumstance that the Council recommended that the flash-point fixed by the Petroleum Acts should be raised to 105° Fahr. (Abel test), and that the sale and use for illuminating purposes of oil of any lower flash-point should be prohibited. It is recorded that the Petroleum Committee propose to raise the flash-point to 100° (Abel test); and the Council are assured that this proceeding would not increase the price of illuminating oil to the consumer. It is further declared that the proposed alteration would "be the means of preventing nearly the whole of the accidents and deaths from the use of petroleum lamps which are now constantly taking place." The Committee of the Council register their agreement with many of the other recommendations of the Select Committee, and trust that they will in due course become law. But they are above all so deeply impressed with the urgent necessity of raising the flash-point at once, that they advise the Council to address a letter to the Home Secretary, "urging that the Government should introduce and endeavour to pass during the present session a short Bill for raising the flash-point named in the Petroleum Act of 1879 from 73° to 100° Fahr. (Abel close test)." It is a bad thing for the petroleum trade as at present carried on that, in London at any rate, it is not in the hands of costermongers. If this were the case, there is a precedent to clearly indicate that the great and good London County Council would be chary of meddling with it, in the mere interest of public advantage, and risk losing the costermonger vote in a few "Progressive" quarters.

#### The Lighting of Waterloo Bridge.

THE attention of those who are interested in watching the experiments of Municipalism, and also of those who take an interest in practical street lighting, should be directed to the spectacle presented by Wellington Street, Strand, and Waterloo Bridge at the present time. Wellington Street, as strangers to London may like to be informed, is the name of the short thoroughfare which connects Waterloo Bridge with the Strand, having for the greater part of its length on one side the western end of Somerset House, and on the other a quiet row of old office buildings called Lancaster Place. We mention this circumstance for the purpose of showing that the public lighting of the thoroughfare does not receive any assistance from shops. Being also one of the main arteries of Metropolitan traffic, and the bridge being admittedly one of the noblest of London monuments, this line of thoroughfare is a favourite scene for experimental street lighting. At the present time it is an exhibition of good, bad, and indifferent lighting by various methods, and of correspondingly various taste in the lighting arrangements and fixtures. Beginning at the Strand crossing, there will be found at this throbbing junction of street traffic from four directions several lofty "refuge" lamp-posts, bearing bold octagonal lanterns containing clustered flat-flame gas-burners. These are unexceptionable—or they would be if the Strand Board of Works, who are the local Highway Authority, would only keep up the columns a little more natively. As an example of street lighting of the first order, however, these lights leave nothing to be desired. They give a flood of light upon the roadway where it is most needed, without attracting the eye to themselves; and if they should happen to catch the eye of a pedestrian or a coachman, they do not dazzle. Farther on, going towards the bridge, the ordinary street-lamps placed on the line of the kerb were till last week occupied by Denayrouze high-power incandescent burners, the brilliancy of which was as noticeable as the crudity or hardness of the effect produced by the unshaded mantles.\* Alongside these, the retired pavement of Lancaster Place is provided with a few ordinary square street-lamps, with 5 cubic feet flat-flame burners. Across the way, the carriage entrances to the Somerset House front are flanked by globular lanterns which do not appear to have been cleaned since they were put up. Then we come to the bridge itself—that grand monument of which even the London County Council are supposed to be very proud. The lighting of the bridge is in the hands of the Council. The old lamp-standards, which date from the building of the bridge itself, are of a simple, dignified, and peculiar design. They start from a plain, oblong base, with four square bars tapering to a smaller cap; the bars being joined top and bottom by diagonals meeting in a rose at the crossing. Hitherto these standards have carried

square lanterns, with a pair of flat-flame gas-burners in each, and finished off with a Royal Crown finial of the pattern familiar to the present generation on florins, and on the publications of the Science and Art Department. Now, every alternate standard has been removed, and replaced with a skimpy cast-iron post for an electric arc lantern of the elongated hexagonal pattern introduced by the City of London Electric Light Company—the Royal Crown being rejected for a round knob—with the crinkled glass which soon gets so dirty and cannot be effectively cleaned. In other words, the electric lamps are "staggered" along the bridge with the gas-lamps, but at a different height. What a display of Progressive taste! Of course, the old parapet has had to be hacked about to accommodate the new lamp-posts; but it could stand more than that. Possibly the beauty of the site and its matchless surroundings will triumph over the vandalism of the London County Council; but the case is a melancholy one all the same.

#### The Gas Supply of Vienna.

AT the last general meeting of the Imperial Continental Gas Association, the Chairman, Mr. T. H. Goodwin Newton, briefly mentioned the litigation which was then pending between the Association and the Municipality of Vienna on the question of the duration of the concessions for the lighting of the out-townships. As will be seen by a report which appears in another column, the Association have now obtained judgment in their favour for the second time in the High-Court of Justice; the confidence expressed in this regard by the Chairman being thus justified by the event. There now only remains the Court of Appeal. The rest of the statement to which we give currency goes to describe the wretched condition brought about in the Austrian capital by the arbitrary conduct of Dr. Lueger. Never was there a more pitiful example of the operation proverbially known as "cutting off one's nose to spite one's face." The Vienna Municipality will have to pay 36 million florins for their new gas-works outside the city, whereas the existing works could have been had for 16½ million florins. Moreover, when finished these new works can only be used to supply the "inner circle" of the city; and in order to get at this region the trunk mains must cross a suburban belt in which the Association have the exclusive right of putting down pipes. The central streets have been torn up in all directions for laying the municipal mains, and not made good again because the distributing plant of the Association is to come up next year, when the Association must restore the pavement. In these depressing circumstances, it is not to be wondered at that the easy-going, pleasure-loving Viennese find life in the city hardly worth living, while the local taxation must be heavier than ever. It is evident the advantages of Municipalism are subject to local realization. A strong national Government might have checked Dr. Lueger's vagaries before they went the length of spoiling the streets of the capital and jeopardizing its finances; but the Austrian Imperial Administration has enough to do just now without troubling much about Dr. Lueger's gas-pipes, even if it does not find in this crying Viennese nuisance a counter-irritant of political value.

#### A Point of Parliamentary Procedure.

AN important point of parliamentary procedure falls to be noticed this week. On the order for the second reading of the General Power Distributing Company Bill, which came up in the House of Commons last Friday, the Chairman of Ways and Means (Mr. James W. Lowther) submitted a resolution empowering the promoters to "hang up" the measure until next session—the progress already made being allowed to count when the consideration of the Bill is resumed in 1899. A similar course was adopted in July, 1871, in regard to certain London Tramway Bills. In the present case, it was explained to the House that the Bill deals with a very large area and with new principles. Its progress has been delayed by the action of Parliament itself, not through any fault of the promoters. It has, in fact, been kept back for the presentation of the report of the Joint Committee of the Lords and Commons upon Electrical Energy Generating Stations; and it could not be properly dealt with this session. There is considerable opposition to the Bill on the part of Local Authorities; but, to their credit, the opponents have not objected to the fair and reasonable course proposed by the Chairman of Committees, which will ensure the Bill being considered on its merits. Care was taken to make it clear that this

\* These are now replaced by triple flat-flame burners.



COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Business continues to move on in a very steady, satisfactory fashion, with a strong tone maintained as regards prices for current sales. On contracts there is a general advance over last year's low figures, of about 3d. to 5d. per ton on engine fuel, and 6d. to 9d. per ton on round coal. In some cases colliery proprietors, in arranging their contracts for the ensuing twelve months, are putting on a special advance of 2d. per ton to cover the extra cost of the Workmen's Compensation Act, and are either introducing a sliding clause regulating the price according to wages—representing an advance of about 3d. per ton on slack, up to 5d. on round coal, for every 5 per cent. advance in wages—or making a direct advance sufficient to cover what they consider the prospective upward move in wages. Generally forward contracts are being settled on pretty much the above basis, both in house-fuel qualities, steam and forge coal, and engine fuel. With regard to gas coals, the position remains much as last reported. The contracts that are now being closed are generally at advances ranging from 3d. per ton where some advance was obtained last year, up to 6d. where minimum prices were taken on last season's contracts. The better qualities of round coal are just now only in limited request, and are accumulating in stock, with pits running four to five days per week. It is, however, only in very exceptional cases where there is any giving way upon what have been current quotations for some time past. Common round coals meet with a ready sale for steam and forge purposes, with no excess of supplies offering in the market. Prices are very firm; good ordinary qualities not being obtainable under about 7s. per ton at the pit month. At many Lancashire collieries the present output of slack is scarcely sufficient to meet the requirements of customers; but there are fairly ample supplies coming in from other districts, so that there is no actual scarcity in the market. Here and there some hardening up on current quotations at the Lancashire collieries is spoken of; but generally prices are not more than steady at the full rates that have been ruling recently—averaging 3s. 3d. to 3s. 6d. per ton at the pit for common, 3s. 9d. to 4s. 3d. for medium, and 4s. 6d. to 5s. for best sorts. A brisk demand still comes forward in the shipping trade; and 8s. 6d. to 8s. 9d. per ton is readily obtained for good ordinary qualities of steam coal delivered at ports on the Mersey, with quotations still as high as 9s. to 9s. 3d. per ton in special cases.

Northern Coal Trade.—There has been increased activity in the coal trade of the North; and fuel supplies have grown rather scarce. This is partly due to the prolongation of the strike in Wales, and partly to the fact that this is the season of the heaviest shipments of coal from the ports of the Tyne and the Wear, and from West Hartlepool. Prices of best Northumbrian steam coals are firmer, at 13s. 6d. per ton f.o.b.; second-class steam coals are about 12s. 6d.; and steam smalls, 5s. 9d. For this time of the year, the demand for gas coals is abnormally heavy; and as the output is rather reduced by the local and colliery holidays, the prices are rather higher. Best Durham gas coals may be quoted at about 9s.

per ton f.o.b. for occasional cargoes; and as it would seem that the range of prices is likely to be permanently higher, those companies who have made their contracts early this year have evidently done well. One or two large local contracts for gas coals are now in course of negotiation. There is no alteration in the price of manufacturing coals, but the demand seems a little stronger. Gas coke is rather steady; but still some of the inland gas companies have good stocks. At the shipping ports, the stocks of gas coke are small.

Scottish Coal Trade.—The West of Scotland was on holiday last week, and trade was so paralyzed that it is impossible to give a description of it, either as to volume or prices, which would be at all reliable. The shipments during the week amounted to 247,190 tons—a decrease (which was altogether due to the state of trade in the West) of 6529 tons, when compared with the preceding week, but an increase of 63,462 tons upon the corresponding week of last year. For the year to date, the total shipments have been 4,798,661 tons—an increase on the corresponding period of last year of 870,881 tons.

The Swansea Corporation and the Gas Company.—At a meeting of the General Purposes Committee of the Swansea Corporation last Wednesday, a Sub-Committee's report was introduced recommending that the appeal by the Corporation against the injunction obtained by the Gas Company, under circumstances already reported, should be prosecuted. The Mayor said the expense of testing the point, which was most important for municipal corporations, would not be more than £200. Several members argued that the Municipal Corporations Association was the proper body to prosecute such an appeal. It was, however, decided to give the Sub-Committee power to go on.

Holyhead and North Wales Gas and Water Company.—The second ordinary general meeting of this Company was held at the Queen Hotel, Chester, on the 9th inst.—Mr. W. Jackson presiding. The report presented stated that the profit on the trading account for the year amounted to £4085—being an increase of £963 on the previous year; and the net balance was £1885. The Directors had secured, near Llandudno Junction, a site for treating their tar and ammoniacal liquor; and the necessary works were in course of construction. On the advice of their Engineer (Mr. Saville), they had adopted a system of profit-sharing with the Managers of the several works. An interim dividend at the rate of 6 per cent. per annum for the six months ending Sept. 30, 1897, had already been paid. The increase on the revenue account had been caused principally by the decrease of the leakage in the various districts and by the increased sale of gas, which, on the whole, was about 18.7 per cent. One satisfactory feature in the accounts was that though the quantity of gas made was so much in excess of previous years, the cost of coal was only £180 more than in the preceding year. It was reported at the meeting that the price of gas in five of the places served by the Company had been reduced considerably; showing that the concern was in a most healthy state. An interim dividend at the rate of 6 per cent. per annum for the six months ending the 31st of March was declared.

CARBURETTED WATER-GAS APPARATUS

Merrifield-Westcott-Pearson Patents.

The Economical Gas Apparatus Construction Co., Ltd.

W. H. PEARSON, Chairman. W. H. PEARSON, Junr., Deputy-Chairman. J. T. WESTCOTT, M.E., Manager. L. L. MERRIFIELD, M.Inst.M.E., Engineer. American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETTED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

|                               |           |            |                                  |                     |
|-------------------------------|-----------|------------|----------------------------------|---------------------|
| BLACKBURN.                    | 1,250,000 | Remodelled | TORONTO (Second Contract;        | 2,000,000           |
| WINDSOR STREET WORKS, BIR-    | 2,000,000 | Remodelled | MONTREAL                         | 500,000             |
| MINGHAM.                      | 2,000,000 |            | BELLEVILLE                       | 250,000             |
| SALTLEY WORKS, BIRMINGHAM     | 2,000,000 |            | OTTAWA (Second Contract)         | 250,000             |
| COLCHESTER                    | 300,000   |            | BRANTFORD (Remodelled)           | 200,000             |
| BIRKENHEAD                    | 2,250,000 |            | ST. CATHERINES (Remodelled)      | 250,000             |
| SWINDON (New Swindon Gas Co.) | 120,000   |            | KINGSTON, PA.                    | 125,000             |
| SALTLEY WORKS, BIRMINGHAM     | 2,000,000 |            | PETERBOROUGH, ONT.               | 250,000             |
| WINDSOR STREET WORKS, BIR-    | 2,000,000 |            | WILKESBARRIE, PA.                | 750,000             |
| MINGHAM (Second Contract)     | 2,000,000 |            | ST. CATHERINES (Second Contract) | 250,000             |
| HALIFAX                       | 1,000,000 |            | BUFFALO, N.Y.                    | 2,000,000           |
| TORONTO                       | 250,000   |            | WINNIPEG, MAN.                   | 500,000             |
| OTTAWA                        | 250,000   |            | COLCHESTER (Second Contract)     | 300,000             |
| LINDSAY (Remodelled)          | 125,000   |            | YORK                             | 750,000             |
| ROCHESTER                     |           |            |                                  | 500,000 Cubic Feet. |



CURRENT SALES OF GAS PRODUCTS.

**Sulphate of Ammonia.**—There has been a better market, with a hardening tendency, especially in Scotland. In the early part of the week, considerable sales were made at £9 2s. 6d. per ton f.o.b. Leith; but at the close the quotation is firm at £9 5s. per ton. A limited quantity was available f.o.b. Liverpool; and the value remained at £9 6s. 3d. to £9 7s. 6d. per ton. There has been a fair amount of direct inquiry. But consumers have hesitated to pay the prices; and the bulk of the buying has been for covering purposes. In the forward position, makers are firm at £9 10s. per ton f.o.b. Leith, delivery up to the end of the year; but there has been speculative offering abroad at the equivalent of about 2s. 6d. per ton less. Beckett quotation remains at £9 7s. 6d. per ton, Beckett terms, July-September delivery.

**Nitrate of Soda,** owing to further arrivals, is rather easy on spot at 7s. 4½d. per cwt. for good up to 7s. 6d. per cwt. for refined quality. In the forward position, however, the market is firm.

**LONDON, July 16.**

**Tar Products.**—Business continues dull and uninteresting. Very low and unprofitable figures are reported in respect to anthracene contracts in Germany. It is quite certain, however, that, at the prices mentioned, English tar distillers will not take the trouble to extract it from their oils. The smaller producers, however, in this country, have taken fright, and are disposing of any little stocks they may have at ridiculous prices. Anthracene is an important factor in the value of tar on the east and south coasts. The present outlook is a source of great anxiety to those manufacturers who have their tar purchased on the basis of former values of anthracene. Benzol and naphthalene continue languid, and quotations are generally speaking, only nominal. There is an undefined sense of hope respecting pitch for next season's delivery. It is felt that the close of the Welsh coal strike, which has so long prevented fuel making in that district, added to increased consumption abroad, may make pitch scarcer than is anticipated. There are, at the present time, no great stocks in makers' hands.

Values during the week may be taken as follows: Tar, 11s. 6d. to 15s. Pitch, east coast, 23s. 6d.; west coast, 18s. 6d. Heavy naphtha, 1s. 1½d.; 50's, 10d. Toluol, 1s. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 1½d.; Crude, 30 per cent., naphtha, 4½d. Creosote, 2½d. Heavy oils, 45s. nominal, "A," 4½d.; "B," 3½d.

**Sulphate of Ammonia.**—The week closes with a steadier market; and somewhat better prices. There is a good inquiry for forward delivery; but buyers offer no inducement on current quotations. It is difficult to forecast this market. But, undoubtedly, stocks are low; and the consumption generally is greater. The lessened production of sulphate at gas-works where water gas is made is of a marked character. To-day's value is £9 5s. to £9 7s. 6d. per ton, less 3½ per cent. at all ports.

NOTICE OF REMOVAL.

**JOHN WRIGHT & CO., LIMITED,**  
Have removed their  
**London Show-Rooms**  
from 105, Cheapside,  
TO MORE COMMODIOUS PREMISES AT  
**19 & 21, QUEEN VICTORIA STREET, E.C.**



exceptional treatment is only extended to this particular Bill on account of the special circumstances; but it is very much to the point to inquire, as the "Daily News" does, whether this is "the thin end of a wedge that will by-and-by be driven into one of the toughest old parliamentary blocks." What is fair in one instance can scarcely be argued to be unfair in another, and the ready welcome extended by the House to Mr. Lowther's proposal of Friday is certain to be invoked for other causes. An enormous amount of parliamentary time and labour is annually thrown away, and grievances stand unredressed year after year, because of the rule that business left unfinished at the end of the session must be begun *de novo* if reintroduced in the next. The "Daily News" remarks upon this: "The common sense of the nation will drive 'in this wedge, and we shall hear of a great extension of 'the principle of carrying over measures from one session to another.'" It is admittedly not always a loss or disadvantage, even to the cause of reform, for Bills to have to be discussed afresh, and even re-drafted, session after session. There comes a stage, however, in the history of most projects of legislation that are worth anything, when both promoters and opponents would like to dispense with this traditional brake upon legislative progress.

#### No Peace for South Wales.

SIR EDWARD FRY is reported to have definitely accepted the conclusion that his mission of conciliation to South Wales has failed. This is the view we ventured to take a week ago; but it is nevertheless possible to hold the somewhat paradoxical opinion that Sir Edward's failure was, in a sense, a success. It succeeded as a demonstration that the difficulty in the way of the resumption of friendly relations between masters and men lies wholly with the latter. It was to the men that Sir E. Fry went first; and he was in consultation with them throughout—the employers having taken an early opportunity of notifying to him that they had no need for his good offices. Apparently Sir Edward had something to do with the framing of the so-called new proposals submitted by the men's representatives to the Employers' Committee at the joint conference which followed his visit to Cardiff. It seems that these proposals pretended to accept the sliding-scale principle; but there was added a demand for "some protection that wages should not be unfairly reduced as a result of undue competition, and that some method of securing finality in the decisions of the Joint Committee should be adopted." This was only a roundabout way of bringing in the independent umpire, as desired by the men all along, and as emphatically rejected by the employers. As the men would not drop this old demand, and the associated employers decline to entertain the idea, the deadlock continues. It is hardly disguised any longer that Mr. B. Pickard, the President of the Miners' Federation, is "engineering" the strike, with the ulterior object of getting Trade Unionism established in the South Wales coalfield. Naturally, Mr. Pickard hates the sliding-scale, and wishes to stop the Welshmen from accepting the principle again. According to a newspaper report, he has been bold enough to state publicly that "during the time the sliding-scale has been in operation in South Wales, there have been more strikes in South Wales than under the Federation."

#### The Liberty and Property Defence League and Monopolists.

—In a pamphlet bearing the title of "Fairplay *versus* Monopoly," the above-named League set forth the reasons why, in their view, the General Power Distributing Company, whose Bill has been passed by a Committee of the House of Lords (see *ante*, p. 53), and is now before the Lower House, ought to be allowed to supply the public with cheap electrical energy. It is pointed out that the efforts at the municipal supply of electricity in certain boroughs within the area dealt with by the Bill have not been at all successful, and that users of electrical energy are charged from 5d. to 7d., as against 4d. per unit, the maximum which the Company would be able to charge. The League conclude their exposition of the case by showing that it is the municipalities who are the advocates of "monopoly" and "vested interests," inasmuch as they claim to be protected against competition merely because they happen to be in possession. Some strictures are offered on what is termed the "vicious system of indirect or oblique taxation," by which one class of the ratepayers—say gas consumers—have to support a costly educational establishment; and it is remarked that such a course "is as unfair a method of local taxation as if butchers' customers, and they alone, were taxed, at the instigation of a vegetarian majority, to maintain the local police force."

## WATER AND SANITARY AFFAIRS.

THE evidence given by Mr. F. G. Banbury, M.P., before the Metropolitan Water Supply Commission last week brought a new feature into the proceedings, in the shape of a plan devised by that gentleman for the purchase of the existing undertakings. The essence of the scheme was described as purchase by dividend, instead of purchase by capital value. That is to say, the shareholders were to be secured in the possession of their present income; and, although allowed nothing for compulsory purchase or for prospective profits, they would benefit by the increased security of their income, and by the augmentation of capital value due to the circumstance that they would hold stock possessing peculiar advantages. Any increase in the profits of the water undertakings would go to the benefit of the consumer, who would in all probability escape anything in the nature of an extra charge for the supply. The plan was simply that of a small statutory central body, to be created by Parliament, with authority to issue a 3 per cent. perpetual stock, secured on the rates. Each shareholder or debenture holder would receive sufficient of this new stock to yield him the same return he was previously receiving. By means of this stock, the statutory body would purchase the undertakings of the Water Companies, and the disturbance of the Money Market which would thereby be occasioned, by the cash payment of some 30 or 40 millions sterling, would be avoided. The stock would be transferable at the Bank of England, and trustees would be entitled to invest in it. Of course, the Progressives of the London County Council will offer the most determined opposition to any such scheme as this. It is too equitable. Nobody would be taxed by it, and nobody would be robbed. To give to the water shareholder what he now receives is the very last thing to which a typical Progressive will consent. The shareholder is to lose some part of his present income, and the County Council is to step into the full possession of it. But the power must come from Parliament; and the Legislature is not likely to see things of this kind with the same eyes as the County Council. The voice of the Royal Commission also has to be heard; and public opinion has to be consulted.

Mr. Banbury's idea is that the statutory body to carry out his scheme, and to manage the water supply, should be appointed by the Government. He says the City has not much faith in the business capacity of the County Council. His own opinion was that if the Council were substituted for the statutory body, his scheme would work well for the shareholders; but he doubted whether it would for the ratepayers. We are perfectly certain that the shareholders would prefer for the County Council to have nothing to do with the working out of the project, as there would be all the risk that the Council would play some prank calculated to lessen the capital value of the stock. The consumer and the ratepayer would also have reason to deprecate the interference of the Council. When once in possession of the Metropolitan Water Supply, the authorities at Spring Gardens would make it subordinate to their own plans, and would be in no way likely to do justice to the present means. The Welsh scheme will still be the favourite child, though Mr. R. E. Middleton, with excellent experience and professional qualifications to guide him, is able to show the Royal Commission the extravagant cost of bringing a supply from Wales, as compared with the Staines reservoirs scheme.

Yesterday the Royal Commission sat for the thirty-first time. The "Daily Chronicle" is losing all patience over this matter, and accuses the Commission of executing a policy of delay, which has the double disadvantage that it "suits the Water Companies and disappoints the County Council." But why should the County Council be thus "disappointed"? It has so far enjoyed a good long talk with the Commission; and if only it wished to hasten matters to a conclusion it might have sent fewer witnesses or given them less to say. Of course, the "Chronicle" and the Progressive party may be specially anxious just now to see the inquiry brought to a close. The case for the Companies is coming on, and the Progressives can have no desire to hear it, or to let anybody else do so. Fallacies and misrepresentations calculated to damage the Companies are in danger of being demolished; and after all the talk on one side, silence would be golden on the other. We are told that the



Royal Commission is "dawdling" over its work, and "its evident intention is to spread itself over another session." Of course, the "Chronicle" can settle the whole question in five minutes, though it has taken a Select Committee four years to report on the flash-point of petroleum. It is complained that the Commissioners only meet "for a few hours on Mondays now and then." We see some reason to believe that the Commissioners would be very glad to meet oftener, if an arrangement could be made for the purpose. They recently attempted to sit twice a week, but by some means were foiled—possibly by the difficulty of obtaining the presence of Counsel. Has Spring Gardens any complicity in this? But if the Commission cannot get on faster, there is something else in store. "It may be necessary," we are told, "for the County Council to take independent action, and promote legislation next session." The responsibility for delay is to be placed on the Government. But in the meantime the County Council goes into recess for two months.

**Hamor Lockwood's, Limited.**—In another part of the "JOURNAL" will be found the prospectus of a Company formed to acquire the business of a tar distiller, manufacturing chemist, &c., established 35 years ago, and now carried on at Bradford and in Manchester, by Mr. Hamor Lockwood. The capital is £100,000, divided into 30,000 cumulative preference (5 per cent.) shares and 70,000 ordinary shares of £1 each. The present issue consists of the whole of the preference shares and 50,000 of the ordinary shares; the remaining 20,000 of the latter being reserved for future issue when required for the development of the business. The subscription list opened yesterday, and will close to-morrow afternoon.

**Hydraulicity of Cement.**—The hydraulicity of a cement can be determined with certainty by the following test, according to Mr. Uriah Cummings, of Stamford (Conn.), who states in a recent work on American cements that for thirty years he has never known it to fail to expose defective material. A cavity 1½ inches wide, 1 inch deep, and 8 inches long, with slightly bevelled ends and sides, is cut in a piece of hard wood. It is well oiled, and then filled with a stiff paste of the material to be tested, pressed in firmly with a trowel, and smoothed off even with the face of the mould. After the cement has hardened, which takes from twenty minutes to two hours, the mould is turned bottom up on supports ½ inch thick under each end. By careful jarring, the bar of cement will drop out. It should then be placed on its side on two supports, at least 6 inches apart and 1 or 2 inches high, in a pan or box, which is afterward filled with water. If the cement is strong in hydraulicity, the bar will maintain its shape indefinitely.

**Sulphate of Ammonia and Nitrate of Soda in Germany.**—According to the report for the year 1897 of the German Association for the sale of sulphate of ammonia, the production of this material in Europe is estimated at 375,000 tons, as compared with 330,000 tons in 1896. The total is divided as follows: England, 215,000 tons; Germany, 100,000 tons; France, 30,000 tons; Holland and Belgium, 30,000 tons. Of the 100,000 tons assigned to Germany, 46,000 tons came from the coke-ovens of Westphalia, 40,000 tons from those of Silesia and Austria, and 14,000 tons from gas-works. The imports of sulphate last year reached 33,113 tons (24,023 tons from England), as compared with 32,061 tons (22,344 tons from England) in 1896. The imports of nitrate of soda were 465,493 tons, against 449,027 tons in 1896. The exports of sulphate and nitrate were 2623 tons and 11,363 tons respectively. The price of sulphate when the year opened was about 19.50 frs. per 100 kilos. It rose to 20 frs. in February; dropped to 18.20 frs. in March; and closed at 22.50 frs. in December. Nitrate began at 19.25 frs.; dropped to 16.75 frs. in July; and closed at 17.60 frs.

**The Gas Companies' Protection Association.**—Mr. F. E. Cooper, the Secretary (*pro tem.*) of this Association, has issued, in accordance with instructions received from the Provisional Committee, a circular announcing the formation of the Association, with Mr. Henry Kimber, M.P., as President; its object being to protect "the property, revenues, rights, powers, and privileges of gas companies," secure united action, and generally keep the members informed of all parliamentary or other proceedings affecting their interests. The names of the Committee, which is a very representative one, are given; and a desire is expressed that the utility of the Association may be rendered as great as possible by all the gas companies throughout the kingdom becoming members. The annual subscriptions range from £2 2s. for companies whose capital does not exceed £50,000 to £10 10s. for £1,000,000, above which figure the payment is to be optional, but not less than £10 10s. For the present the issue of the circular has been confined to companies having capitals of £40,000 and upwards. While these companies will profit by joining the Association, it seems to us that the assistance which the new organization will render must be specially valuable in the case of the smaller companies, who much more frequently stand in need of advice on matters of detail than the larger ones.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 214.)

BUSINESS continues to fall away in the Stock Exchange; and as the end of July approaches, the markets are rapidly settling down into the usual autumnal condition of inactivity. The tendency last week was rather flat at first, through sheer lack of support; but before the close, things took a rather better turn. Some agreeably surprising railway dividend announcements, and a renewed hope that peace in the western hemisphere was almost within sight, put a better complexion on affairs. Movements in price were irregular—some of the gilt-edged, which were standing rather too high, coming down; while improvements took place in the more speculative lines. The Money Market is quite unchanged; and there seems to be a strong prospect of marked ease lasting yet for some time to come. Business in Gas during the week was of the most slender proportions; and on some days it approached complete stagnation. It was utterly devoid of feature, too. Movements in price were very few in number, and slight in extent; and they were almost wholly confined to issues of only secondary importance. Gaslights were quite unaffected. The "A" was very moderately dealt in—the price being steady at about 298 or 299, but not inclined to go higher. A few transactions also took place in the secured issues at good average figures, South Metropolitan was fairly brisk when compared with the rest. The price was well abreast of quotation, but was not disposed to advance. Commercially were quiet and unchanged. The Suburban and Provincial group was as quiet as the rest, though some transactions took place in issues which are not often in the market. The general tendency was favourable; and Brentford new improved a little. The Continental Companies contributed but little to the aggregate of business; but a further recovery took place in Continental Union. Among the minor undertakings, Hong Kong recovered the half point it had lost, and Bombay had a rise; but Tuscan receded. Transactions in Water Stocks were a little more numerous than in the preceding week; and the tendency was firm. Changes in quotation were few and slight; but they were in the upward direction.

The daily operations were: Business in Gas was quiet on the opening day, but not below the average of the week. Prices were not changed. The same may be said of Tuesday; the position remaining unaltered. Transactions on Wednesday were still more restricted; but Hong Kong advanced ½, and Bombay ¼. On Thursday, everything was quieter. Brentford new rose 2½; and Continental Union preference, 3. In Water, East London and Lambeth 7½ per cent. gained 2 each. Friday would have been as dull, but for some dealing in South Metropolitan, which relieved the blank. Quotations did not move. Saturday was no quieter than any other day; and prices generally were fair. Tuscan fell ½.

### ELECTRIC LIGHTING MEMORANDA.

The Decision of the Committee of the House of Commons on the Marylebone and Bermondsey Orders—The Question of Expediency—Mr. Littler's Triumph—Inconsistency of the Committee.

GREAT was the rejoicing among the statutory electricity supply companies when the House of Commons Committee threw out the much-discussed Provisional Order granted by the Board of Trade to the Marylebone Vestry, and suggested that the companion Bermondsey Order should be withdrawn with a view to the Vestry considering the question of buying out the local Company. The shares of the Metropolitan Company, who serve Marylebone, jumped up £2, and those of all the other Companies exhibited a sympathetic improvement. It will be desirable to trace the history of this momentous decision in some detail. The question of principle left for the Committee to settle has been discussed in these columns for several weeks past. It was explained in Parliament that, in granting Provisional Orders for electric lighting to the Vestries of Marylebone and Bermondsey, the Board of Trade had acted as they considered in the spirit and according to the letter of the Electric Lighting Act, which expressly countenanced competition in this business, and with the intention of taking the opinion of Parliament upon the particular aspect assumed by the proposed competition in these two cases. The Department did not feel justified in withholding the Orders, against the terms of the Act, merely because they proposed that the Local Authorities should compete, by the aid of public money, with Companies already established in the same districts.

Of course, the legality of the Orders could not be disputed. They would have brought into the specified areas just the competition in electricity supply which the Act provided for. But behind the strict letter of the law stood the question of expediency, not to say of justice. Granted that competition between two different sources of electricity supply is not only legal, but is in a general way advantageous to all parties concerned—to the competing undertakings not less than to the public—it remains to show that such proceedings as those proposed by the



Marlyebone and Bermondsey Vestries are for the public interest, in the circumstances. The Commons Committee have said "No" in one case, and "Yes" in the other. The Marlyebone Vestry are told that they cannot be permitted to start electric lighting in competition with the Company actually doing business in the locality. If they wish to obtain this business for themselves before the statutory 42 years, they must buy out the Company, as other local authorities have done. On the other hand, the case of Bermondsey is different. Here there is no electric lighting, though there is an Electric Lighting Company and some distributing plant. The Vestry are anxious to go in for dust destruction and public street lighting, which the Company are by no means desirous of touching. The Company happens to be the London Electric Supply Corporation, who are not disposed to be antagonistic to the Vestry. At the same time, no company can relinquish statutory rights save for some consideration acceptable to the proprietors. The Committee thought at first that the Bermondsey Order should be withdrawn, as the point raised in it is not, in their opinion, ripe for discussion. They also thought that the Vestry should consider the question in the light of purchase.

This looked very much like the rejection of the Order; but Mr. Littler, for the Vestry, hung on to it for the purpose, as he said, of saving a year in getting on with the dust destruction and street lighting. The Committee yielded so far as to give another sitting for the purpose of hearing Mr. Littler on his new point. Accordingly, he brought up a clause which the Vestry were willing to insert for the protection of the London Electric Supply Corporation, agreeing not to supply electricity under the Order until the existing distributing mains of the Company, as they were on the 15th inst., had been purchased. Thereupon the powers of the Company to supply electricity within the district were to cease and determine. In reply to this suggestion, the representatives of the Company urged that they could not get their Directors and shareholders together to consider the offer. It was also pointed out that the new clause not only meant compulsory purchase of the distributing plant, but also that the power of supply should go with it. Hereupon the Chairman of the Committee seemed to imply, by a question, that he thought the Directors had full power to deal with the point. After some further protests by Counsel on both sides, the Committee deliberated. When the public were re-admitted, the Chairman said the Committee had hoped that some satisfactory arrangement could have been arrived at. "As this seemed impossible, they had only one duty to do, and that was to decide that the Order, so far as it related to the Bermondsey Vestry, should be confirmed."

This decision, so report says, "was received with evident surprise by the parties." And well it might be. After what the Committee had stated at the previous sitting—that the Order was premature, and that the Vestry should reconsider their proposals in the light of the obligation to purchase the distributing part of the local undertaking of the existing Company—the ultimate decision looks very much like a display of impatience because the representatives of the Company did not feel justified in accepting off-hand the compulsory clause sprung upon them at the last moment. The Company will now, of course, continue their opposition to the Order in the House of Lords; and it will be a strange thing if this House does not deal with the matter in the spirit of the earlier judgment of the Commons Committee. It would perhaps be harsh to remark that this Committee stultified themselves by their action; yet it is difficult to classify their performance otherwise. Mr. Littler, not for the first time in his career, did a smart stroke of business for his clients in making the Committee turn back from their deliberate opinion; but we are by no means sure he was not a little too smart on this occasion. Perhaps if the proposed purchase clause had contained mention of terms of compensation for the extinguished right of supply, as well as for the structural part of the property of the Company, an agreement might have been come to, and further parliamentary opposition saved.

#### GRANT OF A COMPULSORY LICENCE TO WORK A BRITISH PATENT.

AN important event in the history of the British patent system, and also of the international coal-tar colour industry, occurred during the past fortnight. The Board of Trade on the 6th inst. issued the first order for a compulsory licence to a British manufacturer, under section 22 of the Patents, Designs, and Trade Marks Act, 1883; the petitioners being Messrs. Levinstein, Limited, and Ivan Levinstein, of Manchester, and the patentees the Farbwerke vormals Meister, Lucius, and Bruning, of Hoechst-am-Main, in the German Empire.

The circumstances of the case may be within the recollection of our readers. Some time ago, the Chemical Sub-Committee of the Manchester Chamber of Commerce and others began agitating for an amendment of the British patent law in the direction of adopting the principle found in the patent laws of some countries by which patented inventions must be compulsorily worked in the country by the patentees, or else the patent becomes invalid. The history and actual condition of the coal-tar colour industry, which originated in England through the genius and labours of Dr. Perkin, and subsequently migrated

to Germany, was from the first employed to illustrate the suggested need for such an alteration of the law. As a matter of truth and justice, the illustration was not quite fair to the Germans. The direct fruit of Dr. Perkin's discoveries was protected in England by a "master patent" under which the proprietors amassed much money, while no other British firm were able to embark in the trade. The original patentees, it has been alleged, did not concern themselves with the development of the industry of whose beginnings they were the sole proprietors; and consequently when the master patent expired, and they went out of the business, there was nothing much for their successors to go on with. Meanwhile, however, a master patent had been refused in Germany, which gave German chemists the opportunity to carry on and develop the industry with all the resources at their command. Consequently, patent after patent for developments of the industry were taken out by the Germans, until by the time the original germ of the trade came into the hands of English manufacturers to deal with as they chose, all the newer and best-paying derivatives were German property. The British consumer had nothing to complain of—or, if he had, he did not know it. The German colour manufacturers sent over here all the coal-tar dyestuffs and drugs necessary to supply the English market, and sold them for what they would fetch—meanwhile, of course, keeping the production in their own hands at home.

This was the situation when Sir Bernhard Samuelson became the spokesman of a party who clamoured in and out of Parliament for the introduction into the English patent system of the principle of "compulsory working" within the realm. A good deal concerning this agitation will be found scattered through the last three volumes of the "JOURNAL." There was much speciousness about the demand for a "compulsory working" clause after the Continental model, which carried away many superficial thinkers. Experts in patent matters knew all about these foreign provisions for the compulsory working of patents in the country granting the patent, and very few of them admired the principle. Amateurs of British patent law reform upon the Continental plan did not ask themselves how English traders and consumers would benefit by the establishment in this country of a branch factory of some German house, where, for the sake of satisfying the letter of the law, a certain quantity of a patented speciality would be manufactured, still by foreign hands, working with foreign capital, and not competing in any real way with the bulk of the import trade.

Questions were asked upon the subject in Parliament; and the official reply referred to section 22 of the Patents, Designs, and Trade Marks Act, 1883, which had so far not been put into force because nobody had ever asked for it. The Manchester Chamber of Commerce sent a deputation to the Board of Trade in April of last year which further cleared the air. Sir Courtenay Boyle deprecated the too-ready presumption of the Manchester manufacturers composing the deputation, that the English law under which a patentee might be ordered to grant a licence to "any person interested" was a dead letter. He offered them the practical suggestion that the question might be tried upon a test case; and, to their credit be it recorded, the agitators took the Secretary of the Board of Trade at his word. A test case was prepared by Messrs. Levinstein, supported by the Manchester Chamber of Commerce, with the result already stated. The precedent thus created is of supreme importance. Those who declared that the new provision introduced into the patent law of England by section 22 of the Patent Act of 1883 is of far greater value than the "compulsory working" provisions of foreign patent systems are fully justified; and it is to be hoped that the ignorant clamour for the latter will now be stilled. If the Manchester men were misled, as they undoubtedly were, into finding fault somewhat intemperately with the English law before putting it to the proof, they will perceive now that the power to compel a patentee to grant an English licence to another person in the trade is of infinitely greater value than the much-belauded obligation to work his patent himself in this country.

Considering for a moment the general question of compulsory working, we may refer to the denunciation of the principle by Mr. A. V. Newton, cited in the "JOURNAL" for Sept. 28 last. He declared that the question of the policy of compulsory working was threshed out before the Institute of Patent Agents in 1887, and decided in the negative. The question cropped up again at this year's Congress of the International Association for the Protection of Industrial Property (see "Times" report, June 4), when a resolution moved by a French delegate in favour of the modification of the article of the Paris Convention relating to compulsory working was agreed to after several delegates had described as intolerable the present state of things in countries where the principle is in force.

Reverting to the precedent of the Levinstein compulsory licence, which is a complete vindication of the Act of 1883 and of the Board of Trade from the charge of supineness, it is to be borne in mind that the putting in action of section 22 is no small or easy performance. Mr. Roger W. Wallace, Q.C., who has had the fortune of being called in by the Department to help decide one or two of these cases, fully admits, in his useful "Handbook of the Patent Law," that a system of compulsory licences must "prove of great public benefit if patentees are enabled by its instrumentality to combine the inventions of others with their own, and thus produce more efficient machines



and products of better quality." Also, the same authority remarks that "foreign inventors who take out patents in this country without any intention of working here, but merely to prevent any competition in this country, will find it difficult to do so in future if this section is properly carried out." Happily, the wording of the section has not been found to fall short of the requirements of the test case. The section\* is as follows: If on the petition | of any person interested | it is proved to the Board of Trade | that by reason of the default of a patentee to grant licences on reasonable terms | the patent is not being worked in the United Kingdom; or | that the reasonable requirements of the public with respect to the invention cannot be supplied; or | any person is prevented from working or using to the best advantage an invention of which he is possessed | the Board may order the patentee to grant licences on such terms as to the amount of royalties, security for payment, or otherwise, as the Board, having regard to the nature of the invention and the circumstances of the case may deem just; and any such order may be enforced by *mandamus*.

Accordingly, Messrs. Levinstein submitted to the Board of Trade that certain patents, relating to the production of articles in which they were interested, were actually assigned to Messrs. Meister, Lucius, and Bruning. The petitioners proved that, by reason of the default of these patentees to grant licences on reasonable terms, the said patents were not being worked in the United Kingdom; and further that, by reason of such default, the petitioners were prevented from working and using to the best advantage certain inventions of which they were possessed. All the heads of the necessary proof being thus made out according to the language of the section, the Board of Trade have directed "that a licence to take effect from the date of this order and in the form set forth in the schedule hereto, be forthwith granted by the patentees to the petitioners to make, use, exercise, and vend, within the United Kingdom, the inventions described . . . for the unexpired residues of the respective terms of the said letters patent, at a royalty of one halfpenny for each pound weight avoirdupois of products made by the licensees under the said letters patent or either of them, but so that in each year a minimum royalty of £250 per annum shall be paid by the licensees, and the patentees shall forthwith deposit such licence, duly executed by them, with the Board of Trade." Within a month a counterpart licence is to be deposited by the petitioners, on pain of the order being made of no effect.

This decision settles the question of whether or not section 22 of the Act of 1883 is a dead letter. The case was fought before the Board of Trade at a cost to the petitioners, it is reported, of £2000. There is no order as to costs; and no appeal from the decision of the Department. The costliness of the proceedings is no affair of the Board of Trade; the fee payable on application for a compulsory licence being only £5. It is the struggle for the business that costs; and the fact is likely to act as a very salutary check upon frivolous or vexatious petitions. Messrs. Levinstein are to be congratulated on having been able to get a sound case to fight upon; and it is to be hoped they will find the rest of the game "worth the candle." It must be conceded that the precedent set in this instance deals a deadly blow at the selfishly monopolistic use hitherto occasionally made of patents, and not by foreigners only. The promptness with which the Board of Trade acted in the matter, when once set in motion, is not the least satisfactory part of the transaction.

#### THE ACETYLENE EXHIBITS AT THE IMPERIAL INSTITUTE.

(Continued from p. 146.)

THE criticisms we have so far offered of the acetylene exhibits at the Imperial Institute have been couched in general terms, and have not applied specially to the productions of particular manufacturers. In order to give point to what has already been said, and also to indicate more precisely the distinctive features of noteworthy apparatus, it is now desirable to enter into a more detailed review of some of the generators exhibited. The examples are chosen solely for the object we have specified; and we do not wish to imply that they are either more or less meritorious than others we have been forced to overlook.

Not a few experts have expressed the opinion that automatic generating apparatus is a delusion and a snare; and these gentlemen will approve the generator which is manufactured by the Ideal Gas Company, Limited, of Blackburn. This plant has been briefly described in our "Register of Patents" [Vol. LXIX., p. 890; and Vol. LXXI., p. 1067], under patents No. 15,654 of 1896 and No. 13,667 of 1897. Messrs. Whalley and Hacking, the inventors, have thought simplicity of construction compatible with efficiency of working. They take a bell gasholder of ample capacity, and collect in it the acetylene generated from a charge of carbide which will not suffice to furnish such a volume of gas as would fill the holder. The water is run from a cistern directly on to the carbide, which is contained in a generating chamber from which the gas passes through a cooling and condensing chamber to the gasholder. Make all your gas and then—but not till then—proceed to use it, appears to be the motto of

the inventors, who are sceptical as to the merits of the hand-to-mouth system of lighting which the so-called "automatic" acetylene generators exemplify. If we accept the testimony of competent experts who have closely examined the apparatus when in action, we are forced to the conclusion that this simple plant works admirably. A mere cursory examination of the generator in use at the exhibition confirms this conclusion. We are not quite satisfied that there really is no risk of a dangerous or troublesome rise of temperature in the generator, and think it possible that irreparable mischief may thereby have been done to the gas before it enters the cooling chamber. Provision for the purification of the gas previous to its entering the holder should be made. The plant works at low pressures, and is one of the simplest exhibited. The compilers of the price-list of the Ideal Company seem to have been anxious to enrich our language with the word "Ometer," which is neither useful nor elegant. Had they a suspicion that the physical condition of the acetylene produced in their apparatus did not justify the use of the word "gasometer," which was evidently in their minds?

The Manchester Acetylene Gas and Carbide Company, Limited, have made generators which have been extensively used on the Manchester Ship Canal and elsewhere. The generators are manufactured under the patents granted to Mr. A. Kay; and a clear impression of the principles on which they work may be gathered from the abstracts of the specifications and illustrations given in our "Register of Patents" [Vol. LXIX., pp. 484, 848]. The generator is a simple and convenient form of the drip type, in conjunction with a bell gasholder, by the rise and fall of which the rate of generation is controlled. The general objections to generators of the drip type must undoubtedly apply to this apparatus; but the fact that it has shown itself capable of working satisfactorily under by no means ideal conditions, certainly indicates that some of these objections are rather fanciful than real. The illustrated list issued by the Company is conceived in a very bombastic spirit; and the remarks we have made as to the "exaggerated claims" put forward by certain generator makers on behalf of acetylene, apply forcibly to many of the statements made in this list. We are convinced that harm will ultimately accrue to the whole acetylene industry from the misguided efforts of interested parties, who would have us believe that acetylene is the ideal and cheapest illuminating agent under all conditions.

Sardi's Patent Gas Generator Syndicate, Limited, make a dip generator of the automatic class, which is a modification of that described and illustrated in our "Register of Patents" [Vol. LXVIII., p. 1237]. The patent referred to was granted to Signor Sardi, of Turin; and we understand the apparatus has been used to a considerable extent in Italy. The carbide basket which passes through the crown of the generator-bell in the original Sardi apparatus, has been superseded by a series of trays, placed vertically above one another. This change should considerably reduce the after-development of gas which is so marked a phenomenon with most patterns of dip generators. At the Imperial Institute, a so-called 40-light generator is used for the supply of a 7-light pendant. The Sardi apparatus is a very good example of the dip class of generator; and many of the common objections to the class do not apply to it. The list issued by the Syndicate has all the faults of which we have complained in other instances.

Messrs. Thorn and Hoddle exhibit generators and accessories. The generators are of more than one pattern, and that described in our "Register of Patents" [Vol. LXVIII., p. 319], has apparently been superseded by later modifications. This firm supply some useful accessories, such as an air-tight carbide receptacle for storage purposes. They also offer a special purifying material (at 6d. per lb.), for use in a special purifier. By the use of this material and apparatus, the "acetylene light" is said to be rendered "absolutely smokeless and odourless while burning;" and its brilliancy and colour are stated to be improved. In an article on "The Purification of Acetylene" in the "JOURNAL" for June 14 last (p. 1375), we showed that such claims on behalf of any purifying material were absurd; and our warnings apparently came none too soon, for there are now being offered to the public many special purifying agents to which impossible qualities are ascribed.

(To be continued.)

**Automatic Lighting of Public Lamps.**—M. Rodenbach, a Swiss gas engineer, has devised for the automatic lighting of public lamps an appliance having the appearance of an alarm-clock. The face is divided into 24 hours, and carries three hands—one indicating the hours, and the others being used for marking the times of lighting and extinguishing. A smaller dial, divided into minutes, serves to regulate the movement of the hour hand. All the lanterns fitted with this appliance are lighted and extinguished automatically at the time determined upon—one hand opening a tap and causing the gas to ignite at a pilot-light, and the other closing the tap. These operations go on regularly so long as the clock is wound up, which has to be done once a month; and the hands have, of course, to be set according to the season. The inventor claims that the initial outlay for the clocks and their application to the public lamps will be recouped in a year or so by the reduction of lamp lighting expenses.

\* For the sake of clearness, we have here divided up the section into the different heads of the case that must be made out to the satisfaction of the Board of Trade.



## OBITUARY.

The secretaryship of the Drogheda Water-Works Company, Limited, has become vacant by the death of Mr. PATRICK REDDY, who held the position, in conjunction with the managership, for about twenty years.

The death is announced as having taken place on the 18th inst., at Blackpool, of Mr. GEORGE NEWTON, who in 1862 founded the Prince of Wales Meter-Works at Oldham, which since 1876 have been carried on by his son, Mr. Robert Newton.

By the death of Mr. G. ARMSTRONG, of Newcastle, which took place last Friday night, after a comparatively short illness, in his 73rd year, the Newcastle and Gateshead Gas Company lose a Director, and the Water Company their Solicitor.

## PERSONAL.

## Mr. George Livesey and Mr. George Bray.

It is with the greatest possible pleasure that we are enabled to inform readers of the "JOURNAL" that the long-standing disagreement between Mr. Livesey and Mr. Bray (into the originating cause of which it is unnecessary to enter) has been honourably and happily terminated. We have been permitted to peruse letters that have, within the past few weeks, passed between these gentlemen, which make it abundantly clear that they are both glad to let bygones be bygones, and that they will henceforward, as one of them puts it, "recognize each other as friends." This notification of a reconciliation which, we are assured, will leave no trace of rancour behind, but rather a heightened mutual respect, has been submitted to both parties, and is published with their complete concurrence.

Mr. W. H. FORD, of Saltash, has been appointed Manager of the Ashburton Gas-Works.

Mr. J. C. SWINBOURNE, the Manager of the Llanidloes Gas-Works, has been appointed Secretary, in succession to the late Mr. J. D. Davies.

Mr. G. CLOSE, the Manager of the Kingscliffe Gas-Works, has resigned; and Mr. W. CLIFTON, a former Manager, has been appointed his successor.

The Hon. E. H. JOHNSTONE has been elected a Director of the West Middlesex Water Company in place of the late Baron Dimsdale, whose death was alluded to by the Chairman (Mr. E. Boulnois, M.P.) at the last half-yearly meeting.

Mr. G. W. YOUNG, Manager of the Carlow Gas-Works, has obtained a similar appointment at Kilkenny, in succession to the late Mr. W. H. Catlin. Mr. Young, who was formerly at Cleator Moor, was selected by Mr. G. Anderson out of about a hundred applicants.

Mr. H. E. SMITH, who, as announced in the "JOURNAL" for the 12th inst., passed first class in the Honours Grade at the last examinations in "Gas Manufacture," gains the bronze medal and the prize of £2 presented by the Salters' Company. He secured last year the second prize (£1 and a bronze medal) in the Ordinary Grade. Mr. Smith is with Messrs. E. Cockey and Sons, Limited, of Frome, from whom he received his training.

Mr. A. J. HOPE, who for the past seven years has been Assistant-Manager of the Halifax Corporation Gas-Works, has been provisionally selected to fill the position of Superintendent of the Effingham Street works of the Sheffield Gas Company, for which applications were recently invited in the "JOURNAL." The vacancy has been caused by the present Superintendent (Mr. T. H. Hack), who has held the appointment for the past six years, being entrusted with the charge of the new works at Grimesthorpe, the first section of which will be ready for making gas during the coming winter.

On the 21st of April last, the "Southern Daily Mail" announced that, in consequence of the action of the Directors, Mr. S. B. DARWIN, the Secretary and Manager of the Portsea Island Gas Company, had tendered his resignation; and it was stated that in six months from that time Mr. Darwin would "cease to be connected with the Company as its Secretary and Manager." The matter was alluded to in these columns; and it may be remembered that the reported resignation was denied by Mr. Darwin. But, according to a statement which appeared in the above-named publication last Friday, the original announcement "only erred in being premature." It goes on to say: "To-day (less than six months from the first notification being made), Mr. Darwin ceases to be connected in any way with the Portsea Island Gas Company, to whose interests he has given the best years of his life. We learn from a perfectly reliable source that what happened in April last was that, in consequence of a change of policy on the part of the directorate, Mr. Darwin relinquished the secretaryship of the Company, and, at the Directors' request, became Chief Engineer. They were frequently pressed to give a reason for wishing to make the change; but none was assigned. Mr. Darwin has served the Company in the dual capacity for twenty years; and there has been no suggestion made of any dereliction of duty or incapacity on his part. Not unnaturally, Mr. Darwin felt very keenly the circumstance of being compelled to take a subordinate position; and he has therefore tendered his resignation."

## METAL WORK FOR PUBLIC STREET-LAMPS.

THE subject of the appropriate and decorative treatment of street-lamp supports, and interior gas and electric light fittings generally, is one that the "JOURNAL" cannot leave alone for long together. Many hundreds of new and additional street-lamps are fixed in the United Kingdom every year; and, similarly, thousands of gas fixtures are "installed," to use a phrase with which the electricians have familiarized us, in the residences of rich and poor. Yet we have continuing reason for lamenting the neglect of the opportunity thus provided for artistic treatment of a whole order of necessities of modern life, by those who ought to seize every opening for raising the popular taste for applied art. The work of lighting streets and interiors has to be done; and done it is, by means of appliances turned out by the gross, by piecework. All that science, and skill, and power of organization and business capacity can do is done to supply the people of England with the best and cheapest artificial lighting. Nowhere is the electric lighting service so reliable, or the gas so cheap, so pure, and of such uniform quality. The lamp-oil which is so largely burnt by the poor, especially in country places, pays not a farthing of taxation; and consequently the people get their light for the smallest possible outlay. But when one turns from contemplating the illuminant to study the shape and construction of the fitting, or the utensil, by means of which it is applied to its proper use of shedding light where it is wanted, satisfaction nearly always yields to disgust when the observer is able to contrast what is with what might be. We are certainly not an artistic people. There is no denying the impeachment. Our lamp-posts and gas-fittings "give us away" as hopeless barbarians, for whom art has no real attraction.

In these columns we have over and over again set forth how differently these matters are managed in France, where, as the phrase has it, "everybody is a bit of an artist." Not that there is any help for us in following French fashions in lamp-posts and gas-fittings. There is much about the most admired creations of the French designers of these appliances that does not commend itself to the admiration of the critic who bears in mind the differences that separate French and English problems of civilization and necessarily mould their solution. The point is that the French care for the æsthetics of common features of their towns, such as the street-lamps, while we do not. They do consciously design lamp-posts with a view to making them things of beauty as well as useful articles. We leave all such matters to the Town Surveyor, who orders his lamp-posts from the ironfounders, and prefers such patterns as he can depend upon getting "out of stock." The Town Surveyor is a practical man. He knows his business. But his taste in lamp-columns and lanterns is apt to be safest when he confines himself to the simplest kinds, in which it is impossible for anybody to go far wrong. It is when he intends to carry the matter a little farther—to choose a "Jubilee" lamp-standard for an important street centre—that he goes into the outer darkness where there is not a glimmer of a true sense of art to be perceived.

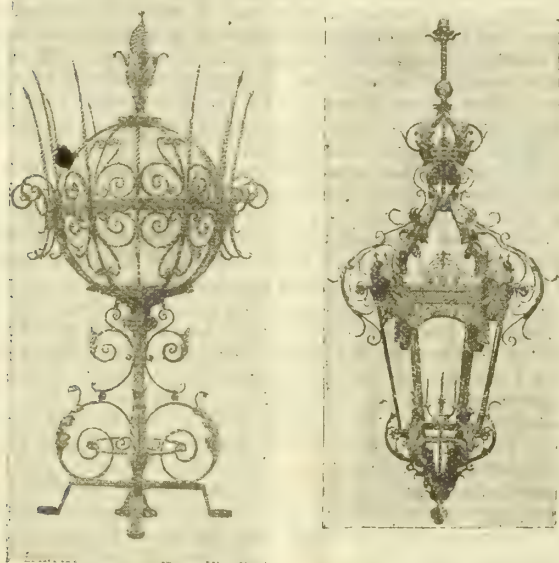
It is with much satisfaction that we discover that we are not alone in lamenting the failure of modern artists to realize the possibilities of the lighting service. There has been recently an Art Metal Exhibition at Westminster, which was critically noticed in the "Ironmonger" by May Morris. The criticism is one of the best efforts in this direction that has ever come under our notice. The writer declares that one of the tasks she—for we assume the femininity of the name—had put to herself in wandering round the exhibition was "to discover what inventive ingenuity has been devoted to the question of fittings for electric light." This is obviously an important question for the present and future; and the critic has "reluctantly come to the conclusion that our best decorative artists do not apparently care to give it much thought." Just so. The writer goes on to remark that candle-light has been easy to cope with. "Nothing can be more charming or more becoming to beauty than the soft radiance of many lighted brass chandeliers with which some women are still wise enough and luxurious enough to illuminate their reception-rooms. *Of gas, the less said the better.*" [The italics are ours.] Of course, the superior beauty of candelabra as compared with all newer kinds of artificial light fittings is to be explained in a variety of ways. Candle-light is beautiful in itself; and candles, as soon as they were first produced, fell into the hands of true artists, who had a correct feeling for the way in which they could be made decorative as well as useful. Gas, unfortunately, came into use at the dullest and dearest period for art in the history of the civilized world. It was contemporaneous with "Churchwarden Gothic;" which is as much as to say that it never had a fair chance of artistic treatment in or out of doors. But what of electric light? Surely, if there is any reality in the renaissance of art of which so much has been heard during the last few years, this, the youngest of artificial illuminants, might be expected to have come in for some of the beautiful garments with which a new baby is due to be adorned. Alas! no. The critic of the "Ironmonger" declares that "as part of the scheme of interior decoration, I do not think electric light has been often successfully treated. There is something paltry in many of the contrivances; and a sham chandelier with sham candles and a sham flame, in which lurks the light itself,



does not satisfy anyone as appropriate treatment. There are many of these 'notions' in the exhibition, and till now I have managed to avoid mentioning them." But sooner or later the mention has to come; and then it is a pitiful tale of imitation candles stuck upon imitation candlesticks, which one is invited to take as representing the best that modern art can do with one of the greatest marvels of modern science and industry.

It is quite true that "in pressing this new force into domestic service, we have got to work at the idea till we evolve satisfactory designs to fit its uses. The possibilities in lighting seem to me to lie," says the writer, "in the flower-like drop-globes often used. But there are obviously infinite possibilities; and I repeat that our cleverest decorative artists ought to consider this branch of design more than they have hitherto done." The trouble is that the artist does not arise when called for. Gas has been waiting for him for nearly a century; and few have been the indications that there is a possibility of his appearance. It is one of the disappointments of modern civilization that men and their productions multiply, but do not advance; and this is especially true of all that appertains to art.

We give herewith a couple of examples, taken from an American periodical, which show that the United States artificers are not breaking new ground successfully in the direction so carefully avoided by English craftsmen. The egg-stand device



to the left is by Winslow Bros., of Chicago, and represents the latest triumph of American smiths' work as applied to the display of an electric arc light. The other is an exercise on an obviously French theme, for gas, by a well-reputed American smith—John Williams, of New York.

It must be conceded that the modern metal worker has to solve a more difficult problem than the ancient blacksmith who was employed to make a cresset or a candlestick. When Quentin Matsys had hammered out one masterpiece, he was not required to produce it by the hundred. This is the controlling consideration in the case of the modern metal worker. Supposing the artificer of the present day were to succeed in producing a pleasing device, whether for a street-lamp column or a house-fitting, success would be manifested by a rush of orders for the same "pattern" until its embodiments would nauseate the beholder. Just as with musical art, no sooner does a composition catch the public ear than its reiteration from all sides converts it from a thing of beauty into a positive infliction. The critic of the "Ironmonger" appears to think that electric lighting pendants might be satisfactorily designed upon the drop-globe "motive." But how many of them? There is a highly effective suggestion for a fitting of this kind in the falling stars of a good sky-rocket, with their tails of golden sparks. One would not mind a few of such pendants, for public rooms, though they are anything but restful of aspect; but the pitiless multiplication of the notion would be wearisome in the extreme. In this respect it is easy to have too much of a good thing.

At the present moment, in London, the much-abused Works Department of the London County Council are engaged in replacing the time-honoured gas-lamp pedestals of Waterloo Bridge with brand-new posts for electric arc lamps. It will be remembered by gas engineers that just twenty years ago, a determined effort to improve public street lighting in London was made in this line of thoroughfare by Mr. Corbet Woodall, then Engineer of the Phoenix Gas Company. The original gas lanterns on the parapet of the bridge were massive constructions, the heavy metal framework of which was exhibited by the glimmer of a miserable gas-burner within. The object of the lanterns seemed to be to keep in the light of the gas, such as it was, as much as possible. Of late years, though the old monumental four-legged lamp standards have remained, the lanterns surmounting them have been of a light, well-glazed square pattern,

containing a pair of flat-flame burners which lit the bridge well enough without throwing too much glare upon the surface of the stream below. The County Council are doing away with the standards, and fixing light cast-iron columns in their place—a work which is necessitating a good deal of cutting of the granite parapet. Of the new lamp-posts, the best that can be said is that they are inoffensive without the lanterns. What the lighting will look like when finished after the new pattern, remains to be judged. We hope to criticize it, at the proper time, as an example of the best that modern street-lighting practice, according to English ideas, can offer for a site which is part of the centre of the British Empire.

The "Builder" for last Friday week contained the following editorial note on the matter here referred to: "A piece of County Council vandalism is in course of perpetration at Waterloo Bridge which ought to be energetically protested against. The cast-iron lamp standards on the bridge are of unusual and very dignified design. They were obviously intended to suit the monumental style of the bridge, and may be regarded as part of the design. Three or four of these are now being removed—or rather have been removed—to make way for modern thin cylindrical lamp-posts of perfectly inferior character. We are informed that these are for electric light, and that the remainder of the old lamp-posts will remain. We presume it has not occurred to anyone concerned that they are thus spoiling Waterloo Bridge. Surely the old standards could have been adapted to carry an electric light lantern; and even if they could not, the new posts might at least have been designed in the same style and proportions as the old. It is, as far as we can see, a very stupid piece of work, and a wanton injury to the effect of our grand bridge."

## NOTES.

### A Comparison of Standards of Light.

M. Laporte has carried out some experiments with the view of ascertaining the relation of the different standards of light one to the other; and the results have been published in the "Bulletin de la Société Internationale des Electriciens." He selected as his standard an incandescent electric lamp; and his comparisons were made with the carcel lamp, the Hefner-Altenack amyl-acetate lamp, paraffin candles, and decimal candles. The results are as follows:—

|                   | Decimal Candles. | Carcel Lamp. | Hefner Lamp. | Paraffin Candles. | Standard Lamp. |
|-------------------|------------------|--------------|--------------|-------------------|----------------|
| Decimal candle .  | 1'000 ..         | 0'104 ..     | 1'13 ..      | 0'955 ..          | 0'305          |
| Carcel lamp .     | 9'600 ..         | 1'000 ..     | 10'90 ..     | 9'200 ..          | 2'930          |
| Hefner lamp .     | 0'885 ..         | 0'092 ..     | 1'00 ..      | 0'815 ..          | 0'268          |
| Paraffin candle . | 1'050 ..         | 0'109 ..     | 1'23 ..      | 1'000 ..          | 0'319          |
| Standard lamp .   | 3'280 ..         | 0'341 ..     | 3'72 ..      | 0'193 ..          | 1'000          |

### Illuminating Power and Flash-Point of Petroleum Oils.

There have been many complaints of the common American petroleum oil of 21° C., Abel test, imported into Germany—not, however, as in England on account of the alleged "deadly low flash-point," but on the score of deficiency of illuminating power and ready explosibility. It was argued that the evil might be remedied by fixing a standard candle power for these oils; but Herr R. Kissling mentions in the "Chemiker Zeitung," by way of commenting upon this argument, that there is no known connection between the illuminating power of petroleum and its safety in use. Moreover, it would be exceedingly difficult to fix a minimum candle power for lamp oils, owing to the practical impossibility of making reliable photometrical tests upon lamps with wicks. Nor does the proportion of paraffin in a burning oil bear any determinable relation to the illuminating value of the oil, in the small proportions in which it usually occurs in the commercial article. It is possible to increase the illuminating power of an oil by adding spermaceti or paraffin to it in considerable quantity; but if the weather should be very cold, this solid would settle out of the oil, and consequently affect the illuminating power in this way. Practically, Herr Kissling does not see that anything more than the Abel test is required to safeguard the users of petroleum lamp oil in Germany—the flash-point being more than 3° Fahr. lower than the law of England requires.

### Strengthening Iron Castings.

A curious observation on the production of molecular changes in cast iron by vibration is due to Mr. A. E. Outerbridge, as described in a Franklin Institute report. It appears that, having occasion to test for strength a number of sample cast-iron bars, Mr. Outerbridge detected in some of the specimens an amount of deviation from the expected standard which aroused his curiosity. He found that the only assignable cause for the increased strength was the fact that the specimens, contrary to the usual custom, had been rumpled in a mill in order to clean them. Mr. Outerbridge followed up this clue with a careful and systematic investigation of the effect of vibration upon cast iron; confining his inquiry in the first place to small castings. The principal fruit of this investigation has been, as the report states, to upset some of the ideas previously prevalent concerning cast iron; so that whereas formerly it was thought necessary to protect small and light iron castings from shock, it is now made apparent that such articles may be



generally strengthened and relieved of their internal cooling strains by judicious treatment in this way. It has been found that where the proper conditions are observed, there will be a decided gain of strength in almost every case—at times rising as high as 35 or 40 per cent. for rumbled as compared with un-rumbled bars of the same composition. For his meritorious work in this field, Mr. Outerbridge has been awarded the John Scott Legacy Premium and Medal.

#### The Condition of Boiler Furnace Efficiency.

Mr. W. H. Booth re-states, in the "American Machinist," the truth established by Herr F. Siemens—but not as yet generally understood or appreciated—as to the proper way of heating surfaces by flame or hot gases. As Mr. Booth remarks, the main principle is this: No substance will ignite unless it is first raised to a certain temperature; and it will not burn freely unless allowed to get hotter than the minimum temperature of ignition. In the case of coal and coal gas, this minimum temperature of ignition may be taken at 800° Fahr., and of continuous combustion at 1000° Fahr. A full furnace temperature may well be 2500° Fahr., which is amply sufficient for throwing off large volumes of gas from freshly-charged fuel, and setting it burning freely. But if we allow these freshly-ignited gases to flow among a nest of cold-water tubes, the flame will be so cooled that it will either become imperfect or go out altogether. This fact explains the reason why such excellent results have been attained by boiler-settings in which the furnace and combustion chamber are kept from the cold metal—sometimes being placed outside the boiler itself. The great object is that of permitting the flame to burn itself out, and only to permit the hot products of combustion to come into contact with the cold boiler surfaces. Of course, the principle requires to be applied with discretion; experience alone being competent to direct how much brickwork should go to the construction of a boiler furnace, and how it should be disposed. It may be placed so as to show a cellular structure; the plates being exposed at the openings only. It may also be placed in the flue as a series of narrow rings, each of which will stop the flow along the plates of any stream of gas from the furnace. The latter device was patented by Herr F. Siemens; but information respecting its use is wanting.

#### A Discussion of the Electrolysis of Gas and Water Pipes.

The subject of the electrolysis of gas and water mains by currents of electricity derived from electrical tramways is discussed by Mr. Albert B. Herrick in "Engineering Magazine." The phenomenon is simple, and capable of easy explanation. Following the usual custom of working trolley-wire tramcars, the trolley-wire is fed from the positive pole of the generator; the current passes through the motors, performing its work of propelling the car, and is then delivered to the rails. So far the current is confined to a definite path. On reaching the rail it may either follow the rail itself back to the power station, or ramify through the earth. It invariably follows the path of least electrical resistance. Sometimes it travels by the gas and water mains; but in passing from one metallic body embedded in the earth to another, the current always carries with it a portion of the substance of its late conductor. It is this action which constitutes electrolysis of the rails when the current leaves them to seek the hospitality of the street mains, and of the latter when it quits them to return to the power station. It is evident that wherever open joints occur, either in the rails or the mains, the current will bridge the gap at the expense of more electrolysis. This is the *rationale* of the operation, of which we are likely to hear more in the future. If the rails could be made and maintained as a continuous conductor, capable of taking all the return current, the trouble of electrolysis would not arise; but the condition is by no means easy of fulfilment. Mr. Herrick takes the view that there is no panacea for the evils arising from electrolysis, but that cure or palliation must be sought by attention to details. Fortunately, cast-iron pipes and fittings do not suffer from electrolysis so rapidly as wrought-iron pipes or lead and brass connections. The latter are very quickly attacked. Gas-pipes carrying an insulating medium are not so subject to this mischief, unless the ground return of the tramway is in a very bad state. Mr. Herrick describes the tests for vagrant currents, and gives directions for restraining them and minimizing their effects. He raises a very debatable point, however, by declaring that "if loam or clay be charged with coal gas or sewer gas, the resistance is greatly reduced." This statement conjures up the ghost of "contributory negligence" in anything but a pleasant shape.

#### Petroleum Vapour Burners.

In the issue of the "Engineer" for July 15, there appears a useful illustrated summary, by Mr. J. S. V. Bickford, of the known practical methods for producing and burning petroleum vapour by means of modified bunsen and blow-pipe burners. The most obvious way of burning this vapour is by a plain jet; the oil being previously vaporized by heating in some kind of retort. Mr. Bickford describes the burner he used for experimental work with petroleum vapour; and he remarks that one of the essentials of all arrangements of the kind is a device for steadying the generation of the vapour. Next, as regards the combustion of the vapour, it is the fact that if a jet of plain petroleum vapour is issuing from a nozzle at a velocity due to a pressure exceeding about 1 lb. per square inch, it will not burn

unless it is either kept in contact with a flame, or impinges upon some solid obstruction. It is also found that the colour of the flame depends upon the distance from the nozzle at which the first ignition is effected. This, of course, is a question of the proportion of air that mixes with the vapour before ignition. In general, the vapour jet is kept alight by the use of an interrupter of some sort—usually the vaporizer itself. But sometimes the vaporizer is not found to offer sufficient resistance, as in the Wells heating and lighting burners; and other means have to be used to increase the effect. The construction of the Wells burner is described. The actual effect of interrupting a jet of petroleum vapour is to check the flow, and thus to permit of its remaining alight. In the Seigel patent lamp, and in many others, the interrupter is in the form of a truncated cone. Mr. Bickford remarks that some peculiar effects can be produced with a sheet of course gauze or a fine grating held at different distances from the nozzle from which the petroleum vapour is being discharged. Unexpected difficulty was encountered when the attempt was made to produce a petroleum vapour blowpipe by copying the usual arrangement for gas blowpipes of a pair of concentric tubes. The air blast blew out the flame. Mr. Bickford recounts the stages through which he passed in his endeavour to produce a petroleum vapour blast flame that should be both smokeless and noiseless. He found that it is not practicable to make an economical burner of the kind that shall be absolutely silent in working. This could be done, he thinks, if the petroleum vapour could be mixed in a close chamber with all the air it needs for complete combustion, so that no addition of air at the point of ignition would be necessary. The article is interesting as a description of experimental work upon the bunsen burner from a different starting-point to that occupied when coal gas is the combustible used.

## TECHNICAL RECORD.

### GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

#### The Annual Meeting at Nuremberg.

The Thirty-eighth Annual Meeting of this Association was held at Nuremberg, from June 29 to July 2, in accordance with the programme which was announced in the "JOURNAL" for June 7 (p. 1318).

Inclined retorts formed the subject of a report by Herr Reissner, of Berlin. He stated that 4485 retorts of this description were in use, and 2500 in course of erection, in England; while on the Continent 1392 were now in use, and 2655 in course of erection.

Dr. Leybold, of Hamburg, and Dr. Strache, of Vienna, both gave papers on "Water Gas." Dr. Leybold's was an exhaustive summary of the experiences with water gas gained during the past ten years in the United States, and in England and other parts of Europe. The following details of experiments carried out by the author at Brussels were, however, included in the paper: Various descriptions of German gas oils were used for the production of gas of 13 to 15 candle power. Blows of 3 minutes' and runs of 6 minutes' duration were adopted; and clinker was removed twice daily. A larger quantity of coke was consumed in the gasification of heavy oils than in that of light oils. Wages amounted to about 12s. 6d. per 353,170 cubic feet (10,000 cubic metres) of carburetted water gas made. The cost of producing this quantity of the gas from different oils, was approximately as follows:—

| Oil Used.                      | 14-Candle Gas. | 17½-Candle Gas. |
|--------------------------------|----------------|-----------------|
| Petroleum (duty neglected) ..  | £1 17 4 ..     | £2 11 9         |
| Gas oil from Halle . . . . .   | 2 0 0 ..       | 2 16 0          |
| Heavy oil from Halle . . . . . | 2 2 6 ..       | 2 19 3          |
| Gas oil from Messel . . . . .  | 2 3 6 ..       | 3 1 9           |

The two generators were actually in use only during the period from October to February, and even then were generally only worked during the day. The total make in this time amounted to 95,356,000 cubic feet; and the consumption of oil in the manufacture of 14-candle gas was about 26½ lbs. per 1000 cubic feet. The adoption of carburetted water gas on a considerable scale in Germany would therefore give a great impetus to the national oil industry.

Dr. Strache's paper discussed the chief points of his process for the production of non-carburetted water gas from coal, and the use of the gas for illuminating purposes by means of the incandescent system of lighting. The more important facts connected with Dr. Strache's system have already been given in the "JOURNAL."\* The inventor hopes to be able shortly to reduce the consumption of coal in the production of simple water gas to 31 lbs. per 1000 cubic feet. He now imparts an odour to the gas by means of carbylamine of 50 per cent. strength, in place of mercaptan which he used formerly. The cost of odorizing the gas by carbylamine is about ¾d. per 1000 cubic feet. The incandescent burners for simple water gas are made in five sizes, giving illuminating powers ranging from 22 to 130 candles. The consumption of gas varies from 48 to 68½ cubic feet per 1000 candle-hours. Dr. Strache considered benzene superior to acetylene as a carburetting agent for water gas.

\* See Vol. LXX., p. 897.



Herr Liebetanz, of Düsseldorf, subsequently gave a paper on "Acetylene;" but it embodied no novel information.

Dr. Bunte, of Carlsruhe, gave a very interesting lecture, illustrated by numerous experimental demonstrations, on liquefied air. He was assisted by Dr. Sieder, of Munich.

The annual report presented to the meeting referred to the completion of the fortieth year of the existence of the "Journal für Gasbeleuchtung," which was first published on July 1, 1858, and the issue of which heralded by a few months the birth of the Association of which it has continued up to the present time to be the official organ. During the past year, conferences have been held with the Union of German Gas-holder Makers; and the conclusions arrived at are embodied in a report, which will be issued shortly. A Committee appointed at the last annual general meeting of the Association to report on the Electrolytic Action of Tramway Currents on Mains, entered into negotiations with the Union of German Electricians; and a Committee of the latter body was appointed to assist in the investigation. Up to the present, the two Committees have been unable to meet together; but some work has been done by correspondence and exchange of literature. The conditions of labour in German gas-works have been carefully investigated by the Council of the Association; and reports on the subject have been collected from about seventy large works in various parts of the empire. The prize competition for Coke-Stoves promoted by the Association\* resulted in descriptions and drawings of 35 stoves being presented on Sept. 1, 1897; but only 24 of the stoves were actually sent to the gas-works at Hanover by Nov. 1, for trial. These were examined by Drs. Plinke and Lubberger; and 14 were chosen for a closer examination, which is still in hand.

With regard to Water Supply, Herr E. Grahn, at the instance of the Association, undertook to collect statistics; and the first volume of his work on the "Water Supply of the German Empire" is now in the press. It treats of Prussia; and the remaining states will be dealt with in a second volume, which will probably appear at the end of the year. The first volume contains 400 tables, and gives information with regard to over 1200 places in Prussia.

The Photometrical Commission of the Association have held two meetings during the year, and have presented a provisional report to the meeting. The Gas-Meter Commission have investigated prepayment meters; and in the course of the next year, will collect information concerning the results of their introduction in various places. The Commission have also had under consideration two communications from the Imperial Standards Commission. The Committees of the Association appointed to investigate the subject of Heating by Gas and to collect Water Statistics, have continued their work, commenced in earlier years. The Commission on Inclined Retorts, which issued an exhaustive report last year, have during this year given special attention to the question of the patent rights with regard to them. The Instruction Committee last year formulated their views as to the training and instruction of technical men; and this year two attempts have been made to carry them out in practice. An eight days' practical course of instruction was given in the spring at the Chemical-Technical Institute at Carlsruhe; and eighteen gas managers and engineers availed themselves of it. The latest chemical aids to the regulation of gas manufacture, and to the valuation of raw materials and bye-products, were explained, both in the laboratory and on the local gas-works. Last October, a school for gas-fitters was opened at Dessau; and twelve pupils were admitted. The results so far have proved very encouraging.

The eighteenth volume of Gas Statistics has been issued during the past year, and includes the returns from 204 gas undertakings for 1896 or 1896-97. With few exceptions, the returns indicate a considerable increase in the production. The following are some of the most notable increases over the make of the preceding year: Berlin municipal works, 326,680,000 cubic feet; Charlottenburg, 70,634,000 cubic feet; Cologne, 49,450,000 cubic feet; Leipsic, 45,900,000 cubic feet; Dresden, 44,150,000 cubic feet; Düsseldorf, 42,380,000 cubic feet; Hamburg, 38,850,000 cubic feet; Elberfeld, 35,300,000 cubic feet; and Nuremberg, 17,650,000 cubic feet. The greater part of the increased consumption can be traced to the extension of the use of gas-engines and gas-fires.

The Association now has 1 honorary member, 600 members, and 144 associates. During the past year, there have been 36 members and 12 associates elected; while 17 members and 3 associates have been removed from the roll by death or otherwise. The number of affiliated Associations is seven. The Marks Association of Gas and Water Engineers, of which Herr A. Müller, of Charlottenburg, is President, held their eighteenth annual meeting in August last, at Salzwedel, and a winter meeting in February at Berlin. The members of the Association now number 159. The Mid-Rhenish Gas and Water Engineers' Association held their thirty-fourth annual meeting at Heilbronn in August last, under the presidency of Herr Merz, of Cassel. Several interesting papers were read at the meeting. There are 132 members of the Association. The Association of Gas and Water Engineers of Silesia and Lausitz held their twenty-ninth annual general meeting in August last, at Schweidnitz, when

about half of the 112 members of the Association were present. Herr Thomas has been President of the Association for ten years, but has now retired in favour of Herr G. Happach, under whose presidency the next meeting at Glogau will be held. The Association of Gas, Electrical, and Water Engineers of the Rhine Provinces and Westphalia held their annual meeting at Bonn, in August last, under the presidency of Herr Söhren, of that town. A second meeting was held at Cologne in November last; and a social gathering in commemoration of the twenty-fifth anniversary of the foundation of the Association took place on March 20, in the same city. A fourth meeting was held in May last. The Bavarian Association of Gas and Water Engineers held their thirteenth annual meeting in April last, at Ansbach, under the presidency of Herr Ruoff, of Ratisbon. The Association has 108 members. The Association of Gas and Water Engineers of Saxony-Thuringia held their forty-fourth annual meeting on March 6, at Chemnitz. The President is Herr Achtermann, of Annaberg. The membership numbers 130. The seventh affiliated Association is the Baltic Association of Gas and Water Engineers, which has not at present issued a report for the year.

THE CARBURATION PROCESS AT HASTINGS.

In the course of the remarks made by Mr. C. E. Botley upon Messrs. S. & T. Glover's paper on "A New Departure in Carbonizing," read at the recent meeting of the Institution of Gas Engineers, he gave a few figures showing the result of the introduction at the Hastings Gas-Works of the gas carburization process devised by himself and his son (Mr. C. F. Botley), and described by them in a paper read at the meeting of the Institution in 1897. We have received the following additional statistics in regard to the process, which is now only used to retain the naphthalene in the coal gas:—

In the year 1897, the quantity of gas sold was 366,426,000 cubic feet; and the oil account stood thus: Oil for process, 2940 gallons; deduct new oil used on works or sold, 226 gallons—leaving 2264 gallons used. This was disposed of thus—

|                           |                |                  |
|---------------------------|----------------|------------------|
| Suspended                 | 1352'00 galls. | 59'71 per cent.  |
| Recovered                 | 850'75 "       | 37'57 "          |
| Unaccounted for, or waste | 61'25 "        | 2'72 "           |
|                           | 2264'00 galls. | 100'00 per cent. |

|                                  |  |          |
|----------------------------------|--|----------|
| Used for carburization—          |  |          |
| Canneline, 205 gallons, at 10d.  |  | £8 10 10 |
| Tea rose, 2059 gallons, at 5'2d. |  | 44 12 3  |

|                                                                           |         |
|---------------------------------------------------------------------------|---------|
|                                                                           | £53 3 1 |
| Recovered and used for carburetted water gas, &c., 850'75 gallons, at 3d. | 10 12 8 |

|                 |          |
|-----------------|----------|
| Net cost of oil | £42 10 5 |
|-----------------|----------|

Total Cost of the Process.

|                                                                             |          | Per 1000 Cub. Ft. of Gas Sold. |
|-----------------------------------------------------------------------------|----------|--------------------------------|
| Oil, as above                                                               | £42 10 5 | 0'028d.                        |
| Other charges, including steam, labour, repairs, and allowance for interest | 110 3 1  | 0'072                          |
| Total                                                                       | 152 13 6 | 0'100d.                        |
| 0'100d. per 1000 feet sold, or (say) 1d. per ton.                           |          |                                |

Results of the Process.

| Year.           | Naphthalene Stoppages. | Average per Day. |
|-----------------|------------------------|------------------|
| 1893            | 4948                   | 13'55            |
| 1894            | 4167                   | 11'41            |
| 1895            | 7125                   | 19'52            |
| 1896            | 1667                   | 4'55             |
| 1897            | 768                    | 2'10             |
| 1898 (159 days) | 210                    | 1'32             |

Results Stated as Ratios.

| Year. | Stoppages: Consumers. | Stoppages: Each 1000 Cubic Feet Sold. |
|-------|-----------------------|---------------------------------------|
| 1893  | 0'813                 | 0'0157                                |
| 1894  | 0'678                 | 0'0128                                |
| 1895  | 1'092                 | 0'0207                                |
| 1896  | 0'238                 | 0'0047                                |
| 1897  | 0'100                 | 0'00209                               |

Notes and Comparisons, 1896 and 1897.

|                                                          | Year 1896.     | Year 1897.     |
|----------------------------------------------------------|----------------|----------------|
| Oil per 1000 cubic feet of gas sold                      | 0'022 gall.    | 0'066 gall.    |
| Oil suspended                                            | 0'017 "        | "              |
| Percentage of oil suspended                              | 75             | 60             |
| Gas carburated by one gallon of oil used (approximately) | 45,000 c. ft.  | 166,000 c. ft. |
| Cost of oil per 1000 cubic feet for carburization        | 0'173d.        | 0'028d.        |
| Total cost of process per 1000 cubic feet of gas sold    | 0'24d.         | 0'100d.        |
| Water gas made during 1897                               | 8'00 per cent. | "              |
| Cannel used                                              | 1'82 "         | "              |

\* See "JOURNAL," Vol. LXIX., p. 231. † Ibid., Vol. LXX., p. 795.

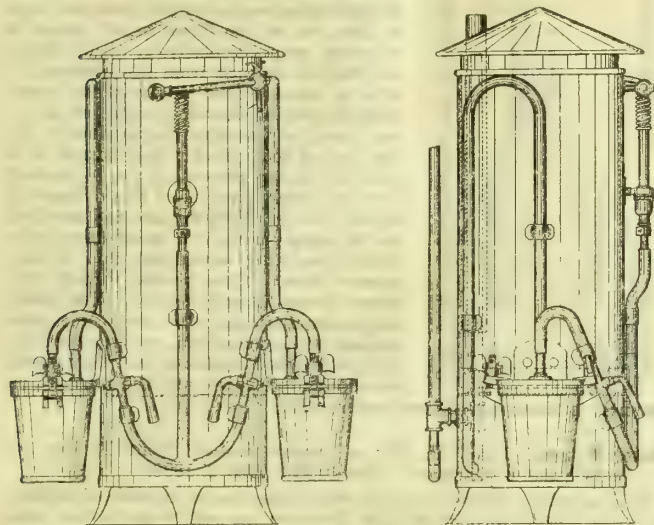
\* Most of the stoppages were due to known causes other than naphthalene. The remainder may or may not have been caused by naphthalene.



## REGISTER OF PATENTS.

**Making Acetylene.**—Ackroyd, J. & B., of Cullingworth, No. 16,344; July 10, 1897.

This apparatus (shown in front and side elevation) consists of an upper and lower water-vessel divided by a horizontal partition. A gas-holder is placed in the upper vessel, which is free to rise and fall on the same principle as if used for ordinary illuminating gas. A detachable generator is provided, the cover of which is preferably permanently fixed to the upper water-vessel. The gas-passage from the generator is connected to the cover, and passes up above the maximum level of the water in the upper vessel, and then down—entering the lower vessel at or near the bottom. The gas-passage from the lower vessel is connected to the top of this vessel, and reaches up above the maximum level of the water in the upper vessel. The water-supply passage between the generator and the upper vessel leaves the latter at a point below the minimum working level of the water therein, and is then bent down far enough to form a

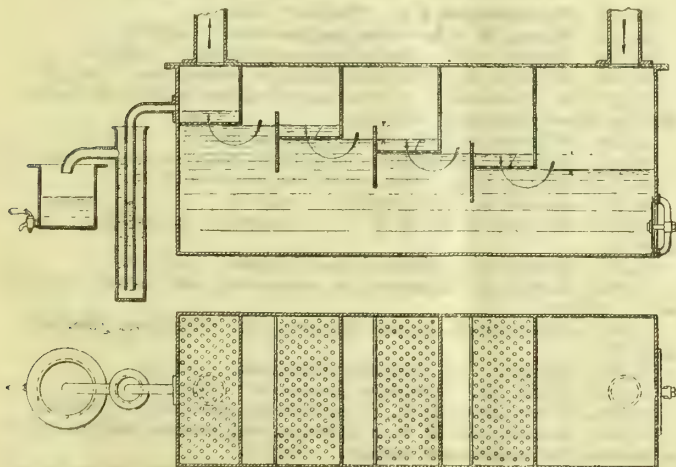


trap or water-seal; then up again, and connected to the cover of the generator. The passage is fitted with a valve normally kept closed by a spring; and a lever is provided arranged to be operated by a projection on the holder, opening the valve and admitting water to the generator when the holder falls to a certain point.

In operation, the water-level in the lower vessel is kept below the level of the cross partition, so as not to interfere with the passage of the gas. This is effected by fitting the filling aperture some distance below the level of the partition. A safety-device is fitted to the generator, consisting of a bent pipe in the form of a water-trap, and connected to a ventilating pipe. Between the end of the trap and the ventilating pipe an enlargement is provided, into which the water from the trap is forced, in case of excessive pressure—leaving a free passage to the ventilating pipe; and it is so arranged that when the abnormal pressure subsides, the water flows back into the trap.

**Washing or Scrubbing Gases.**—Lake, H. H.; a communication from Fellner and Ziegler, of Bockenheim, Germany. No. 17,644; July 27, 1897.

This apparatus for purifying gases by washing or scrubbing is designed to enable currents of gas to be freed from any impurities which they may carry along with them, or, in the case of mixed gases, to enable any particular gas to be absorbed by water or other liquid. In order to completely fulfil these objects, the apparatus is arranged to repeat the washing or scrubbing operation several times over in the same liquid; and means are provided whereby, when the pressure employed for forcing the gases through the washing or scrubbing liquid ceases to act, the liquid is prevented from being drawn back by suction through the gas inlet-orifice.

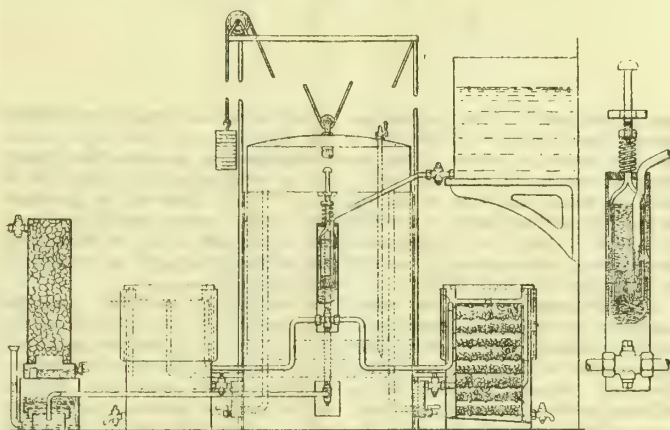


The apparatus shown comprises a chamber divided into a number of spaces or compartments by partitions extending from the roof. This latter contains the washing or scrubbing liquid; and the partitions are of gradually increasing length, and are so arranged that when the gas pressure is turned on, the liquid assumes different levels on opposite sides

of each of the partitions—its surface taking a cascade or steplike form. The gas bubbles up under the edges of the partitions, commencing with the longest, and passes in this way from compartment to compartment. Between each pair of the partitions are arranged subsidiary partitions, the purpose of which is to assist the liquid to assume the different levels referred to; and from each of the main partitions extends a horizontally axial or perforated plate for the gas to bubble through. The gas, together with any impurity with which it may be charged, is admitted to the end compartment adjacent to the longest partition, and discharged from the other end compartment of the chamber. The horizontal grids may consist of perforated sheets of metal, which serve for breaking up the gas bubbles, and afford a maximum surface for the purifying or scrubbing operation, which accordingly takes place within the limits set by the level of the water through which the gas bubbles pass. The subsidiary short vertical partitions are arranged vertically at different levels in relation to each other, and extend through the whole width of the apparatus; while they are in all cases situated at such a distance from the top of the chamber as to leave ample space for the passage of the gases.

**Manufacture of Acetylene.**—Bull, J. C.; a communication from Josse and Defays, of Lille, France. No. 18,355; Aug. 6, 1897.

This apparatus comprises essentially two or more generators for containing the calcium carbide; a gasholder for storing and equalizing the pressure of the gas; a water tank or reservoir in communication with the generators through the medium of a special form of mercurial valve, adapted to be operated by the movement of the bell of the holder; and a washer or purifier through which the gas passes on its way to the burners.



The generators consist of suitably shaped receptacles adapted to be closed by a lid, so as to make a gas-tight joint (preferably by means of a water-seal), and also to contain a series of shallow trays which rest on each other, and which contain the calcium carbide. The bottoms of the trays may be perforated in any suitable manner; but they are preferably formed with cone-shaped projections on each side—the apices of the cones being cut off or formed with holes or perforations. It will be seen that the bottom of one tray forms the lid of the one immediately below it. Plug-cocks are provided at or near the bottom of the generators, to allow of the unused water and chalk being drawn off, and also to allow of the escape of air when the generator is started after being recharged.

On the lower outside casing or fixed portion of the gasholder is the mercurial valve referred to, and shown in detail at the right-hand side of the engraving. It is constructed on the principle of the difference in the densities of liquids—in the present case, on the difference between the density of mercury and water. As mercury has a density of 13.5 and water only of 1, it is necessary that the water column shall be 13.5 times higher than that of mercury in order that it shall overcome the resistance of the mercury.

In carrying this principle into effect, the present inventor uses a suitably shaped receptacle adapted to contain water, and within which receptacle is suspended another receptacle containing mercury. The outer receptacle is fixed to the outside casing or fixed portion of the holder. Dipping into the mercury contained in the inner receptacle, is an open tube or pipe for conducting the water from the tank or reservoir, the water in which is preferably kept at a uniform level by a ball-cock or the like. The inner receptacle is kept in its normal position—that is, with the mercury covering the end of the water-tube—by means of a spring, so that no water is able to pass from the tank or reservoir into it. At or near the bottom of the outer or fixed receptacle, is a two-way cock, communicating with either one of the generators which are situated below the mercurial valve. The pipes enter the generators in any suitable position; but their free or delivery ends are situated at or near the tops of the generators—means being provided to prevent the entering water from attacking the calcium carbide contained in any but the lowest tray which has been unacted upon.

A rod carrying the receptacle containing the mercury is acted upon by means of a projecting stop or bracket carried by the upper portion of the gasholder, when this portion of the holder nearly reaches its lowest position—that is to say, when there is very little gas left in it.

As the gas is expended, the holder sinks, and thus operates the rod and depresses the mercury-containing vessel. This causes the end of the water-pipe to become uncovered more or less, and so allows a certain proportion of water to flow in from the tank or reservoir. The water overflows the inner receptacle into the outer one, and so raises the height of water contained therein, and therefore increases the pressure. This allows an equivalent amount of water to flow into one of the generators and act on the calcium carbide. The generated gas is led from the upper portion of the containers by means of pipes into the holder, the bell of which will then rise, and the stop thereon will no longer engage with the rod of the mercury-containing receptacle, which will be returned to its normal position by means of the spring, and so prevent more flowing into the generator until the bell of the holder again descends.

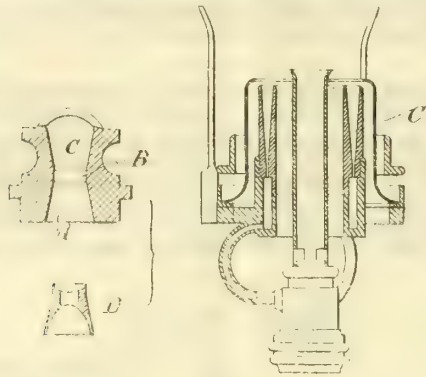


**Gas-Burners.**—Sugg, W. T., of Regency Street, Westminster, S.W. No. 19,354; Aug. 21, 1897.

This invention relates to "a gas-burner provided with an expanding chamber, in which the gas can expand so that its velocity is decreased before it arrives at the point of ignition."

In the accompanying engraving are shown (in sectional elevation) the invention as applied to a table-top flat-flame burner, and to a Sugg's "London" argand burner.

In the former, the lower part A of the burner is made of conical or similar shape, leading up to a contracted opening B, with parallel sides. From the opening B, the sides of the passage through the burner expand, as at C. The angle of inclination will vary slightly, according to the size of the burner and the illuminating power of the gas; but generally the inclination may be said to vary from 10° to 20° from the vertical. In a burner to be used without a governor, the area of the

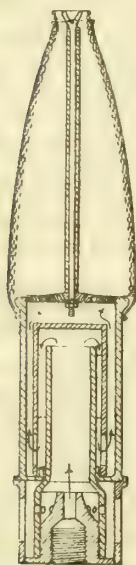


contracted part B of the gas-passage should be about equal to, or slightly larger than, the area of the slit in the rounded top; but as it is impossible, from the nature of the tools employed, to produce the proper form of expansion chamber with such a small opening, a plug D is used to reduce the size of the opening. When, however, a governor is applied, so that the pressure of the gas to the burner can be reduced to 2-10ths, 3-10ths, or 4-10ths, according to the size of burner, this extra constriction is unnecessary; and the size of the opening B, as compared with the gas-slit, may be as 6 to 1, or thereabouts.

In the argand burner, the conditions are slightly modified; and the length of the expanding chamber C is increased, and its width in cross section reduced. In this case, there is no issuing slit; but the gas burns at the outlet of the expanding chamber. The same principle is, however, involved—namely, to delay the upward movement of the gas. This is effected by the expansion; so that, "at the point of ignition, the velocity is so reduced, whereby the gas is longer in contact with the air, and more perfect combustion takes place, thus reducing smoke. A better-shaped flame is also ensured; because what pressure there is, is spread evenly over the whole of the gas slit or opening; and the formation of forks or points is prevented. If more perfect combustion takes place, then there is obviously an increase of illuminating power, as the carbon, instead of being given off in the form of smoke, is consumed."

**Incandescent Gas-Burners.**—Salzenberg, E., of Crefeld, Germany. No. 20,319; Sept. 3, 1897.

The present invention is said to be based upon the discovery that, when the pressure of the gas is considerably increased upon an incandescence body, the body "emits a golden yellow light very agreeable to the eye, and which light displays objects in their natural colours." Hitherto, the patentee remarks, it has been impossible to make use of greater pressure of gas than usual, because of the sensitiveness of the incandescence body, and because the suspended body is broken up by high gas pressure, and in consequence of its light weight is blown away from the burner. The applicant has, however, discovered that yellow light and a great intensity of lighting can be obtained by means of a considerably increased gas pressure, on condition that the incandescence body is made use of in such manner as to render it possible to withstand the high gas pressure without breaking up and being blown away.



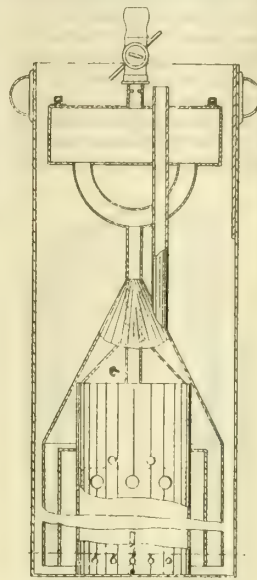
His proposal is that the gas should be supplied to the burner at a pressure of about three atmospheres or upwards; and in order to render this possible, the incandescence body is attached to the burner by means of incombustible fastenings in such a manner as to be capable of withstanding the pressure. By this means, it is claimed that a single incandescence jet of the usual size can evolve a light of up to 1000 candles. On application of extremely high gas pressure, pointed flames are evolved when a single mantle is used, which flames pass out between the meshes of the mantle; but this drawback can be avoided by drawing several mantles in the unburned state over one another, and then incinerating the whole. Or a single mantle constructed of several layers of fabric may be employed; the pointed flames formed on the innermost mantle layers then impinge against the threads of the outer layers, and are thereby broken up and prevented from passing through.

To fasten the incandescence body, it is proposed (as shown in the engraving) to place the mantles one upon another in the unburned condition, and incombustible threads of asbestos, platinum, or the like passed through them. After the combustion of the mantles, these threads are so secured around the outermost layer of incandescence material, as well as to the burner or burner support, that the incandescence body is enclosed with a netting of incombustible threads or wires, and cannot be blown off or destroyed by any pressure. The mantle support, which, in consequence of the pressure, is easily burned away, is preferably protected by a cover

of incombustible material—such, for instance, as asbestos, platinum, or fire-clay.

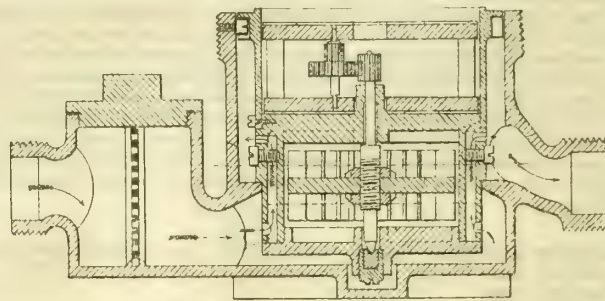
**Acetylene Gas Producer.**—Thiersant, H. de, of Fulham Road, S.W., and Coulson, W. A., of Kyverdale Road, N. No. 29,571; Dec. 14, 1897.

In this arrangement (as shown) there is an outer vessel containing water, and receiving the main portion of the apparatus, which consists of a cylinder communicating by means of curved tubes, from the bottom, to an upright tube, which in its turn communicates with a receiver below, into which the receptacle for the carbide is placed. Outside this receiver, and about two-thirds of its height, is an outer gallery communicating with the receiver by means of small holes at the top and bottom. Covering the carbide receptacle and the receiver with its outer gallery, is a cone-shaped vessel attached at the top to an upright tube, and descending at an angle until it reaches close to the side of the outer vessel, when it descends perpendicularly to within about one-third of an inch from the bottom. A tube is inserted near the top of this cone-shaped covering, for the purpose of carrying away any surplus gas produced. At the top of the cylinder first named is a tube with a tap permitting gas to proceed into the supply-pipes; and at a distance of about 18 inches from the tap, and attached to the supply-pipe, is a small metal tube filter containing amianthus and broken pumice stone. After passing through this filter, the gas is ready for use. The working is automatic, as water only comes into contact with the carbide, and produces the acetylene when sufficient has been burnt or allowed to escape; and the pressure on the water is thus removed from underneath.



**Water-Meters.**—Lake, H. H.; a communication from F. Lux, of Ludwigshafen, Germany. No. 10,043; May 2, 1898.

This invention relates to a vane-wheel water-meter, capable of measuring water flowing through it in the direction opposed to that of the usual flow. The apparatus is arranged in such a manner that the passages provided in the walls of the measuring cylinder are horizontal, one above the other, and are of the same size, but run in opposite directions. Upon both the base and cover of the measuring vessel or space, are provided stemming or damming ribs of triangular cross-section, so arranged that



water flowing in from below strikes against their vertical faces, while water flowing in from above strikes against their inclined faces. In consequence of this, the vane-wheel, in spite of being more heavily loaded with the water flowing in the backward direction, makes exactly the same number of revolutions, only in the reverse direction, for each unit of measurement of water flowing backwards as for each unit flowing in the forward direction.

#### APPLICATIONS FOR LETTERS PATENT.

- 15,174.—FEATHERSTONE, J. L., "Valves." July 11.
- 15,175.—MARRS, W., "Acetylene gas generator." July 11.
- 15,179.—DELMOULY, E., "Generating acetylene gas." July 11.
- 15,207.—MACTEAR, J., "Obtaining cyanogen compounds." July 11.
- 15,212-3-4.—DILLBERG, G., "Treatment of calcium carbide for the production of acetylene gas." July 11.
- 15,229.—WHITEREAD, S. J., "Coin-freed gas-meters." July 11.
- 15,241.—BOSS, J., "Generating and utilizing acetylene gas." July 12.
- 15,245.—COLLIS, A. B., "Gas and oil engines." July 12.
- 15,260.—BROWN, C., "Gas-engines." July 12.
- 15,271.—MILLER, C. A. & F. J., "Generator for acetylene gas." July 12.
- 15,275.—FOSTER, H., "Gas and other engines." July 12.
- 15,291.—KEITH, J., "Pumping or compressing and mixing gas and air." July 12.
- 15,367.—ARMITAGE, J. A., and RAMSDEN, E., "Acetylene generator." July 13.
- 15,382.—SOUTHALL, J., "Gas and oil engines." July 13.
- 15,394.—MYERS, R., "Acetylene generators." July 13.
- 15,396.—BAUMGARTEN, D. L., "Acetylene gas generators." July 13.
- 15,404.—KOLLENBERG, H. F., "Fastening and securing the lower part of mantles for incandescent burners." July 13.
- 15,414.—PIERON, L., "Compound bodies or substances for producing automatic ignition of combustible gases." July 13.
- 15,423.—BOHNE, M., "Acetylene gas generators." July 13.
- 15,462.—WIGHAM, J. R., "Illuminating buoys and beacons." July 14.
- 15,606.—AULTON, H., "Acetylene gas lamps." July 16.
- 15,624.—KIRKHAM, W., "Reversing valves for regenerative gas-furnaces." July 16.



## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

## Meeting Extraordinary Claims Out of Reserve Funds.

SIR,—So far as I am aware, there is no legal definition of the expression "extraordinary claim or demand" in the Gas-Works Clauses Act, 1847, beyond that which is afforded by the more ample phraseology of later Acts by which the dual application of the reserve fund to supply a deficiency in dividend and to meet an extraordinary claim has been differentiated, and two distinct funds have been set up—the one to supplement the dividend, and the other to meet claims. This later phraseology is "any extraordinary claim, demand, or charge which may at any time arise against or fall upon the company from accident, strikes, or other circumstances which in the opinion of [the controlling authority] due care and management could not have prevented."

But apart from this, the language of the 1847 Act makes it quite clear that the claim or demand must be one that "arises against the undertakers." The voluntary construction of a main could scarcely be brought within these terms. In the report of the Barnsley case it is only stated that the Company "had to" construct a main. The expression is vague, and it might possibly be intended to denote some compulsion from without which the Company could not resist. But the case was unopposed, and was very briefly reported; and I fear "Inquirer" will not be able to get much light out of it.

Commercial Gas Company, Stepney, E.,  
July 20, 1898.

H. D. ELLIS.

## Illuminating Gas from Sludge.

SIR,—In the last issue of the "JOURNAL" you report that, at the recent annual conference of the Association of Municipal and County Engineers in Edinburgh, Mr. Cameron read a paper in which reference was made to the production of illuminating gas from sewage. As bearing somewhat indirectly upon it, I made some experiments with sludge from the sewage works of the Corporation of this town some twelve months since, with a view to ascertaining whether there were sufficient gases existing in the sludge to make it worth while to carbonize. I had a whole week's test, the result of which was as follows:—

## Summary of Tests.

| Date, 1897. | Gas Made per Ton. Cub. Ft. | Illuminating Power. Candles. | Moisture. Per Cent. |
|-------------|----------------------------|------------------------------|---------------------|
| June 11     | 3680                       | 11'00                        | 63                  |
| " 14        | 3680                       | 12'00                        | 40                  |
| " 15        | 3920                       | 15'00                        | 40                  |
| " 15        | 5360                       | 16'10                        | 35                  |
| " 16        | 6000                       | 16'30                        | 35                  |
| " 16        | 5360                       | 16'30                        | 35                  |
| " 16        | 5120                       | 16'74                        | 27                  |
| " 16        | 5440                       | 16'74                        | 27                  |
| " 16        | 5760                       | 16'10                        | 27                  |
| " 17        | 5600                       | 16'10                        | 27                  |
| " 17        | 5840                       | 14'70                        | 27                  |
| " 17        | 6320                       | 14'70                        | 27                  |
| " 17        | 6560                       | 7'00                         | 25                  |
| " 17        | 7200                       | 7'00                         | 25                  |
| " 17        | 6000                       | 8'40                         | 25                  |
| " 18        | 5200                       | 8'40                         | 25                  |
| " 18        | 5520                       | 8'20                         | 25                  |
| " 18        | 5680                       | 8'20                         | 25                  |
| " 18        | 5120                       | 12'92                        | 33                  |
| Average     | 5440                       | 12'92                        | 33                  |

It will be apparent that, as only 5440 cubic feet of gas of an illuminating power of 12·92 candles was obtainable per ton, on an average, it was not economical to do anything with the refuse. The average moisture in the material was 33 per cent.; and there was the further almost fatal objection that the sludge contained quantities of minute organisms.

It occurs to me that these tests may have some slight interest, although upon different lines from those indicated in Edinburgh.

Huddersfield, July 22, 1898.

E. A. HARMAN.

**Scunthorpe Gas and Water Supply.**—The Urban District Council of Scunthorpe, near Doncaster, have decided to promote a Bill next session to authorize them to manufacture and sell gas and supply water. Messrs. Stevenson and Burstal have been appointed Engineers. The first part of the contract for the water supply—viz., the deep boring which is to be sunk into the red sandstone—has been let for £4495. It is estimated that the total cost of providing the town with a proper supply of water will be £16,000.

**Is Gas Lime Injurious to Fish?**—Attention was called last week at the meeting of the Devon Sea Fisheries Committee to the deposit of gas lime on the shore of Torbay by the Torquay Gas Company. Colonel Studdy said the bye-laws prohibited any poisonous matter being sent into the sea; but the Watch Committee, whose attention was directed to it eighteen months ago, had done nothing. It was proposed that the Watch Committee should be instructed to deal with the question immediately, with power to employ an expert and, if necessary, to institute a prosecution. Colonel Studdy held that after last year's Biological Society's report, in which it was distinctly stated that gas lime was injurious to fish, an expert was quite unnecessary. As representing the Torquay Gas Company, of which he is a Director, Mr. W. Ball remarked that when he laid the matter before his colleagues their instructions to the Manager were that he should give the Committee's representative every facility; and it was agreed that if the gas lime were really proved to be injurious to fish, the Directors would do everything they could to remove it. Mr. Sandars declared that as he passed the gas-works that day he saw several tons of gas lime deposited on the shore; and the water was discoloured for some distance. The question was whether the lime was injurious to fish. The Chairman (Mr. E. Windeatt) said the analyses did not show that it was. The resolution was adopted.

## PARLIAMENTARY INTELLIGENCE.

## HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Keighley Corporation Bill, Paignton Improvement Bill, St. Helens Corporation Bill. Bill reported, with amendments: Mid-Kent Water Bill. Bills read the third time and passed: Clacton-on-Sea Gas and Water Bill, Coventry Corporation Gas Bill, Gaslight and Coke Company Bill, Leyton Urban District Council Bill, Maldon Water Bill, Middlesbrough Corporation Gas Bill, Plymouth and Stonehouse Gas Bill, Southampton Gas Bill.

## HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills reported: Gas Orders Confirmation Bill (No. 2), Newhaven and Seaford Water Bill. Bills read a second time and committed: Forres Water Bill, Heywood Corporation Water Bill, Water Orders Confirmation Bill. Bills read the third time and passed: Felixstowe and Walton Water Bill, Folkestone Water Bill, Gas Orders Confirmation Bill (No. 2), Newtown Water Bill.

## HOUSE OF COMMONS COMMITTEES.

In the "JOURNAL" for the 14th ult. (pp. 1391-2), we reported the proceedings on the Brompton and Southend Water Bills—the first two in Group E. The remaining Bills in the group—the Cranbrook, Higham, Mid-Kent, Haselmere, and Wey Valley—were subsequently considered by Committees presided over by Colonel Gunter and Sir Charles Dalrymple respectively.

## CRANBROOK DISTRICT WATER BILL.

Some preliminary conversation passed regarding this Bill and Bills which were being promoted by the Mid-Kent, the Higham and Hundred of Hoo, and the South Kent Companies; it being pointed out that to some extent they were connected one with another. It was agreed that the Cranbrook and the Mid-Kent Bills should be taken as competing; and that the former should be dealt with first.

Counsel engaged were Mr. Littler, Q.C., Mr. Balfour Browne, Q.C., and Mr. Rickards, for the Cranbrook District Water Company; Mr. Joseph Shaw, for the South Kent Water Company; Mr. A. J. Ram, for the Maidstone Rural District Council; and Mr. Pembroke Stephens, Q.C., and Mr. Reginald C. Saunders, for the Mid-Kent Water Company.

According to the opening statement of Mr. Littler, the Cranbrook District Water Company was incorporated in 1895, to construct water-works and to supply water to Cranbrook and certain other places in Kent. The enterprise had been remarkably successful; and but for the late engineering strike, which delayed the delivery of the pumps, the Company would have had their works so far completed that they would now be able to supply the whole of their district. A well 60 feet deep had been bored in the Tunbridge Wells clay; the capacity being 33,000 gallons daily. The Company had also another spring which was estimated to yield no less than 180,000 gallons daily. There was a pumping-main from the wells to a reservoir at Hartley of 200,000 gallons capacity, and at a height of 448 feet above sea-level. So satisfied were the town of Tenterden and a number of parishes in the locality with the resources of the Company, that they were anxious to be supplied by them; and power was therefore taken to extend the limits of supply to Tenterden, Bewenden, Frittenden, Biddenden, High Halden, Rolvenden, Sandhurst, Newenden, Lamberhurst, Horsmonden, Marden, Staplehurst, Woodchurch, Wittersham, and Stone-cum-Ebony in the county of Kent, and Northiam and Beckley in Sussex. The Mid-Kent Company proposed to supply in no fewer than 32 parishes; but the only two parishes which both the Companies wished to secure were Marden and Staplehurst. How the Mid-Kent Company proposed to supply these places, he did not know; seeing that their works were almost on the other side of the county. The more reasonable and proper course seemed to be to authorize the Cranbrook Company to supply the district, which was in their immediate vicinity. The works of the Mid-Kent Company consisted of a well and two reservoirs. One reservoir was 150 feet, and the other 250 feet above sea-level; whereas the Cranbrook Company's reservoir was 448 feet above sea-level. The consequence was that the Mid-Kent Company were seeking a special charge for high services of 25 per cent. extra. The lower reservoir held 250,000 gallons, but was open; whereas the Cranbrook Company's reservoir was covered. The higher reservoir was covered, and held 125,000 gallons. The Mid-Kent Company could pump at the outside 312,000 gallons a day, which would be only sufficient for a population of 10,200 persons. Therefore, in endeavouring to extend their limits, they were doing that for which they would have to make very special provision. True, they were seeking to sink another well; but it was doubtful whether it would yield much more water. They also proposed to build a new reservoir 380 feet above sea-level. But it would be 68 feet lower than the Cranbrook Company's; and seeing that the pipes would have to be so long to reach the district of supply, much of the advantage of the height would be lost by friction. Having regard to all these circumstances, there could be little doubt as to which of the two schemes was preferable for the public. The first petition Counsel dealt with was that of the South Kent Company—a little concern which, although it had parliamentary powers, did not and could not supply. The Cranbrook Company proposed to step into their shoes, and to supply in the whole of their district. Practically the South Kent Company only supplied water to the Paddock Wood Railway. They had a brick well (a mile and a half from Paddock Wood Station) a few feet deep, with a borehole lined with iron running down 90 feet. But the well being within a few miles of the Medway, there could be no doubt that the water came from the river. They had a settling-tank holding a few



thousand gallons, which had been used apparently for extracting iron from the water—iron existing in the water to an enormous extent. The engine-house was about 10 feet square, and contained a vertical boiler supplying steam for a pump of 4-horse-power, capable of throwing 16 gallons a minute. In summer, the well usually ran dry after a few hours' pumping. The Company had been in existence since 1889; but no steps had been taken to supply water anywhere except at Paddock Wood. The whole supply, if pumping could be continuous—which it could not—would be insufficient for 3000 people. The authorized capital of the Company was £52,000; but according to the last issued balance-sheet (to December, 1893), they had only been able to get £2446 from the public. The outlay on works had been £260; while their Act cost £2000. They had spent £3068, for which they could only show the £260 worth of works. This was the Company who objected to the present Bill, on the ground that, though they had not supplied water in their limits, they certainly intended to do so. But how they were going to do it, looking to their financial position, Counsel could not understand. The next petition was that of the Mid-Kent Company, who were promoting a Bill which competed with the present measure in regard to the two parishes of Marden and Staplehurst. They urged that they could supply these places at lower rates than the Cranbrook Company; but they concealed the fact that for more than half the district they would have to add 25 per cent. for high service. Then they said the sources of supply of the Cranbrook Company were objectionable and insufficient—which was absolutely without foundation. The petition of the Maidstone Rural District Council also related to the parishes of Marden and Staplehurst, which respectively contained an area of 7607 acres and 5737 acres, and a population of 2350 and 1920. Powers of supply were given the Cranbrook Company under their Act of 1895, the petition stated; but no water had, as a matter of fact, yet been supplied. Water could be found near Marden, which could be supplied at 3 per cent. per annum on the rateable value to the houses; and as the Company could not give the supply at less than 7 per cent. on the rateable value, the Council objected to the inclusion of the district in the Company's area. Portions of Staplehurst were undoubtedly at present inadequately supplied. But the petitioners were taking steps to remedy this; and if the Company could supply this part of the district at the same price as the Council, they would welcome such supply. In face of this, Counsel said, the evidence would show that the Parish Council of Staplehurst were urgently desiring that the Company might get their Bill, and thus be able to supply good and abundant water at a moderate cost. The petitioners further alleged that the sole object of the Bill was to enable them to obtain further capital with which to carry out their original scheme of 1895. This, Counsel asserted in conclusion, was a statement absolutely devoid of foundation.

Mr. E. P. Seaton, the Engineer to the Company, said he was Engineer to the Paddock Wood Railway. While engaged on the latter work, he found the district had a very bad water supply. He made an investigation, as a result of which a reservoir was built at Hartley, the highest place in the neighbourhood, and a well sunk at Soaper's Lane, Hawkhurst, which well had a proved yield of 180,000 gallons per 24 hours. The pumps were capable of drawing 12,500 gallons an hour. The Company had power also (which had not yet been exercised) to construct another well at Hawkhurst. At Goudhurst a well had been sunk in the Ashdown sand, the absolute capacity of which had not been tested, because the pumps were not sufficiently powerful. The minimum yield, however, was estimated at 500,000 gallons per 24 hours. The works proposed under the Bill included another well near Tenterden, where a trial hole had been sunk to a depth of 77 feet, with the result that the water rose a foot above the tube that was put in; a reservoir near the present one at Hartley; a main from Goudhurst well to Hartley reservoir; and a number of other mains, &c. The places proposed to be included in the Cranbrook Company's district had a population in 1891 of 22,718; a rateable value of £18,816; and an area of 88,000 acres. The population of the district which the Mid-Kent Company sought now to include in their area was about 41,000. The works proposed in the Cranbrook Bill were estimated to cost £28,048, including the purchase of land. But the capital sought was £36,000; the balance being for service-pipes and supply-mains for the next few years. Witness went on to give a description of the works of the South Kent Company. Their water, he said, was most impure, and quite unfit for drinking. The two small reservoirs which they had were about 12 yards square, and had no doubt been used to pump the water into, so as to allow the oxide of iron which was present in large quantities to settle before it was distributed. The water was only used for supplying the Paddock Wood Railway and one or two cottages. The Mid-Kent Company's works consisted of a well with a 15-inch borehole. They had duplicate pumps and engines and good water; but they were now supplying as much as they could. They had also two reservoirs which, though they could supply Marden and Staplehurst by gravitation, could not furnish water to Horsmonden, Goudhurst, or Hawkhurst. Their pumping-well was by their well at Halling; and they had very good works, which, however, were not sufficiently large to supply the area they were now proposing to take. Another well was being sunk within 50 yards of the existing one; but it was very doubtful if it would yield much water in addition to the present well. They were pumping about 300,000 gallons a day, of which 40,000 gallons were being supplied to Maidstone. At 30 gallons a head a day, the supply of 300,000 gallons would be sufficient for only about 10,000 persons; whereas they sought power to supply a population of 42,000. The site of the Mid-Kent Company's new reservoir was in an old disused chalk-pit (380 feet above sea-level), which was 20 miles from Marden and Staplehurst; whereas the Hartley reservoir of the Cranbrook Company was only 8 miles from these places. A large amount of the head of water would be overcome by friction in travelling this 20 miles. The Mid-Kent Company asked for an additional 25 per cent. on their authorized charges in case of high service, which would bring their rates considerably above those of the Cranbrook Company, who made no distinction between high and low service.

Mr. Ram briefly cross-examining, witness said the Maidstone Rural District Council knew water was wanted for Marden and Staplehurst; but they desired to have the water of the Mid-Kent Company there. In reply to Mr. Pembroke Stephens, witness said the Company would be able to supply Tenterden within six months, and Staplehurst within a year. The Mid-Kent Company were pumping all the water from their

well that could be got. In cross examination by Mr. Shaw, witness admitted that in some cases the charges of the South Kent Company were lower than those of the Cranbrook Company. There was a farmhouse with a cesspool near the well at Goudhurst; but no contamination could get to the well, because it was lined with iron cylinders. It was physically impossible that surface contamination could find its way to the borehole at Goudhurst.

A number of other witnesses were called for the promoters, including Mr. Gerald Perry, the Resident Engineer to the Company; Mr. Otto Hehner, the Public Analyst; Mr. C. E. Hawkins, a member of the staff of the Government Geological Survey; Dr. Tew, Medical Officer of Health for the West-Kent Combined Sanitary District; Mr. Charles D. Merton, Solicitor to the Company; Mr. Joseph Mace, Town Clerk of Tenterden, and Clerk to the Tenterden Rural District Council; and Mr. A. E. Nunn, the Contractor who carried out the works of the Cranbrook Company. Their evidence went to show that the Mid-Kent Company were quite unable to supply anything like the populations they proposed—viz., their own and that of the Mid-Kent district—their resources being only 312,000 gallons daily; whereas at 30 gallons a head, they would need 2,440,000 gallons a day, or, at 20 gallons a head, two-thirds of this quantity. The water from the two wells of the Cranbrook Company had been analyzed; the water from the Hawkhurst well being shown to be exceptionally pure, while that of the Goudhurst well, though not so good, having a trace of iron, was in every way suited for domestic purposes. As to the possible contamination from surface water of the Goudhurst well, Mr. Hawkins expressed the opinion that the impervious strata of clay lying between the surface and the bottom of the well would effectually prevent it; and regarding the well at Halling, and the one which it was contemplated to sink within 100 yards of it, he thought one would certainly pump against the other. The water supplies of the parishes proposed to be included were generally in a most unsatisfactory condition; illness having been traced to this cause. The workhouse at Tenterden was entirely dependent on shallow wells, which in the summer ran dry. The borough of Tenterden itself was also dependent on shallow wells. Both the Tenterden Authorities had passed resolutions in favour of the Cranbrook Bill. Dr. Tew said the South Kent Company's water was absolutely unfit for consumption. The only reason the Maidstone Rural District Council desired the Mid-Kent Company's water, rather than that of the Cranbrook Company for Marden and Staplehurst, was that the terms were better. The rates of the Cranbrook Company were 10s. per cent. higher than those of the Mid-Kent Company; but the latter had power to charge 25 per cent. extra for high services. Mr. Nunn stated that in constructing the Goudhurst well he used cement segments fitting into one another; cement being then placed at the joints, so that the concrete all the way down virtually became solid, and thus obviated the chance of contamination. The Cranbrook Company would be able to supply Tenterden in six months, and Marden and Staplehurst in twelve.

The case for the South Kent Company was then proceeded with; Mr. Edward Easton being the first witness called. He said he was Chairman of the Company, which was formed in 1889, and had carried out several water schemes in this part of the country. He sketched the history of the Company, and gave an account of the attempts they had made to secure water, none of which, however, had been successful. The other Directors had resigned; and he had therefore put three clerks on the Board—witness then becoming practically the Company. In 1895, he agreed to give up Goudhurst, Cranbrook, and Hawkhurst to the Cranbrook Company; but when they proposed to swallow him up entirely, he approached the Mid-Kent Company, who had agreed to supply him with water for the whole of the South Kent district at so much per 1000 gallons. As a matter of fact, the pipes were now ordered; and he could commence supplying in four months. He had a practically inexhaustible supply; and, as far as he could see, as much capital as was wanted. The South Kent Company's rates were much lower than those of the Cranbrook Company. They were going to construct a reservoir at Pembury, whence the water would be delivered to the whole of the present authorized district by gravitation.

In cross-examination, witness admitted that under his Act, if he did not provide a supply within seven years, the restriction on any of the Local Authorities not to construct water-works was removed; but he held that he should still have the legal right to lay competing pipes. His last balance-sheet was issued in 1893; and he knew that he was liable to a penalty of £20 a day for not having issued one every year since. He admitted that the Company had practically supplied no water. Witness produced the agreement (which was in perpetuity) with the Mid-Kent Company, under which the latter Company were to supply the South Kent Company with all the water they required—the first 10 million gallons per annum at 6d. per 1000 gallons, and succeeding quantities at 5d. If the South Kent Company were in default in paying for the water, or were to break any other clause, the Mid-Kent Company had power to cut off the supply without notice. The South Kent Company also undertook to construct reservoirs for storage. It was suggested to witness that he had no power now to construct works; but while admitting that the Company's compulsory powers had expired, he held that they still had their general powers. To carry out the agreement with the Company, which was dated the latter end of April last, £40,000 or £50,000 would be needed. He had now got £10,000 of the capital subscribed; £5000 having come from Lord Wandsworth, and £4500 from another gentleman. With this money, a banking account was opened the day the agreement was signed. Witness signed the agreement as Secretary *pro tem*. He was now Chairman of the Company; and two Directors of the Mid-Kent Company were to come on the Board to look after their own trusts. Questioned by the Chairman as to why he had not gone to the Mid-Kent Company sooner, witness said he had not had an opportunity. He estimated that the South Kent district would require about 500,000 gallons a day.

Mr. Shaw having addressed the Committee, the petition of the Maidstone Rural District Council was proceeded with; Mr. L. Fletcher, Chairman of the Council, being called. He gave the reasons why the Council preferred the Mid-Kent Company's supply to that of the South Kent Company; the only one which had not already been stated being that the former Company proposed to furnish water to a number of other parishes besides Marden and Staplehurst, and the Council would rather have all the parishes supplied by one Company.

The Chairman interposed at this point, and said that, without deciding



which Company were to have power to supply in Marden and Staplehurst, the Committee at present thought the Cranbrook Water Company should not have it. The Committee, however, were of opinion that the Cranbrook Company should have power to supply in the extra districts they had scheduled. The time within which the supply must be made would be reduced from the period stated in the Bill to eighteen months.

Mr. Saunders then claimed to be heard generally in opposition to the preamble of the Cranbrook Bill. He said he had a large body of evidence which would demonstrate that the Cranbrook Company's water was impure. Counsel for the Cranbrook Company contended that the Mid-Kent Company had no right to be heard now; seeing that all that had been in dispute between the two Companies was as to who should supply Marden and Staplehurst, which matter had been decided against the Cranbrook Company. A long argument ensued, which, in the end, was referred to Mr. Chandos Leigh, the Speaker's Counsel, who, after having the facts explained to him, decided that the Mid-Kent Company had no *locus standi* to be heard against the preamble.

The clauses of the Bill were then gone through and adjusted; and the Bill passed the Committee.

## LEGAL INTELLIGENCE.

### PRESCOT PETTY SESSIONS.—Tuesday, July 19.

(Before Messrs. J. STONE, W. LEE PILKINGTON, and J. BERRY.)

#### The Liverpool Corporation Fined for Deficient Water Supply.

To-day an adjourned summons, taken out at the instance of Mr. Harry Mercer, the Hon. Secretary of the Prescott Conservative Club, against the Liverpool Corporation, for having, between the 1st of February and the 10th of May neglected to furnish him with a sufficient supply of water, as required by the Liverpool Water-Works Act, 1847, came on for hearing.

Mr. COLLINGSWOOD HOPE appeared for the complainant; Mr. T. SWIFT represented the defendants.

Mr. SWIFT explained that the case had been already twice adjourned. At the time the adjournments were asked for and obtained, there were a number of appeals going on. Since then, however, the Corporation had passed a resolution to the effect that the Water Engineer be instructed to lay a special main for Prescott of a sufficient size to supply the houses about which the complaint had been made. The Corporation were fully determined to comply with every possible obligation under their Acts of Parliament, and to lay down the necessary pipes and execute the works required in order to give to the town of Prescott and its inhabitants a full and adequate supply. Then, again, it was resolved by the Corporation—"That the Town Clerk withdraw the notices of appeal, and abandon the special cases granted by the Justices." The Corporation submitted entirely to what this Court and Quarter Sessions had decided. Since the resolution had been passed, the Engineer had entered upon the work. It would take some time to get the pipes down; but they expected to be finished in about three weeks' time. Therefore, he asked their Worshipships that the case might be further adjourned for a month, in order to see whether or not the Corporation would carry out their intentions.

Mr. HOPE said that, having regard to the past history of these transactions, the application for an adjournment was not dignified on the part of the Corporation; and he objected to any such thing. Nearly eighteen months ago the Corporation had the case of Brady started against them, and they were convicted in this Court. An appeal was taken to the Divisional Court last year, and decided against them. They were not satisfied with this, but disputed the decision right up to last month. The case for the complainant was that on various dates between the 1st of February and the 10th of May, although during the daytime, more or less frequently, there was water going into the cistern, at other times, when the ordinary supply was being drawn upon by other consumers, there was no water entering the Conservative Club at all. Hence the summons taken out for an infringement of the Act, which declared that the supply of water should be sufficient for domestic purposes. He asked for a penalty for each of the 99 days during which time the offence had been in progress.

The CHAIRMAN said the Bench were satisfied the case must go on.

Mr. HOPE then called Mr. Mercer and the Club Manager, who corroborated the statement as to the inefficiency of the water supply.

Mr. SWIFT, in cross-examination, strove to elicit an admission that the supply, as a whole, was adequate.

This led to a sharp exchange between Counsel.

Mr. SWIFT, in his defence, contended that, on the evidence, there had been no proof that the supply of water was insufficient for domestic purposes; and consequently no case had been made out.

The CHAIRMAN, after retiring with his colleagues, decided that the complainant's case had been made out, and that there had not been a constant supply of water. The defendants would be fined the full amount—£10 for one day and £2 for each of the 98 days on which the offence was repeated. They must also pay £10 costs; making £216 in all.

Five other cases of a similar nature were, by agreement, adjourned.

#### Interruption of Water Supply—Consumers' Right to Notice.

An action was brought at the Honiton County Court on the 14th inst. to recover damages against the Honiton Town Council for turning off the supply of water without notice. The plaintiff, James Greedy, alleged that the water was turned off several times without notice; and on one occasion, in particular, he was 60 or 70 hours without water—thus being compelled to fetch his supply from some distance. He was informed that the water was then turned off because the reservoir was being cleaned out; but he was given no notice of this. In answer to his Honour Judge Beresford, plaintiff said he understood that 100 notices were posted; but none were sent into his district. His Honour remarked that the Town Council were bound to do their best not to cause inconvenience; but it did not follow that they must post notices on every door in the neighbourhood. He non-suited the plaintiff.

## MISCELLANEOUS NEWS.

### EUROPEAN GAS COMPANY, LIMITED.

The Annual Meeting of this Company was held on Monday last week at the London Offices, Finsbury House, Blomfield Street, E.C.—Mr. JOHN BLACKET GILL in the chair.

The SECRETARY (Mr. W. Williams) read the notice convening the meeting, and also the following report of the Directors:—

The business of the Company has made satisfactory progress during the past twelve months; and the Directors are pleased to report, that, with the exception of Bolbec, where the consumption has been stationary, there has been a general increase in the sale of gas at the Company's stations. The increase was, in the aggregate,  $4\frac{1}{2}$  per cent., and has again been greatest at Havre, where it amounted to 7 per cent.

Coals have cost less than during the preceding year; and both coke and sulphate have yielded improved returns. The revenue from tar has been practically unchanged.

In accordance with the policy mentioned in the last report, the Directors have sold some further land at Boulogne, not required for the Company's business.

The lawsuit between the Company and the town of Bolbec on the question of public lighting came before the first Court in February last, when, unfortunately, the decision was unfavourable to the Company. The Directors have, however, appealed against this decision, and hope to be more successful in the next Court.

Pursuant to the terms of the treaty made with the town of Nantes in 1886, when the Company's concession, which would have expired in 1906, was extended for a further period of twenty years, the Board had, last year, to increase the allowance paid to the town. This additional charge, together with the heavy expenses in connection with the large number of prepayment meters and fittings on hire placed at the various stations during the year, has absorbed the extra profit resulting from improved business. The Directors are, however, able to recommend the payment of the usual dividend—viz., 20s. per share on the fully-paid shares, and 15s. per share on those £7 10s. paid, less the interim dividend of 8s. and 6s. per share respectively paid on the 1st of February last; also the payment of a special bonus of 1 per cent. on all shares, according to the amount paid thereon. A balance of £1488 will remain to be added to the reserve of undivided profits.

Notice has been given that two Directors (E. F. White, Esq., and N. E. B. Garey, Esq.) and both Auditors (J. Reeson, Esq., and F. M. Fry, Esq.) retire from office at this meeting; but, all being eligible, they offer themselves for re-election.

The CHAIRMAN said he thought the report which had been read would be regarded by all the shareholders as very satisfactory. As they had heard, there had been an increase of  $4\frac{1}{2}$  per cent. in the rental, which was somewhat better than last year. Though it was not a large sum, still when they remembered the enormous amount of competition they had to meet in every town, he considered it was very gratifying that they were able not only to maintain their position, but to improve it. The increased profit had been distributed in this way: according to their receipts at Havre, the Company had to make a certain allowance to the Municipality; and this time they had to give them £800 extra. Then again, at Nantes, the Company were under agreement, for the lengthened concession they obtained some years ago, to give the Municipality an additional allowance which represented £2000 a year. These items, together with £5000 which had been spent on fittings for the prepayment system and depreciation, had to be set against the £9000 increased rental. But it was a matter for considerable congratulation when they reflected that they were able to use a large portion of the increase of rental in so excellent a fashion that it was being employed, in the shape of coin meters, in extending their business. As the shareholders were aware, the Bolbec lawsuit had not terminated. It would be remembered that he alluded to this at the previous meeting. It was really only a small matter; but there was a principle involved in it. Therefore the Directors felt it was their duty to carry it to a higher Court, and have the question properly settled. He understood the law's delays in France were much the same as in this country; so that probably the shareholders might meet again before they were able to learn the result. The report also alluded to the selling of a small portion of the Company's land at Boulogne. As many of the shareholders were aware, some years ago the French Government imagined that Boulogne was to be a great seaport, and expended large sums of money upon the harbour. The Company thought they would follow suit; and the Directors at that time spent more than subsequent events had shown was absolutely necessary upon increasing the gas-works. Now, however, they watched for, and took advantage of, every opportunity of selling a portion of the land that was not useful. They were about to put up a new gasholder at Havre. For some time they had been suffering from shortness of storage there; and, acting on the advice of an eminent London Engineer, they had obtained plans for a holder, and had just settled a contract for its construction. It might interest the shareholders to learn that this holder, which would make a great hole in £10,000, could have been put up in England considerably cheaper. Although labour was dearer in this country than in France, there was a heavy amount to be paid in the way of protective dues. They would have to pay more than £1000 dues on the steel and cast iron they had to export. More than this, they were going to construct the holder with only two lifts, for which they would have to pay a tax of about £240 per annum to the French Government; while if they had built the holder in four lifts, the tax would have been just double. This showed that gasholder building in France was an expensive luxury. The coin meter business progressed very favourably. They had no less than 202 of these meters at Bolbec, 286 at Boulogne, 1514 at Havre, and 2530 at Rouen; making a grand total of 4514. They had not unduly pressed these meters. In the several towns they supplied, they had shops where all sorts of gas appliances were exhibited; and he presumed that many of the working people had seen them there, with the consequence that there was a large increase in the number of these meters placed. They were doing an important business in this direction; and would do even better in the future than in the past. As to the amount put down for depreciation of works, their concessions had an average of about 25 years to run. The Directors were making efforts to extend their concession at Amiens, as they were desirous of reducing the price of gas supplied in that city. As the



shareholders would understand, the Directors were prepared to lower the price; but they wanted to get a *quid pro quo*. They therefore hoped that eventually they would have a longer concession for Amiens by supplying gas at a reduced rate. The same remarks applied to Boulogne; and they were endeavouring to obtain a longer concession there. He (the Chairman) was sorry to inform the shareholders that they had the misfortune to lose their Engineer at Nantes (M. Perthuis) last November. He was a young man of considerable promise. He was formerly Assistant Engineer at Nantes; but on M. Gautier's promotion to Havre, the Directors were glad to advance him to the position of Manager at Nantes. He would have been a good servant; but unfortunately he died from lung disease shortly after his promotion, much to the regret of the Directors. Coal had risen considerably this year; and they had to pay a good deal more than before. The South Wales strike had so pressed the northern collieries that they were charging very much more now than they were this time last year. It was, however, absolutely essential that the Company should make their contracts, and so they had been obliged to pay a higher figure. But when coal was high in price, they obtained some sort of compensation in coke; and he hoped it would be the same this year. Anyway the Board would strain every nerve to make both ends meet next year. The Company were in a strong position. They had now about 50,000 gas-stoves on hire, which was very satisfactory; and 350 gas-engines. The number of consumers had increased by 2849; so that they had a total of nearly 40,000. Many of the new consumers were, no doubt, coin meter ones. As to the residuals, coke had produced £47,783, which was an increase of £731. Tar had yielded very much the same—£8000; while sulphate of ammonia showed an increase of more than £500. He was glad to say there was a chance of the sulphate of ammonia market improving. Their bad debts for the year amounted to £588; and he thought the shareholders would agree that, with a rental of £250,000, this was very satisfactory, and proved that the collectors looked well after their business. The Company were able to declare the same dividend as last year—10 per cent., and a bonus of 1 per cent.—and to carry forward £1488. The investments had not been very largely added to. They stood at a good round sum, where he trusted they would continue to stand for many years to come. Some of the shareholders might have noticed that the price of the Company's shares had somewhat diminished lately; but he believed this applied to most Continental companies. It arose simply from the rise and fall of the political barometer; and if things went on happily in France, they would soon find that the price of the shares would rise again. He concluded by moving the adoption of the report and accounts.

Mr. N. E. B. GAREY seconded the motion, which was unanimously carried.

The dividend and bonus recommended in the report having been declared,

The CHAIRMAN proposed, and Mr. E. T. E. BESLEY, Q.C., seconded, the re-election of the retiring Directors (Messrs. E. F. White and N. E. B. Garey); and afterwards, on the motion of Mr. H. E. JONES, seconded by Mr. R. S. GARDNER, the retiring Auditors (Messrs. Joseph Reeson and F. M. Fry) were also re-appointed.

The usual complimentary votes were passed to the Chairman and Directors, as well as to the officers at home and abroad; and the proceedings terminated.

### DEVONPORT GAS COMPANY.

The Fifty-fourth Annual Meeting of this Company was held last Thursday—Mr. R. C. SMITH in the chair.

The SECRETARY (Mr. J. Williams) having read the notice convening the meeting, the report of the Directors was presented. They stated that while the sales of gas for public and private lighting showed an increase of 3½ per cent., there had been a falling off in the consumption of gas recorded in the Government departments to the extent of 5 per cent., partly due to the closing of Raglan Barracks. The total amount received for gas was £23,646, compared with £23,350 in the preceding year. Residuals showed a marked improvement; the total amount realized being £6277, compared with £5266 in 1897. The revenue for the financial year ending May 31 was £30,768, compared with £29,435 before. The expenditure amounted to £26,132; leaving a balance of £4636, which was carried to the credit of the profit and loss account. After payment of the dividends declared and authorized at the last general meeting, together with the interest on debentures, there remained a balance of £9565, from which the Directors recommended payment of the statutory dividends of 10 per cent. on the original, and 6 per cent. on the guaranteed shares. The upward movement in the price of gas coals, noted last year, had been accentuated by a further rise during the year reported upon. Happily the Directors concluded their contracts for the annual supply before the late advance was reached. The reconstruction of two of the retort-houses was being proceeded with; and it was expected that the work would be well advanced, and the whole of the benches reset on the regenerative principle by the end of the current year.

The CHAIRMAN, in moving the adoption of the report, commented upon the increase in the price of gas coal, which was now, he said, from 15 to 20 per cent. dearer than it was a couple of years ago. The property of the Company was re-assessed last year, and the value was increased from £3000 gross and £2250 net to £6646 gross and £4800 net. The Directors appealed against the new assessment, which was ultimately reduced to about £1000 in advance of the old amount. The small increase in the sale of gas was partly accounted for by the closing of Raglan Barracks, and partly by the fact that about 60 per cent. of the new houses erected the last few years did not have a supply of gas. This fact had led the Directors to enter into an arrangement with Messrs. Willey and Co., of Exeter, to fit up all new houses with pipes, meters, and stoves, so that a tenant upon going into possession would not have to provide gas-fittings. The gas would be carried into the houses and the fittings supplied entirely free of charge to the owner or occupier; the gas consumed being paid for on the slot system at the rate of 1d. for every 22 feet, compared with 3d. for every 100 cubic feet as at present. The system had been found of great advantage in several large towns; and he believed it would be acceptable in Devonport. There had been an increased expenditure in nearly every

item, with the one notable exception of rents, rates, and taxes. The new assessment had not come into operation; and the Company had ceased to pay conventional or ground rent—the property being now freehold. In conclusion, he referred to the scheme which is before Parliament for the enlargement of the boundary of Devonport, and condemned it.

Mr. G. HAWKEN seconded the motion.

Mr. W. J. MOON, while congratulating the Directors upon adopting the system of supplying pennyworths of gas, asked whether it would be extended to houses which already had gas laid on.

The CHAIRMAN said at present the Directors were not prepared to fit up cooking-stoves to every house which had a supply of gas. They were simply prepared to fix the pipes and fittings to small houses recently built, and they did not at present contemplate carrying out the system generally. The shareholders would derive no pecuniary advantage from the supply of "penny-in-the-slot" meters, because the Company were limited in the amount of their dividend, which was at its maximum. It was a mere question of *pro bono publico*.

The report was adopted, the dividends recommended were declared, and the retiring Directors re-elected.

Mr. R. H. RAE proposed—"That, in consideration of the valuable services rendered to the Company by Mr. A. Bennet, as Managing Director, the amount allowed as fees to the Directors be increased by £100 a year, that Mr. Bennet may be more adequately remunerated for his services."

Mr. W. FORD seconded the proposition, which was carried unanimously, and acknowledged by Mr. BENNET.

The Directors and officials were then thanked for their services; and the proceedings closed.

### THE GAS QUESTION IN VIENNA.

The Municipality's Dispute with the Imperial Continental Gas Association. Victory of the Association.

Telegraphing last Friday, the Vienna Correspondent of the "Daily News" said: "Dr. Lueger, the anti-Semitic Mayor, has suffered a terrible defeat in the enormous undertaking upon which he entered with so light a heart. After his election, he loudly proclaimed his intention to get rid of the English owners of the Vienna Gas-Works. The contract of the Company ends in October, 1899, and Dr. Lueger offered 16,500,000 fls. for the works and street-lamps. The Company, anxious, no doubt, to come to an amicable arrangement, after some delay accepted; but the Mayor then declared it was too late. He had already ordered new pipes, and he would not hear of an arrangement. His experts declared that a capital of 22,500,000 fls. would cover all the cost; and Dr. Lueger set about laying his pipes and building his new works. It was his conviction that the incorporation of the suburbs in Greater Vienna legally annulled the contracts of the English Company with those suburbs, all of which contracts were made for longer periods than the one with the City proper, and some of which run until 1918 and 1920. On the 1st of April, the sum already spent upon the works exceeded 25,000,000 fls.; and experts declare now that 36,000,000 fls. is the very least they will cost. This is bad enough; but yesterday the High Court of Justice for the second time found in favour of the English Company; and the Municipality will not only have to give up the idea of providing the suburbs with gas, but it will find it almost impossible to approach its own works with the pipes that are to supply Vienna proper, since the Company has the exclusive right of laying pipes in the suburbs. The consumption of these 26 suburbs amounts to three-tenths of all the gas consumed in Vienna. It must be, moreover, remembered that Vienna has spent these enormous sums at a time when electric lighting is taking the place of gas very rapidly. When Dr. Lueger has done laying gas-pipes all over Vienna—the misery of which undertaking to the population is beyond description—the English Company will begin taking their pipes out. In the meantime, the streets are paved worse than village roads, because the Municipality is leaving the final paving to the Company."

### THE SWANSEA CORPORATION AND THE GAS COMPANY.

The Appeal Abandoned.

In the last number of the "JOURNAL" it was stated that the General Purposes Committee of the Swansea Corporation had authorized a Sub-Committee to proceed with the appeal against the decision of Mr. Justice North in the matter of the application of the Gas Company for an injunction to restrain the Corporation from expending the borough funds in opposing the Company's Bill without the consent of the ratepayers. When the minutes of the Committee came before the Town Council last Wednesday, Mr. Martin drew attention to the one bearing upon this matter. He pointed out that the appeal would be expensive, and remarked that, inasmuch as it was a matter to benefit the municipal authorities of the country at large, he thought they should get the Municipal Corporations' Association to take steps to have the law amended. It would be a far better and more practical way than to appeal against the decision of one of Her Majesty's Judges. The Mayor (Mr. J. Aaron Thomas) mentioned that the opinion of Counsel had been received; but as he (the Mayor) had said before, the point was a moot one. He hoped no one would think he wanted to unduly press the appeal. There was a great deal in what Mr. Martin had said. They were really making law for the country. If the Council were in any way divided by a large section, he personally did not wish to press the appeal. Mr. Martin moved the elimination of the minute; and Mr. Sinclair seconded the motion. It was stated that the Chairman of the Committee was prepared to accept the resolution. The Mayor deprecated discussion on the matter, because, if they were going on with the appeal, anything they might say might be used against them. He had the personal opinion of the Town Clerk; and he (the Mayor) should like the Council to know what it was. But he did not think it should be published, as it was, after all, only an opinion. Alderman Viner Leeder suggested that the Council should consider the matter privately in Committee. Before they voted money for the appeal, he said, members should all have the knowledge which the Sub-Committee possessed. Alderman G. Morgan thought the matter should go back to the Sub-Committee. Eventually, the minutes, amended by the omission of the one relating to the appeal, were passed.



## THE BENIGHTED POLICY OF LIGHTING AUTHORITIES.

The current number of "London" contains an article on the above subject in which some well-directed remarks are made in regard to the public lighting of the Metropolis. Our contemporary says:—

London, we regret to say, continues to keep its unenviable position as the worst lighted of all large cities. Here and there electric arc lamps throw off a blaze of light, and at some corners big gas-lamps have been erected; but many of our chief central thoroughfares and almost all the small streets remain with only dim flickering lights distributed by means of obsolete lamps. Such an important thoroughfare as the Strand, for instance, depends mainly for its light, not so much upon its antiquated lamps as on borrowed light from shops, public bars, and theatres. No authority has yet set a good example of street lighting in London, if we except one or two little bits of electric lighting, and these are not by any means perfect. Parliament and the County Council are among the chief offenders. The lamps round Palace Yard and Parliament Square are picturesque, but not successful as a means of illumination. Recently the Office of Works decided to improve them by using incandescent burners. But the lanterns were so dilapidated that they would not be adapted; and rather than alter the lanterns, the authorities left Parliament Square as it is. The County Council are responsible for the lighting of the Thames Embankment and the parapets of the bridges; but although many schemes have been proposed, the public have not yet reaped the benefit. An effort is now being made to disfigure Waterloo Bridge by establishing electric light. The old dignified gas-lamp standards are allowed to remain, and alongside these are set up thin, insignificant standards entirely out of harmony with the others and the character of the bridge. Either new standards of a style in harmony with the architecture of the bridge should have been used, or the old ones adapted.

The local authorities, of course, are the greatest offenders. They make no effort to improve the light except in a fitful sort of way; and even when one district shows enterprise, its neighbour lags behind. This is illustrated in Kensington, which has adopted very largely, and with good effect, incandescent gas-lights. But one side of a main road which is in Kensington is well lighted, while the other side, which is in Westminster, has still to put up with the old-fashioned lamps and burners. It cannot be said that this desire to maintain a bad lighting system is prompted by economy. Some of the districts have a fancy for electric light lamps, which, we admit, are expensive; but no better light can be found for street purposes than the new incandescent lamps, and it actually becomes cheaper than the present system. Some attempts which have been made to establish incandescent lamps in the London streets have not been very successful owing to the short-sighted policy of the Vestries. Incandescent lamp-burners, to give the best effect, ought to be put in good lanterns; but the Vestries expect to get the good result from this new method without going to the expense of giving it a proper installation. We frequently see attempts being made to fix up new incandescent burners in old-fashioned lanterns tacked on to standards which have lost the perpendicular. Under such circumstances, good results are impossible; and the Incandescent Gaslight Company has too much regard for its own reputation to help authorities to light in this half-hearted way. As a matter of fact, however, if the Vestries would go to the trouble of spending 15s. on new lanterns, which would improve the appearance of the streets, besides improving the illuminating power of the lamps, it would be found that the extra cost would soon be equalized by the economy of using incandescent burners. This is well illustrated in Liverpool, where the principal streets are lighted with incandescent lamps, although the Corporation own the electric lighting supply. The important thoroughfare of Lime Street is lighted with incandescent lamps at a saving of over £500 a year; while no better lighting could be desired. The burners were put in special lanterns which did them justice; and by good management, it was found that the average annual renewals were only two mantles and two chimneys—the total cost amounting to 3s. 11d. a year, which was equal to a reduction of 75 per cent. on the maintenance charges as compared with the former lamps. It is here where the economy comes in, and not in begrudging a good lantern to start with.

The Greater London authorities are more alive to improved gas lighting than most of the London authorities. Croydon, Tottenham, Twickenham, Willesden, Acton, and Barnes have all adopted incandescent gas lighting for their streets, and are extending it. The system is making enormous strides in the Provinces; and almost every large town, including Liverpool, Manchester, Bradford, Ipswich, and Preston, is using it in some of its streets, while it has gained great popularity at seaside resorts. Sheffield has adopted it, and is putting two burners to each lamp, which will make it the best-lighted city in the country. Sheffield, again, owns its electric lighting, but finds that incandescent gas is cheaper, and, by distributing the light more equally, is preferable.

## HUDDERSFIELD CORPORATION GAS SUPPLY.

### A Comparison of the Working with that of other Undertakings.

The Huddersfield County Borough Council, at their Meeting last Wednesday, had before them the following motion, of which notice had been given by Mr. Barras:—"That the Gas Committee be requested to furnish this Council at the next meeting with further details of their last year's expenditure and income account, showing amount of gas made, sold, and used at the works, leakage of gas, and net cost of same per 1000 cubic feet, also the average price of coal and oil used per ton."

Mr. BARRAS, in proposing the adoption of his motion, said it was no mere idle curiosity which prompted him to endeavour to learn why the profits from the gas undertaking were so much less in comparison with certain other towns. When they considered the large amount of money that had been spent upon the gas plant, and the high price charged for gas for lighting purposes, certainly they ought to expect as good results in regard to the production of gas and profits as was obtained by other undertakings. But he was afraid, from information before him, that they did not. The Corporation could buy coal as cheap as other towns; and the fact of getting 2s. 9d. per 1000 cubic feet of gas should help to make the profits better than at present. But he feared that, even with these advantages,

they were behind the times, especially as to the production of gas per ton of coal carbonized. In their own case, it was 10,095 cubic feet; while at Halifax it was 10,313 feet, at Bradford 10,475 feet, at Leeds 10,337 feet, and at Cleckheaton 10,835 feet. Besides this comparatively low production, the amount of gas unaccounted for must be enormous. Then in the past year, they had carbonized 55,209 tons of coal, costing £21,786, and 374 tons of oil, costing £1533; making a total of £23,319. This ought, even at the low rate of production of 10,095 cubic feet per ton, to produce 557,334,855 cubic feet. The amount of gas sold was 432,510,000 feet, leaving unaccounted for no less than 124,824,855 feet, or nearly 20 per cent. of the total, and this on a small production. This unaccounted-for gas represented, if reckoned at 2s. 9d. per 1000 feet, above £17,000. Halifax in the past year produced from 75,197 tons of coal, costing £27,568, no less than 775,529,000 cubic feet of gas, and sold 709,104,700 feet at the low price of 2s. 2d., less 8½ and 12½ per cent. The leakage was 8·02 per cent. Cleckheaton had produced from 7508 tons of coal 81,349,000 cubic feet of gas, and sold 73,511,000 feet. The cost of coal averaged 8s. 11d. per ton. The leakage of gas was 9·63 per cent.; and the gross profits, £3595—the charge for gas being 2s. 8d., less 10 and 15 per cent. Bradford had made a gross profit, including street lighting, of £65,771, or a net profit of £38,345, reckoning the cost of lighting at over £20,000. The leakage of gas was 4·7 per cent.; and the price was 2s. 3d. and 2s. net. His opinion, from the scanty information at command, was that the production of gas per ton of coal carbonized was much below what it should be; and that the large amount of money spent on the works ought to show much better results. In addition to the few particulars given in the Gas Committee's statement, the Council ought to have specified, for their information, the amount of gas produced and used at the works, the leakage, the leakage per mile of main, and the average cost of the coal carbonized. Besides this, they ought to know the net cost of production and distribution of gas, as he feared it would work out to more than the 2s. per 1000 feet, less 5 per cent., charged for stoves, especially taking into consideration the cost of fixing the stoves, which was now borne by the Gas Committee.

Mr. BEAUMONT seconded the motion to give the Chairman of the Gas Committee an opportunity of replying to Mr. Barras.

Alderman STOCKS (Chairman of the Committee) expressed surprise that Mr. Barras should plead so much ignorance, and ask for these simple questions to be answered, when he was in possession of such an amount of information as he had shown himself to be. Mr. Barras had told him more than he was aware of—that the leakage of gas was over 20 per cent. As a matter of fact, it was not half that. Speaking for himself, he should do no such thing as answer the questions in detail. He objected to Mr. Barras coming to the Council first, and going over the heads of himself, the Gas Engineer, and the Committee.

Mr. JORDAN thought the charges brought against the Committee ought to be inquired into.

Alderman WOODHEAD hoped the mover and seconder would withdraw the motion, and appeal to the Chairman of the Committee for the information required.

Mr. BARRAS said he made no charge against the Committee, but merely sought for information, the nature of which could be gleaned in other towns, but which the members of the Huddersfield Council could not get from the Gas Committee. He thought he had asked for the information in a proper manner; but if the Council would abide by the result, as he was prepared to do, he would withdraw his motion.

The Council agreed to allow the motion to be withdrawn; and the matter dropped.

## A "REVOLUTION" IN GAS PRODUCTION.

### Gas Without Coal.

Rumours recently reached us of a new process of gas manufacture which had come to light in the Antipodes, and which, it was claimed, would revolutionize the gas industry. An esteemed correspondent has now sent us the following particulars of the process which appeared in the "Melbourne Age"—curiously enough on the 1st of April. They will doubtless be perused with some interest.

After recent events in Sydney, the public are likely to look askance at inventions claiming to develop a high standard of illumination at a very moderate cost. But a representative of the "Age" has had an opportunity of witnessing the trial of a new patent gas, which promises to revolutionize modern systems of lighting. The inventor is Mr. A. A. Stephenson, and his system has been in daily use for lighting the town of Frankston since November last. Its superiority to coal gas has been amply demonstrated in these practical trials; and its cheapness may be gathered from the fact that the cost of manufacture does not exceed 1s. per 1000 cubic feet.

The apparatus and materials used by Mr. Stephenson for the production of this illuminating fluid are exceedingly simple. He first of all creates a reservoir of air in the ordinary way, by means of a cylinder sunk in water. The atmosphere so stored passes from the air chamber through a carburetter containing a combination of various chemicals. These are all set out in the patent, and were used in the experiment in the following proportions: First of all Mr. Stephenson placed in the carburetter (which is simply an ordinary iron box with taps for conveying air on one side and discharging the gas on the other) a pint of kerosene; then he added about a couple of ounces of powdered resin; next a certain proportion of shale oil, about an ounce of salt, half an ounce of ether, a few drops of bisulphate of carbon, half a gallon of gasoline, a little camphorated chalk; and, finally, a small dose of oil of cloves. Before these articles were placed in the carburetter, that instrument was thoroughly examined by the company present. It was found to be empty, there were no compartments inside, and it was not attached to any fixture except those connected with the apparatus. The ingredients were purchased at a chemist's shop by a gentleman present; and the proportions used by Mr. Stephenson would probably represent a value of 2s. Having placed the various compounds in the carburetter, it was well shaken, the air was turned into it, the tap from which the gas escapes was turned on; and when a match was applied to the burner, a flame similar to that of coal gas, but of greater



brightness, was at once given forth. This is the light that has been in existence at Frankston for the past four or five months; and it has given great satisfaction. The gas can be applied for heating as well as lighting, and may be used for driving power, having been adapted to ordinary gas-engines up to 24-horse power with the same success as ordinary coal gas. The materials used in the trial were sufficient to maintain one light five or six hours a day for a period of six weeks, at the end of which time the carburettor would require re-charging.

In order to obtain a light of still greater brilliancy, Mr. Stephenson has made a further discovery, the practical application of which has been attended by most gratifying results. Using a generator specially made for the purpose, he produced another form of gaseous fluid, the illuminating capacity of which is equal to some 45-candle power. The ingredients used in the manufacture of this gas are a mixture of iron and low carbons (enclosed in linen cartridges 8 or 9 inches long and 1 inch in diameter), unslacked lime, naphthalene balls, and camphor. The lime coming in contact with the water sets up heat, causing the carbons to discharge a gas. That proved to give a light of extraordinary brilliancy; and, despite its power, the consumption of gas is exceedingly small. The best results are obtained from a combination of what, for convenience, we may call the Frankston gas and the new aeriform. They were run into the same burner; and the light was a clear, steady, beautiful flame, dazzling to look at. Mr. Stephenson stated that his gas in the experiment was burning at the rate of only 1 foot an hour, and would in that time give a light equal to 18 feet of coal gas.

The charm of the invention is its simplicity, and the easy, convenient manner in which it may be applied. The two forms of gas made may be produced in the one generator, which occupies comparatively little room; and the air reservoir only takes up a small space. The mixing of the chemicals is a somewhat unpleasant process; but this could be done at central works, and the generators replaced as they were exhausted. All the consumer would have to do would be to keep the air chamber supplied, and that could be done with an ordinary bicycle pump. There is no need for expensive mains or the tearing up of streets; but the ordinary gas-pipes could, of course, be used for supplying small consumers. In large establishments each system would be complete in itself. The present gas installations in houses and shops will convey the new gas in the same manner as the ordinary illuminant—the burners and other appliances being just the same. Mr. Stephenson states that his gas would keep the pipes clean, and the naphthalene deposited by coal gas would tend to improve his light.

If the inventor can maintain in actual working and over a prolonged period the results achieved, then coal gas is doomed. Because, not only can the new gas be produced for 1s. per 1000 cubic feet, but the amount consumed in accomplishing the same result is only about a third of what would have to be used by present methods of lighting. The influence of the invention upon coal mining must also be very great, as the new illuminant can perform all the services discharged by coal gas. Mr. Stephenson's invention is said to be free from every danger of explosion; tests made with the object of determining the explosive quality of the gas having satisfied the insurance companies, who have not hesitated to allow exhibitions of the apparatus in full working order in one of the largest buildings in Queen Street. A Company is being formed to work the patent in Melbourne. The rights have been disposed of in some of the other colonies; and Mr. Stephenson is now under negotiation for the sale of his invention in England.

### ELECTRIC LIGHTING NOTES.

A Local Government Board inquiry has been held at Croydon with reference to an application by the Corporation for power to borrow £23,278 for extending the electric light to Norwood. The evidence was of a formal nature, and no opposition was offered by the ratepayers.

An application for power to borrow £26,000 for electric light extensions was the subject of a Local Government Board inquiry at Sunderland a few days since. The Inspector (Mr. G. W. Wilcocks) was informed by the Town Clerk that the deficiency on the electric light undertaking for the first year of its existence was £642; and for the second year, £982. But this year they had earned a net profit of about £164.

Now that a little of the novelty has worn off, the people of Exeter are beginning to criticize the electric lighting of the streets. One of the papers pronounces it "a great success," but at the same time expresses the opinion that the standards are too far apart and the lights too high to be effective. In one of the thoroughfares—Fore Street Hill—the residents are complaining, "with too much reason," that the lighting is not so good as it was with gas, and this in spite of the fact that at this season the nights are seldom really dark.

Evidently, the Bradford Corporation Gas and Electricity Committee do not intend being troubled further as to the price paid for the gas supplied by the Shipley Gas Company to the street-lamps in Frizinghall; for, at the meeting of the Council last Tuesday week, on their recommendation, the Electrical Engineer was instructed to proceed with the lighting by electricity of the lamps in that district. It was further decided that a transfer should be made from the Gas Department to the Electricity Department of a sum equal to the amount paid to the Shipley Gas Company for any lamps in which electricity is substituted for gas.

The citizens of Bath appear to have a just cause of complaint against the electric street-lamps, which seem to possess remarkably turbulent spirits. In what should be the still hours of the night, they make such a noise that they prevent Mr. C. B. Oliver obtaining sleep. This gentleman, being a member of the City Council, complained of their vexatious conduct at a meeting of that body last Tuesday; and he even went so far as to appeal to the Chairman of the Electric Lighting Committee (Alderman Taylor) to have the offenders removed from the neighbourhood of his residence. Confirmation of the annoyance was given by his Worship the Mayor (Major C. H. Simpson), who declared that the complaint as to the behaviour of the lamps was very general; many had spoken to him about it, and it was very distressing. Alderman Taylor assured the Council that the lamps were receiving all the care that was possible from the makers, who were constantly saying that, before the lamps were handed over to the Committee, they would make nothing beyond the ordinary noise. The Alderman did not appear prepared to define what was meant by "ordinary noise;" and, further

questioned, he stated that to explain the reason for the noise would involve many technicalities. It is to be hoped, however, that he will yet be prevailed upon to enlighten his colleagues on the point.

Mr. H. Boulnois visited Bury St. Edmunds last Wednesday to inquire, on behalf of the Local Government Board, into an application by the Town Council for permission to borrow £20,000 for purposes of electric lighting. Mr. T. C. Blofield laid the case for the applicants before the Inspector. He summarized the various reports of the Engineer of the scheme (Mr. Medhurst); and, in doing so, he compared the gas supply and what was expected to be effected by the electric light—his remarks revealing a rather curious financial arrangement between the Town Council and the Gas Company. The charge for the electric light was to be 6d. per unit, which, in Mr. Blofield's opinion, would make it cheaper than gas at 3s. 6d. per 1000 cubic feet, which they were paying. He mentioned that, when the Gas Company obtained their Act in 1849, the Corporation advanced them £2500, free of interest, on their undertaking to supply the street-lamps with gas at what they termed cost price—2s. 3d. per 1000 feet. There were now 323 gas-lamps, which cost £583 a year, including a calculation for interest on the £2500 advanced to the Gas Company; while under the electric lighting system there would be six arc lamps and 420 incandescent ones, which would cost £498. As a matter of fact, Mr. Blofield said, the lighting of the town was at present very insufficient. If the almanac said there ought to be a moon, it was assumed there was a moon; and, with one lamp lighted at the corner of each street, the remainder were given a rest. The Inspector here remarked that he went round the town on the previous night, and felt bound to admit that the lighting was exceedingly bad. Mr. Wild (who appeared on behalf of certain petitioners against the scheme) observed that the Corporation could have any amount of gas they liked at the same price, to which Mr. Blofield replied that, if the town were to be properly lighted with gas, the cost would probably be £700. Resuming his statement of the case, he showed how the total cost of the scheme was made up; his figures including an assumption that the Gas Company would give up the £2500 of which they had had the use. A long discussion took place on this point. Mr. Salmon (the Town Clerk) stated that the late Town Clerk was also Chairman of the Gas Company; and when it was proposed some time ago to take Counsel's opinion as to the free loan of £2500, the case was drawn up by Messrs. Leech and Son, an independent firm of Solicitors. Counsel's opinion was that, in the event of the Town Council no longer requiring gas for purposes of public lighting, the £2500 became immediately payable, and could be called in. The present Chairman of the Company (Mr. F. C. Andrews) had also said that he did not think, as honest men, they could keep the money. Several witnesses were called; and one of them (Mr. Jaggard), in cross-examination, was asked whether the financial arrangement with the Gas Company was not an advantageous one for the town. He replied that it was a very good one for the Company; but he admitted that he did not know of any town in the neighbourhood where the price of coal was the same, and where gas was supplied for public lighting at 2s. 3d. per 1000 cubic feet. In summing up the objections to the proposal, Mr. Wild contended that the scheme would be a serious matter for the poorer ratepayers, and especially for those who did not use electric light. No less than 44 provincial authorities were working electric lighting systems; and of these 21 made a surplus and 23 a loss. Out of the 44 towns, there were only 15 which had a population of less than 50,000; and of these four had a surplus and eleven a loss. Mr. Wild asked the Inspector to advise the Board that Bury should be instructed either to abandon this scheme altogether, or to substitute a greatly-modified proposal upon which their 'prentice hands might be exercised. The inquiry lasted seven hours.

**Derby and District Residual Products Committee.**—A meeting of this Committee, the formation of which, under the chairmanship of Mr. F. C. Humphrys, of Ilkeston, was announced in the "JOURNAL" some months ago, took place on the 15th inst., at the Midland Hotel, Derby—nearly all the Companies constituting the Committee being represented. Seven tenders which had been received in response to the Committee's invitation were opened; and it was found that the best price offered was at least 7s. above that quoted in our "Current Sales." Most of the members will therefore receive better prices for their tar and liquor, though general quotations are lower. This new departure has, therefore, been productive of good. The object of the Committee is not, however, to force up prices, but to be sure that they get the market rate, be it high or low, for their products—a condition of things which, they say, did not always obtain before. The idea has been entertained that, in the event of the Committee not receiving any tenders, they would deal with their products themselves at central works; but, of course, they would not do this unless compelled.

**Southport and the Gas Supply of Birkdale.**—The Birkdale District Council are proposing to carry out several improvements in the town, among them being the laying of new gas-mains. For this purpose £1500 is required; and the sanction of the Local Government Board has been sought to the borrowing of it among other sums. Last Tuesday, Colonel C. H. Luard sat at the Town Hall to hear evidence regarding the application. He was informed by the Law Clerk (Mr. J. J. Smallshaw) that the gas distribution system in the district belonged to the Birkdale Council; but the gas was supplied by the Southport Corporation. For the use of the mains, the latter paid 4½d. per 1000 cubic feet of gas consumed by private consumers, and a royalty of 3½d. per 1000 cubic feet for the privilege of supplying the gas. Birkdale therefore received 8d. per 1000 cubic feet of gas supplied. On the other hand, the Corporation charged them 3s. 6d. per 1000 cubic feet, as against 3s. in Southport. These figures did not include street lighting. The Inspector: They do not let you off very cheaply. The Law Clerk observed that there had already been a Local Government Board inquiry and a fight on the subject. The Inspector: They seem to get back 6d. out of the 8d. they pay you. The Law Clerk: Yes, the difference is only about 2d. The Chairman of the District Council (Mr. T. O. Clinning) asked the Inspector to use his influence to obtain for them the borrowing powers as early as possible, in order that they might proceed with the laying of the gas-mains in readiness for the lighting season. The Inspector did not think it would take long, as matters of this kind were now left more in the hands of the Inspectors than formerly.



## METROPOLITAN WATER SUPPLY COMMISSION.

## Thirtieth Day—Monday, July 18.

(Viscount LLANDAFF, Chairman, Sir JOHN E. DORINGTON, Bart, M.P., Sir G. B. BRUCE, M.Inst.C.E., Major General A. DE COURCY SCOTT, Mr. A. DE BOCK PORTER, C.B., Mr. H. W. CRIPPS, Q.C., and Mr. R. LEWIS.)

The sitting took place at the Guildhall, Westminster.

The following Counsel are engaged: Mr. POPE, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., for the New River Company; Mr. LITTLER, Q.C., and Mr. LEWIS COWARD for the Kent Water Company; Mr. PEMBER, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. RICKARDS for the Chelsea Water Company; Lord R. CECIL for the Hertfordshire County Council; Sir JOSEPH LEESE, Q.C., M.P., for the Kent County Council and Kent Local Authorities; Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN, Q.C., for the London County Council; Sir R. NICHOLSON for the Middlesex County Council; and Mr. GABRIEL P. GOLDNEY (Remembrancer) for the Corporation of the City of London. The Southwark and Vauxhall Water Company are represented by Messrs. BIRCHAM and Co.

Mr. Henry Weeden, Vice-Chairman of the Ilford Urban District Council, said the district was growing at a phenomenal rate—1000 or 1500 new houses a year. The water supply was given by the East London and South Essex Companies; both having concurrent powers of supply over the whole area. They had, however (by agreement presumably), partitioned the district between them. The charges of the East London Company were 5 per cent. on houses whose rateable value did not exceed £30; and those of the South Essex Company were  $7\frac{1}{2}$  per cent. on similar houses. As the bulk of the houses in Ilford were under £30 rateable value, this charge of  $7\frac{1}{2}$  per cent. meant an increase of the water-rate by 50 per cent. The charges in respect of houses over £30 annual value were also in favour of the East London Company. The growth of the district was very largely in the South Essex Company's zone. His Council preferred the East London Company's supply on all grounds. The South Essex Company obtained their water from Grays—from wells and chalk pits. The local Council had never attempted to compel the East London Company to give a supply in the South Essex Company's district, by tendering the necessary guarantee of rates for three years.

The CHAIRMAN remarked that if an abstract furnished by the London County Council was correct, the East London Company were exempt from supplying in any district where another Company were actually supplying.

Witness (continuing) said his Council wished to have power to buy up the works of the East London Company in their district, and to compete with the South Essex Company. As an alternative proposal, the Council thought the Government might give the London County Council power to buy the works of the East London Company; and in this event the London County Council could supply water in bulk, and the local Council could sell it in competition with the South Essex Company.

Major-General SCOTT: So long as the South Essex Company are able to supply water, are you not precluded from giving a supply?

Witness: We think the law might be amended to allow us.

The CHAIRMAN: I do not think the law prevents them. It only exempts them from the obligation.

Witness (continuing) said he thought the London County Council would be quite willing to supply his Council with water in bulk, until the local Council obtained sources of their own. In a certain portion of the South Essex Company's district, the charge was based on the net rateable value; in the remainder, on their own estimate. In the East London Company's district, he believed, the charge on each house was a few shillings in excess of the net rateable value.

Mr. F. G. Banbury, M.P., Trustee and Manager of the Stock Exchange, said he had framed a scheme of purchase of the London Water Companies which would not increase the rates now paid by the consumers, and would give the consumers, free of cost, any increase of profits. He proposed that Parliament should create a small statutory central body, selected something on the lines of the Indian Council, and consisting of not more than nine or ten members. They should be paid members and experts—men of business who were accustomed to administer water matters. This body should be authorized to create a 3 per cent. perpetual stock secured on the water-rates, transferable at the Bank of England, and in which trustees should be entitled to invest. Each share or debenture holder in a Water Company should receive as much of this new stock as would yield him the dividend he was now receiving. The purchasing Authority would thus require to raise no more income than the Companies were raising at present, because they would only give sufficient of the stock to the shareholders to meet the income they were now receiving. The statutory body would purchase the Companies by means of this new stock. One advantage of the scheme would be that, whereas if the purchase were by a cash payment some £30,000,000 or £40,000,000 would have to be raised—which would occasion considerable difficulty in the Money Market; by his plan no money would have to be raised at all. The advantage to the seller would be that he would receive a fixed income, secured upon the water-rates of London, in the form of stock in which trustees would be entitled to invest. This latter condition was one which water shareholders did not enjoy at present. It was of considerable importance, however, and would materially increase the value of the stock. In this way the sellers would receive an ample sum for their undertaking; while the purchasers would pay nothing beyond what they were at present paying.

Mr. DE BOCK PORTER: Would you treat dividends of all the Companies as of equal intrinsic value?

Witness: I should take what each shareholder is receiving from his Company. If he is receiving 8 per cent., he would get sufficient stock to pay him 8 per cent., and so on. For this purpose, I should take the dividends last available.

The CHAIRMAN: The Company may be paying 8 per cent., but may have capital expenditure in front of them which will reduce it by 1 or 2 per cent. If you crystallize the 8 per cent., you are giving them a vast sum.

Witness: You must take the rough with the smooth. During the past twenty years the dividends of the Companies have largely increased,

though there has been considerable capital expenditure during the time. I should allow nothing for prospective value; and, on the other hand, no deduction would be made for future possible expenditure, which might diminish the income very largely. If the water-rates were insufficient to pay the 3 per cent., they would have to be increased.

As I understand, there is to be no arbitration?—No; you do away with all that expense.

Sir J. DORINGTON: The shareholder in a good Company would have adequate compensation in the increased capital value of his stock; and the shareholder in a bad Company would obtain rather extravagant remuneration?—Yes. There is no scheme that has not one or two objections to it.

In answer to further questions, witness said a shareholder in the Southwark and Vauxhall Company would get the same relatively as a shareholder in the best of the Companies. His scheme would not prevent the dividend—the basis of the new stock—being fixed by arbitration. He had not provided for this because the Water Companies were subjected to Government control; therefore he assumed that their dividends were proper and fair. The essence of his scheme was purchase by dividend, instead of purchase by capital value; and he wanted some easy way of ascertaining what the dividend was. The dividends of the Companies during the past twenty years had been very regular, save in 1894; the tendency being upwards. This might make shareholders want more, but not if they understood the value added to the stock by making it a trustee stock, transferable at the Bank of England. He provided no means of extinguishing the stock; seeing no reason why the present generation should pay for the benefit of the future. He would drop the right to receive back dividends altogether. To provide funds for increasing the works, the statutory body would have to have power to create more stock of a similar character, also secured on the rates. No doubt, the new Authority would have to spend more money, but not unless there were new customers, who, as in the past, would provide a remunerative return on the capital invested. The Companies had undertaken large expenditure the last few years; but their dividends had not decreased much. The water charges would be levied by the new body; and they would probably be reduced by the amount of the saving caused by the amalgamation of the Companies, and by reason of the growth of consumption, which in the past had meant increased dividends to the Companies. If London did not continue to grow, the consumers would be in no worse position than now. He had mentioned his scheme to, perhaps, the largest water shareholder; and he was anxious to see it carried through. He agreed that his scheme was in some respects similar to that of the late Mr. Smith. If the London County Council were substituted for the statutory body, witness's scheme would work well for the shareholders; but he doubted whether it would for the ratepayers. The City had not much faith in the capacity of the County Council. In his scheme he considered he was disposing of the question of back-dividends by increasing the value of the stock.

Mr. LEWIS: Suppose Parliament were not to sanction a perpetual annuity of this kind—and Parliament is very likely to object to it—are there no means of retaining the stock as a trustee stock, and at the same time providing for its being extinguished in 80 or 100 years?

Witness: Yes. Trustees are empowered to invest up to a certain premium in a terminable stock; but if you start with a sinking fund, you at once do away with the advantages that will accrue to the ratepayers. Given a business body to carry out the scheme, I believe in five or six years the water-rates would be reduced, and the supply be as good as now. I do not think Parliament would make any difficulty about the stock being irredeemable, though they had only sanctioned redeemable stock where Local Authorities had borrowed money. The body he proposed would be appointed by the Government, and would always be under the control of Government, and, in this way, of Parliament. He should prefer to leave the control entirely with the Government. If a Local Authority had a complaint, they would be able to bring an action, if necessary. He should think the County Council could get a loan of £40,000,000 or £50,000,000 on the Stock Exchange, secured on the water-rates first and then on the rates of all London or the Metropolitan Counties, at about £2 16s. per cent. His scheme could not be passed, he thought, if strenuously opposed by the Water Companies.

By Mr. POPE: The advantage of the scheme to the shareholders would be the great increase in capital value of their stock, which would arise from their receiving stock in which trustees could invest. The security would be better than now, because at present the Companies could not increase their rates; whereas the new body would have power to do so if necessary. By excluding back-dividends, he did not refer to those at present being paid, but to the payment of them in future. Whatever was paid for the undertakings, it would be better that it should be in equivalent stock, and not cash. To decide what the income of the Companies was, he should take the last year. In this way, he should take the dividend of the Kent Company at 13 per cent., and thus perpetuate the 3 per cent. on account of back-dividend which they were paying. Under Mr. Smith's scheme, a certain income would have had to be purchased; and the Companies had never earned this income. Under witness's scheme, the Companies were earning the money that would have to be paid.

By Mr. PEMBER: In the case of the Lambeth Company, who last year paid 10 per cent., and might have divided £19,000 more as back-dividends, he should take the dividend at 10 per cent. They must assume there was a good reason for not dividing the £19,000.

The CHAIRMAN: You take the dividend income, and not the actually earned income?

Witness: Yes.

Mr. PEMBER: Your scheme would make the Companies give up all prospective value and the right to back-dividends, both of which would be very important concessions as against the Companies; and you say this would be met by the fact that they would get enhanced capital value?

Witness: Yes.

By Mr. H. L. CRIPPS (representing the London County Council): In 1893, when the East London Company were before the House of Commons, he said he was authorized to speak on their behalf; but he had no special interest in the Company. He had had no direct communication with the Water Companies regarding the present scheme; but he had shown it to one or two of the Directors. The scheme was his own idea altogether, and was not suggested on behalf of any Company. Parliament, in granting a loan to a Local Authority, had no control over that Authority;



but in this case it would have control over the body, and would not therefore object to granting powers without insisting on the provision of a sinking fund. The agreements of the Companies to sell, arrived at in 1880 through Mr. Smith, were too favourable to the Companies. He did not think it would be necessary to have the dividend the Companies were paying, which would form the basis of transfer, investigated by arbitration, having regard to the legal rights and obligations of the Companies and the probability of future expenditure. If the total revenue of the Companies available for interest and dividends was £1,180,788, and the revenue actually paid away £1,128,811, he should take the latter figure, because there might have been legitimate and proper reasons to prevent the distribution of the whole amount.

The CHAIRMAN: You would not allow the arbitration to take place upon the lines the County Council suggest—that much of the capital is obsolete, and ought to be struck out?

Witness: No.

Or as to whether certain charges (statutory or not) were equitable or fair?—No.

Mr. Allen Stoncham, Auditor of the Accounts of the Metropolitan Water Companies, a position he had occupied since the Act of 1871, said he was limited in the investigation of the capital of the Companies to periods prescribed by that Act, varying from 1864 to 1869, antecedent to which he was not to examine. To arrive at what the existing capital of each Company was at each of these specified dates, he practically audited the accounts for some years, and so ascertained the method in which they had been kept, and satisfied himself that they were pretty well kept. Every year after these dates, he only allowed the sum to go into capital which was properly chargeable in that way. There was nothing to be written off for deterioration. If an engine (say) was worn out, it would be replaced out of revenue; but witness did not use his own eyes to see that the engine was actually replaced—accepting the statement of the Engineer as to the fact. Before the water famine of 1894-95, he was not aware that any pipes were likely to burst. When the accounts came before him later on, it was suggested that a certain portion of this expense might be attributed to revenue and a certain portion to capital, on the ground that if the pipes had been laid at a lower level more capital would have been expended. Witness thought this reasonable, and the expense was so divided. He thought the capital of the Companies, as a rule, represented a fairly going concern, in working order. Of course, a good deal of it must have been expended on works that were now obsolete; but, on the other hand, no doubt some of the property had increased in value.

Mr. DE BOCK PORTER: When you began your examination of the capital accounts, did you not find very varying practices in the judging between capital and income?

Witness: I think on the whole it was very fairly done.

The CHAIRMAN: Would you not admit that there is a very large sum in the Chelsea Company's capital account which represents works very little used now, or of little value?

Witness: I have no official knowledge of that. I have no opportunity of forming such an opinion.

Mr. DE BOCK PORTER: You only look to the accretions to the capital since your audit commenced?

Witness: Certainly.

The CHAIRMAN: And you can say all these accretions have been proper at the time they were made?

Witness: Yes.

Mr. DE BOCK PORTER: The Companies never look into their undertakings as a commercial matter, and write off so much for depreciation.

Witness: No.

You only look at the expenditure as it is made?—Yes.

You do not, and cannot, judge whether the sums paid are proper for the purpose for which they are paid. All you can judge is whether the purpose of the work is a proper capital purpose?—That is so.

By the CHAIRMAN: In proceeding against a Company, he had to bear the expense out of his own pocket. He had fought one case, and was now taking Counsel's opinion on another. In an arbitration before Sir Henry James, he had the present Solicitor-General and Mr. Justice Wright against him. The Arbitrator practically argued the case for witness from time to time; but witness found himself at such a disadvantage, that he determined in the next case that he would employ Counsel, and so he fed Mr. Danckwerts. The expense fell upon him, as there was no provision in the Act by which he should have legal assistance. Witness at present had a difference with the Southwark and Vauxhall Company, and was taking Mr. Danckwerts' opinion as to what he should do. He could not suggest any further powers that were necessary to him for a proper audit; and he did not consider himself in any sense retained by the Companies because they found his salary. The money was collected by the Local Government Board, and paid by them to him.

By Mr. DE BOCK PORTER: He had always held it was the duty of the City Chamberlain to see that the sum he received under the operation of the sinking fund clauses was proper. Witness always passed the sum.

Mr. R. E. Middleton, M.Inst.C.E., M.Inst.M.E., examined by the CHAIRMAN, said he had been an Assistant-Commissioner to Lord Balfour's Commission, Joint Engineer with Mr. Hunter for the Staines Reservoirs Bills of 1896 and 1898, and Joint Engineer with Mr. Francis for the New River Company's Bill of 1896. He did not believe the purchase of the Metropolitan Water Companies' undertakings by anybody to be financially expedient in the interests of the consumers. Any purchase based on the full value of the undertakings must simply be a change of investment, so that there would be no profit in it. He did not, however, wish to be understood as saying that purchase would not pay at some future time, because that was a problematical thing which he could not enter into. If the consumption went on increasing as it had done, purchase would very likely pay eventually. At no time would the Companies cost less than at present. Undoubtedly some capital expenditure or other would be necessary, either for the Companies if they continued to exist, or for the purchaser if purchase took place. Witness had considered the comparative cost of the two schemes so far laid before the Commission—the Staines Reservoir scheme and the Welsh scheme. The Welsh scheme was much the most costly. In his estimates, he had

assumed that 200 million gallons a day would be allowed to flow over Teddington Weir. At present the London Companies were authorized to pump 130 million gallons a day from the river; or, adding 20½ million gallons under the Southwark and Vauxhall Act and 35 million gallons under the Staines Reservoir scheme, 185½ million gallons daily.

The CHAIRMAN: I suppose the proper thing is to find out the cost of storage reservoirs and filters for this quantity?

Witness: The work must be done, whether the Companies are purchased or not.

Then we ought to consider what would be the cost of providing sufficient storage and filtration for 130 million gallons?—The filtration is already provided; and the storage very nearly. I think you may disregard it up to 185 million gallons.

Assuming that 300 million gallons will be ultimately drawn from the Thames, this leaves storage to be provided for 114½ million gallons?—Yes; but Lord Balfour's Commission never limited the amount to 300 million gallons.

At any rate, they suggested that 300 million gallons might be taken from it without injury. Have you considered the cost of providing storage for 114½ million gallons?—Well, I have taken it at 123½ million gallons—this being the capacity of one reservoir in Wales.

What would be the cost of carrying out what I may call the Staines Reservoirs condition for this 123½ million gallons?—The total capital cost would be £4,337,408.

What is the cost to pump both for storage and supply?—£1,239,854.

What reservoir space do you provide for the 123½ million gallons?—18,000 million gallons. The natural flow of the Thames is always in excess of 200 million gallons daily.

The CHAIRMAN said he was sure Sir A. Binnie placed diagrams before them showing that there were many days when the natural flow was below 200 million gallons.

Witness pointed out that this was after the quantity actually being pumped had been extracted.

The CHAIRMAN: We have this evidence: "In 1883, there were 286 days when the flow of the river fell to or below 200 million gallons."

Witness: That is perfectly accurate. It is because you have to calculate the Companies are pumping above that, and taking 110 million gallons a day. The natural flow would have been actually above that if the Companies had stopped pumping.

This does seem to show that you must make in your reservoir scheme allowance for those days in which the pumping of the 130 million gallons at present authorized would reduce the flow below 200 million gallons?—That is perfectly true; and this storage amounts to 1802 million gallons. It is sufficient storage for providing for the present 130 million gallons and not reducing the flow below 200 million gallons. The total expenditure that the Companies or a purchaser of the undertakings would have to provide to secure 123½ million gallons in addition to the 185 millions already authorized is £5,577,262. The cost of pumping I have taken as lasting for only twenty years; whereas Sir A. Binnie calculated that it would go on for ever. If counted as going on in perpetuity, it would add about £600,000 to my estimate.

By Major-General SCOTT: One principal point in which witness's estimate differed from that of Sir A. Binnie was as to the amount of reserve reservoirs necessary to meet cleaning, and dirty water at the base of the reservoir, and evaporation. The storage necessary, according to witness, was 18,000 million gallons; according to Sir A. Binnie, it was 28,000 million gallons. Sir A. Binnie said two reservoirs must be put out of use for purposes of cleaning; and the amount of reserve water which would not be used was to be one-eighth of the whole. This practically amounted to the difference of 10 million gallons. Witness held that it was absolutely not necessary to have any reservoirs out of use, because the amount of mud collected, if they took the very dirtiest water out of the Thames during the whole time, would not amount in twelve years to more than ⅓ inch, 90 per cent. of which would be water. It would only be necessary to have the reservoir cleaned once in thirty years; and this could be done when a new reservoir was made. For evaporation, 10 per cent. was quite sufficient. The remarks he had made in reference to cleaning applied equally to bottom water. The amount of silt, as far as he could make out, never exceeded 2 grains a gallon. If they had a mass of water in a reservoir, he agreed that at every foot of depth the silt would increase; so that in the lowest portions they would have a considerable amount suspended. But as the water was drawn down, so the silt would settle. From experiments he had made, he found that a very large proportion of the silt subsided after three days' storage. There was no reason why water should not be pumped when the river was in its very worst state. After storage for six to ten days, it would be perfectly innocuous and harmless. Witness's figure per million gallons for the construction of the reservoir was £155, against Sir A. Binnie's £380. The latter, however, included items excluded from the former. Taking the actual figure for storage capacity in each case, there was not much difference between the two figures.

By the CHAIRMAN: The reason only 5000 million gallons of storage was required to supply 185 million gallons daily, whereas 18,000 millions storage was required for a subsequent supply of 123 million gallons, was that on the average of years 185 million gallons could be obtained from the river almost without storage at all. Witness, however, only calculated on not taking water for twelve days after flood, whereas Sir A. Binnie allowed fifteen days.

The CHAIRMAN pointed out that, according to Sir A. Binnie, the cost yet to be incurred in respect of the 185½ million gallons was £4,705,000; and the cost of obtaining 300 million gallons a day, £15,589,000. The difference between the two—more than £10,000,000 (representing the cost of the extra 114½ million gallons)—corresponded approximately with witness's £5,577,000. What accounted for the enormous difference?

Witness replied that Sir A. Binnie took the storage at 28,000 million gallons, whereas he (witness) put it at 18,000 million gallons.

The CHAIRMAN said that was not so, because 8000 million gallons had to come off Sir A. Binnie's figure for existing authorized supply.

Witness admitted that it was so. He presumed the error was partly in the £350 per million gallons, because he had been into the figures by the sums spent on the Staines reservoirs.

The CHAIRMAN said they had had it in evidence that the Staines reservoirs cost £380 per million gallons.

Witness said that was where the error lay. Sir A. Binnie had taken



the supply as being 35 million gallons. This was the quantity put upon the Staines Committee by Parliament; but the Staines reservoirs were capable of supplying 54 million gallons.

The CHAIRMAN: Do you mean you made your reservoirs too big for what Parliament authorized?

Witness: They were made according to the original plans.

Sir J. DORINGTON: In other words, you have to divide their cost by 54, instead of 35.

Witness (continuing) said he had also calculated what it would cost to bring 123½ million gallons from Wales, on the analogy of the Manchester, Liverpool, and Birmingham schemes—the best, and, as he thought, a fair and reasonable way of arriving at a conclusion.

The CHAIRMAN: Give us now your estimate for bringing 123½ million gallons from Wales.

Witness: The capital cost is £20,910,998.

That is, you make out that the Welsh scheme would be four times, or nearly, as costly as the Thames storage scheme?—Yes. The amount that will have to be spent in order to provide storage for the 185½ million gallons already authorized to be taken from the Thames is £858,287, if the work is undertaken in the most economical way.

Witness had not concluded his evidence-in-chief when the Commission adjourned.

The thirty-first sitting of the Commission was held yesterday at the Guildhall, Westminster—Viscount Llandaff presiding. It is probable that this sitting will prove to be the last before the summer vacation. Mr. Reginald E. Middleton, whose examination was not concluded when the Commissioners last sat, was further examined, and also, at the suggestion of Mr. Pember, questioned with regard to certain matters in his proof which had been ignored on the last occasion. Counsel pointed out that witness's evidence was directed not merely to criticism of tables and statements of preceding witnesses, and notably those of Sir A. Binnie, but also to establishing the substantive case for the Water Companies in relation to evidence to be given later.

### THE WATER PROVISIONAL ORDERS OF THE SESSION.

The Board of Trade have issued a memorandum stating the nature of the proposals contained in the Provisional Orders included in the Water Orders Confirmation Bill. There are six Orders, relating respectively to Broughton-in-Furness, Hayling, Portsmouth, Ross, St. Neots, and Wrexham. The first Order is to empower the Broughton-in-Furness Water Company, Limited, to construct and maintain water-works, and to supply water within the town of Broughton-in-Furness, and the hamlets of Sykehouse and Keppelway, in the township of Broughton West, in the county of Lancaster. The second is to authorize the South Hayling Water Company, Limited, to carry out additional works and extend their limits of supply. The Portsmouth, Ross, and Wrexham Orders are to sanction the raising of additional capital; and the St. Neots Order is to empower the St. Neots Company to construct and maintain water-works.

### GLASGOW CORPORATION WATER SUPPLY.

#### Report for the Year 1897-8.

During the past forty-two years, the water supply of Glasgow has been one of the marvels of that great seat of municipal government. In the year 1856, the Act of Parliament by which the supply of water became transferred to the Corporation, and which was passed on July 2, 1855, came into full force. The price on the north side of the Clyde started at 1s. 2d. per £1 of rental for the domestic supply; and for the past half-dozen years the whole of the city, on both sides of the river, has been getting a constant service of Loch Katrine water at only 6d. per £1 of rental, while it is confidently anticipated that next year another penny will be taken off the domestic rate. The annual report on the undertaking, with its myriad of statistics, was laid before the Water Commissioners of the city last Thursday, and its principal features are given below.

Dealing first of all with the financial portion of the report, we find that the ordinary revenue for the past year amounted to £204,216; that from hydraulic power works, to £3471; and from river supply works, to £3685—in all, £211,372. Adding the balance brought from the previous year, £40,786, makes £252,158. The expenditure, including annuities, amounted to £146,464; that for hydraulic power works, to £4829; and for river supply works, to £3791—together, £155,084, leaving a balance of £97,074. There has been carried to sinking fund accounts, £57,302; and the balance carried to the credit of the revenue account for the year 1898-9 is £39,772. This balance is carried forward to meet the compulsory sinking fund on the cost of the new works, which came into operation last year. The total revenue for the past year, as shown above, was £211,372; that for the previous year was £201,226—being an increase of £10,146. The total expenditure for last year, exclusive of the sum carried to the sinking fund, was £155,084; that for the previous year was £148,961—being an increase of £6123.

Next in order there follows the amount expended on new works and added to capital account during the past year. It was £71,069. The capital expended on the new works now being constructed under the Acts of 1882, 1885, and 1892, amounts to £1,339,598. Under the Act of 1892, the borrowing power was increased to £3,250,000. But there are given several items, such as funded debt issued, Corporation loans fund account, &c., which collectively make up a total of £3,160,601; so that there is unexhausted borrowing power to the amount of £89,399. The sinking funds set apart for the redemption of annuities and the repayment of moneys borrowed in terms of the Acts, including the redeemed mortgage account, now amount to £896,705.

Coming to the part of the report referring to works, we learn that the portions of the new aqueduct from Loch Katrine which have been completed continue to discharge an increased quantity of water into the

service reservoirs. Of the 23½ miles of which the new aqueduct consists, there now only remains the Loch Katrine tunnel contract, 1½ miles long, to complete the whole. This contract will take two years to finish; but the driving of the tunnel will be completed in about two months, when the construction of the basins at the entrance from the loch will be commenced. The service reservoirs of Mugdock and Craigmaddie continue in good order; and the supply to the high levels of the city has been much improved by their joint use. The Gorbals works and reservoirs are in a proper state of repair. A contract has recently been made for the deepening of the remaining portion of the edge of the Balgray reservoir, with the view of preserving the purity of the water stored therein. Details are then given of the pipe-laying work of the year, amounting to 30,241 lineal yards, or upwards of 17 miles.

With regard to the supply of water sent into the city and district during the year ending the 31st of May last, it averaged as follows: From the Loch Katrine works, 46,642,223 gallons per day; from the Gorbals works, 4,808,642 gallons per day—together, 51,450,865 gallons per day. The average for 1896-7 being 49,786,667 gallons, there was an increase of 1,664,198 gallons. The use of the hydraulic power water continues to increase. The number of machines now supplied is 238—being an augmentation of 85 during the past year; while there are applications for 60 others still on the books of the Water Committee waiting for the completion of the buildings or machinery. The quantity of water furnished to the river supply works averaged 2,780,700 gallons per day for 1897-8, as compared with 2,513,674 gallons per day for 1896-7; being an increase of 267,026 gallons.

### LOSS OF WATER FROM PIPES.

A paper on the above subject was presented by Mr. F. H. CRANDALL, the Superintendent of the Water-Works Department at Burlington (Vt.), at the last meeting of the New England Water-Works Association, and was published in a recent number of the "Engineering Record." The following are some extracts therefrom:—

The determination of the loss of water from any considerable system of underground piping is at best problematical, and does not admit of definite unquestionable solution; but in the case which I will endeavour to present for your consideration, some of the difficulties ordinarily encountered have been eliminated. Systems, even of such small extent as that to which your attention is invited—on which for months at a time there is no occasion to open public fire hydrants, on which there are no large manufacturing concerns using water for fire purposes, and on which all ordinary legitimate use is metered—are not numerous. On the Burlington high service, however, it has recently come about that these conditions obtain. By far the larger portion of the pumpage on this service is accomplished by a motor; an auxiliary steam plant being used only when it becomes necessary.

The works were built in 1880 and 1881, and now serve the University buildings, the State Agricultural Experimental Station and its farm buildings, two Roman Catholic schools, one hospital, and five Summer residences with innumerable fixtures, besides 45 dwellings, nearly all of which are supplied with modern conveniences in plumbing. Some of the mains were laid in rock cut; and some are, for the greater portion of the year, below the ground water-level.

The service comprises an iron tank of 2260 cubic feet capacity, 9671 feet of cast-iron mains from 4 to 8 inches in diameter, and about 1560 feet of 4-inch cement mains, with six public fire hydrants, one 4-inch and two 2-inch services supposed to be used for fire purposes only, 62 metered taps, through which water is used for domestic supplies, one 3-inch metered elevator service, one 2-inch overflow (metered), and one 1½-inch metered service used to supply power for operating the valves of the motor. Each of the meters at the time of setting registered, on full size ¾ and 1-16th inch streams, not more than 2 per cent. fast nor more than 3 per cent. slow. By sizes, the meters in use are one 3-inch, two 2-inch, two 1½-inch, seven 1-inch, seven ¾-inch, forty-one ½-inch and five ¼-inch.

As the discharge of the motor is conveyed to the tank by way of the distribution system, and thus far conditions have not been favourable for accurate measurement, the losses in the pump can be arrived at only by estimation. The plunger in the pump end of the motor, which works against about 41 lbs. static and 43 lbs. dynamic head, is 4 7/8 inches in diameter, and is provided with a double-cup leather packing, which has frequently been found, when the plunger is not in motion, to be absolutely tight at different points of the stroke. In motion, a small leakage is developed. There is also leakage of the ports. The suction and discharge ports of the motor pump are each 12 in number, about 3 inches in diameter, and capable of ¾-inch lift. The motor runs at from 4 to 32 strokes per minute, and will not go many minutes at the maximum speed. The average is about 12 strokes a minute. Besides the losses common to all pumps, a further source of error in the counter measurement in this case is the shortening of the stroke on small streams like that in small meters, which in this case reaches at times 3 per cent. of the stroke. It is not, however, expected that in practice the motor will be required to run for any considerable length of time on a very small flow. The records for the two periods into which the whole time may be divided, during one of which the steam-pump was used, and the average daily consumption was about 4770 cubic feet, and during the other when the pump was not used, and the average daily consumption was about 3552 cubic feet, do not differ materially in the percentages not measured. In taking the statements of the meters recording the consumption, about two hours are consumed; and the counter of the motor is read during that time. In determining the correction to be applied to the counter record for losses on the pump, taking the leakage of the ports at the mean noted during several tests, made under static pressure, that of the plunger at the mean noted while moving with considerably less than its usual velocity against the static pressure, and that of the stuffing-box at an arbitrarily chosen amount equal to one-half that of the plunger, we have an aggregate loss, under the conditions noted, of about 1 per cent., and, for purposes of estimation, we will assume the losses under working conditions at 5 per cent.

Records are at present obtainable of the pumpage and consumption on this service for a period of eleven months, during which every legitimate



use was made of water. During the first eight months, the steam plant was used only five times. The total quantity of water handled was 1,144,907 cubic feet—1,088,563 cubic feet, or about 95 per cent., by the motor, as per indicator, and 56,344 cubic feet, or about 5 per cent., by the steam plant. Of this indicated pumpage, 729,282 cubic feet, or about 64 per cent., were metered to the consumers; 193,285 cubic feet, or about 17 per cent., to the motor; 39,040 cubic feet, or about 3 per cent., to the overflow; 27,630 cubic feet, or about 2 per cent., were estimated to the consumers; 57,245 cubic feet, or about 5 per cent., were the estimated loss in the pump, and 93,425 cubic feet, or about 9 per cent., were not accounted for. During the last three months for which records are obtainable, the steam plant was not called upon at all. The total amount of water handled was, according to the indicator, 319,734 cubic feet. Of this indicated pumpage, 230,375 cubic feet, or about 72 per cent., were metered to the consumers; 40,360 cubic feet, or about 13 per cent., to the motor; 1680 cubic feet, or about 0.5 per cent., to the overflow; 2024 cubic feet, or about 0.5 per cent., were estimated to the consumers; 15,986 cubic feet, or about 5 per cent., were the estimated loss in the pump; and 29,309 cubic feet, or about 9 per cent., were not accounted for. During the entire periods for which records are available—eleven months ending Feb. 1, 1898—the total amount of water handled was 1,464,641 cubic feet—1,408,297 cubic feet, or about 90 per cent., by the motor, as per indicator, and 56,344 cubic feet, or about 4 per cent., by the steam plant. Of this indicated pumpage, 959,657 cubic feet, or about 65 per cent., were metered to the consumers; 233,645 cubic feet, or about 16 per cent., to the motor; 40,730 cubic feet, or about 3 per cent., to the overflow; 29,654 cubic feet, or about 2 per cent., were estimated to the consumers; 73,232 cubic feet, or about 5 per cent., were the estimated loss in the pump; and 127,733 cubic feet, or about 9 per cent., were not accounted for.

In the "Transactions" of the American Society of Civil Engineers for December, 1897, there is printed some information on the same subject contributed by Mr. C. F. Loweth in a discussion on a paper by Mr. Emil Kuichling. In this paper the leakage in a well-constructed distribution system is estimated at 2500 to 3000 gallons per mile daily—an amount far too large in the opinion of Mr. Loweth, who has come to the conclusion that the leakage can be kept within 60 to 80 gallons per inch-mile of pipe per 24 hours, or 600 to 800 gallons per mile of 10-inch pipe-line. These figures are deductions from tests of several new pipe systems, in most cases before any service connections were made, and are believed to be within the ability of honest and experienced workmen. In the same discussion, Mr. G. S. Williams described the leakage from a distribution system comprising 3487 feet of 10-inch pipe, of which a length of about 3000 feet was submerged in a river crossing, and 4700 feet of 8-inch, 10,820 feet of 6-inch, and 6300 feet of 4-inch on land. Connected to the 8, 6, and 4 inch pipes are 20 hydrants and 12 gates; and on the 10-inch pipe are three gates. The pipe, where submerged, was laid with special ball joints every four to seven lengths; the remaining joints being of the ordinary bell and spigot type. This pipe was laid in 1893, and was first tested in July, 1894, by pumping through a 3-inch disc meter. With an average pressure on the pipe of about 90 lbs., the leakage amounted to 599 cubic feet in 12 hours; and with a pressure of about 50 lbs., tested after the higher pressure, the leakage was 277.5 cubic feet in 12 hours. In the fall of 1894, the 8-inch line was laid by day labour, and was tested at about 50 lbs. pressure in the open ditch; leaks being repaired before covering. In 1896, the 6-inch and 4-inch pipes were laid by contract; and the test in the open ditch was not required, though the contractor made use of it to some extent. In November, 1896, the whole system was tested; the river crossing being investigated first. The crossing and the approaches were 3487 feet long, of ordinary 10-inch cast-iron pipe, and contained 306 ordinary and 49 ball joints, as well as three gates. It was ordinarily supplied through two 6-inch disc meters. For this test a new 3-inch disc meter was coupled in, so that by closing the gates the water passed through a 6-inch meter, then through the 3-inch meter, and finally through the other 6-inch meter to the pipe to be tested. The water was taken from the city mains, which are supplied by direct pressure. To reduce as far as possible any leakage past the 10-inch gate at the farther end in the original test, a 10-inch cap had been leaded into the pipe; but for the last test two gates controlling the two branches of the pipe, about 15 feet behind the 10-inch gate, were closed, and then the latter was shut. The three meters were read every five minutes, and pressure-gauge readings were taken at both ends of the line every minute. The pressure on the pipe at the level of the river was between 42 lbs. and 43 lbs. The leakage was found to be 745 gallons a minute. The test was then extended to the rest of the system; the same meters being used in a like manner. The record was taken for 20 minutes with all the services shut off; and there resulted a leakage in the entire system, including the 10-inch line, of 4847 gallons a day.

**Wolverhampton Corporation Water Department.**—The annual report of the Water Committee of the Wolverhampton Town Council shows that the profit for the year, after paying interest on capital and providing for the sinking fund, amounts to £4459, out of which £4000 is to be transferred to the improvement fund. The total expenditure incurred in respect of the trial borings at Dimingsdale, amounting to £859, has been debited to revenue account during the year; and this, it is stated, more than accounts for the diminution of the profits as compared with those made in the previous twelve months.

**The Consumption of Gas at Coventry.**—The financial results of the working of the Coventry Corporation Gas Department during the year ending March 31 have already been published; and now we have, in the abstract of the audited accounts of the Corporation, some interesting information regarding the remarkable development in the consumption of gas in the city during the last few years. The quantity of gas made in 1897-8 was 504,639,000 cubic feet, or almost exactly the same as in the previous year. Of 472,723,300 cubic feet sold, 215,595,000 feet, or about 45 per cent., was delivered to large consumers at reduced rates. In 1876 only 124,770,000 cubic feet of gas was manufactured; and in ten years—i.e., in 1886—this had not increased beyond 182,478,400 feet. The increase became marked in 1889-90, when it reached 246,330,000 feet; but since then the output, as already shown, has more than doubled.

## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Paisley Gas Commission had a revenue last year of £42,176, an increase of £1490 upon the preceding year; and an expenditure of £34,239, an increase of £610. The balance at the credit of profit and loss account was £7937; but from this there fell to be deducted, £2155 as interest on mortgages, and £2748 carried to contingent account—leaving a net surplus of £2352. With the balance brought forward from the preceding year, there was a sum at the credit of profit and loss account of £7715. The accounts were presented to the Commissioners by Treasurer Mathieson at a meeting on Thursday, and were adopted; the price of gas being continued at 2s. 6d. per 1000 cubic feet. Everything is as it should be in the Corporation Gas-Works; and Mr. G. R. Hislop, the Engineer, deserves all the credit which can be given him, for efficient management. When, however, we get outside the range of his duties we find the pernicious principle in force of the appropriation of the surplus from the gas undertaking to Corporation purposes. This year £2000 has been applied to the reduction of the debt upon the Town Hall. There are 16,831 meters in use, which is an increase of about 700 during the year. The Works Committee recommended that prepayment meters be supplied, to a number not exceeding 500; the meters to be procured as they are required by the consumers. Treasurer Mathieson stated his disapproval of the proposal, on the grounds that the rate at which gas would be supplied would virtually amount to an annual meter rent of 4s. 7d. upon every meter, and he did not think there was sufficient slum population in Paisley to make the supply of prepayment meters a success. The Corporation, however, adopted the recommendation of the Committee.

The annual meeting of the Montrose Gaslight Company was held on Wednesday. The report of the Manager (Mr. T. Douglas Hall) stated that during the year 2710 tons of coal were carbonized, a decrease of 48 tons, when compared with the preceding year; but that from this quantity of coal 29,987,000 cubic feet of gas were produced, an increase of 840,000 cubic feet. The yield of gas per ton was 11,030 cubic feet, or 500 cubic feet per ton more than was obtained in the previous year. The gas supplied was of 25.22 candle power. Unaccounted-for gas amounted to 11.8 per cent., a decrease of 0.7 per cent. There were 63 prepayment meters in use, through which 374,700 feet of gas passed, the return being £89 13s. 5d.—an average of about 6000 cubic feet, and £1 8s. 6d. per meter. Seventeen gas-engines consumed 621,100 cubic feet; the return being £129 7s. 1d. The consumers numbered 2267, an increase of 26. Since the previous report, a set of four new purifiers, 15 feet square, by 4½ feet deep, had been erected, at a total cost of £947. They were set to work on the 6th of October last, and had given entire satisfaction. For the current year, it is hoped the cost of purifying materials will be considerably reduced, and it will be possible to send out gas free from impurities, which, with the old plant, it was at times difficult to do. The income, including a balance of £67 from the previous year, amounted to £5908, and the expenditure to £4512—leaving a surplus of £1396. A dividend at the rate of £2 10s. per share was declared, absorbing £1250; and the balance of £146 was carried forward. The Directors were re-elected, and so were the officials, which is a custom of the Company, and which, curiously enough, extends to Mr. Hall himself. There may be other instances, but I do not know of them, in which the Manager is elected year by year. It seems to be a useless ceremony, because, if a manager were not giving satisfaction (which is by no means the case here, for Mr. Hall was thanked for his services), he could be removed from office even though there were no yearly appointment. It is doubtless a rule of the Company, and I can suppose it to have originated in the methodical mind of the first Secretary of the Company, who, in all likelihood, was a lawyer, and was impressed with a sense of the magnitude, if not the risk, of the undertaking they were bringing into existence. I suppose the fortunes of a gas undertaking are about the best index procurable as to the state of trade in a town; and in this view it is pleasing to observe that Montrose seems to be in a flourishing way, and all the more so because within the past two years some industries in the burgh did not appear to be so prosperous as they might be.

The result of the past year's working of the Arbroath Corporation Gas Department is of more than ordinary interest. A year ago, in order to retrieve the harbour finances, an Act of Parliament was procured, which virtually annexed £250 a year out of the revenue from gas. It so happened that during the past financial year two payments of £250 fell to be made. Yet the gas revenue has borne it; and there is £16 over. The elasticity of the gas accounts was sufficient to bear an extra and unasked burden; but the wisdom, or otherwise, of raising money by this method for the relief of struggling local institutions, is made apparent by another peculiarity in the Arbroath Corporation Gas Act. By it one-half of the surplus upon the gas accounts goes to the Town Council, and the other half is placed to a consumers' account, to be used for the reduction of the price of gas. In the working of this fund, when it reaches £170 a reduction of 1d. per 1000 cubic feet is made. Now, there is £28 at the credit of the fund; and if the payments to the Harbour Board had not required to be made, and their amount had been placed to the consumers' account, there would have been a sum of £520, or thereabout, which would have enabled a reduction of at least 3d. per 1000 cubic feet to have been made in the price of gas. Yet the Corporation were unable to make any reduction, and have continued the price of gas at 3s. 11½d. It is not fair to Mr. Carlow that he should be obliged to make his own business prosperous, and should, under obligation to assist other bodies, be compelled to sell gas at a higher figure than is necessary. It is all very well so long as there is money in the gas account; but should it fail, or should the Corporation succeed in reducing it to the condition to which they have brought the harbour undertaking and the water supply—for, by the way, the gas undertaking is the only flourishing public body—whether are they to look next for help? They seem to be doing their best to cripple their most successful department. This is the principle to be applied to the situation. It is well for the public men of the town that, in practice, the gas undertaking has a back broad enough to carry all that they have hitherto put upon it.

The Corporation had their annual reports and accounts before them on Tuesday. The report of Mr. Carlow, the Manager, was as follows: The quantity of coal used during the year was 5865 tons, as against 5584 tons in 1896-97—being an increase of 280 tons, or 5.48 per cent. The make of



gas was 57,294,200 cubic feet, as against 54,597,200 cubic feet the previous year, which was an increased make of 2,697,000 cubic feet, or 4.93 per cent. In the past year the make of gas per ton of coal carbonized was 9768 cubic feet, which was a decrease of 8 cubic feet per ton, or 0.082 per cent., and the gas sold was 8764 cubic feet, which was an increase of 51 cubic feet, or 0.058 per cent. The unaccounted for gas for the year 1896-97 was 9.2 per cent. of the quantity made; in the past year it was 8.731 per cent., which was a decrease of 0.469 per cent. The Finance Committee's report was given in by Mr. Sutherland, the Convener. It showed that for the year ending May 31 the revenue from gas amounted to £10,174, against £9632 for the previous year. From the chemical works a revenue of £976 was derived, against £1039 last year; the total receipts, including a sum of £250 set aside to meet the interest on the harbour subvention scheme, being £11,537. The expenditure was less by £16 than the revenue; leaving practically the same balance as for the previous year. The chemical works account showed that the total receipts last year amounted to £1937. The principal outlays were on wages (£115) and on sulphuric acid (£116). The balance in this department in favour of the Commissioners was £976, against £1038 the previous year. The accounts were approved of.

At a meeting of the Forfar Gas Corporation on Monday, an abstract statement of the accounts for the year to the 15th of June, 1898, was submitted. The revenue amounted to £6604, and was made up as follows: Balance from revenue account of year ending June 15, 1897, £900; gas rates (less discount, &c.), £4969; residual products, £734. The expenditure during the year amounted to £6385, showing a balance, being free revenue (subject to the payment of annuities), of £218. The principal items of expenditure were: Coal and carriage, £2770; retorts, bricks, and fire-clay goods, £210 (less re-sold and in hand, £104); new meters, £253 (less in hand, £129); wages, £895; interest, £269; management, £205; arrears written off gas rates, £154. The annuities payable on the 15th of July, 1898, amounted to £458; leaving a deficit on the year of £240. The sinking fund account showed a balance at its credit of £1330 standing against the works; and during the year there was paid for the redemption of annuities £219. The contingent fund account showed a credit balance standing against the works of £1201. Consideration of the accounts was delayed for a month; details regarding arrears having to be prepared in the meantime, at the request of one of the members. The price of gas is 3s. 9d. per 1000 cubic feet. The Corporation consider that they can continue at this rate; and it is possible they may. But it is open to observation that it is the lowest price charged for gas in any inland town in a wide district around. A deficit is, therefore, not so much to be wondered at; and a rise in price need cause no surprise. But why should there be so large an amount written off as irrecoverable? Had the £154 so dealt with been recovered, the deficit would only have been £86. The undertaking requires careful steering yet, before it can be said to have altogether recovered from the effects of the lethargic policy which was pursued down to a few years ago. At the same meeting, a letter was read from the gentleman who has tendered for the taking of the residual products, stating that the liquor was weaker than he anticipated, and reducing his offer by from

1s. 7d. to 1s. 9d. per ton of coal carbonized. This state of matters has directed the attention of the Corporation to the subject of erecting plant for the working up of residuals, which has been so successful at Arbroath and elsewhere; and the Commissioners are, during the current month, to inquire into the matter.

I observe workmen at last engaged in the work of preparing for the taking down of the giant chimney in the Edinburgh gas-works. They have erected a ladder up one side. As yet, they have got no further than to envelop the pillar with a multitude of ropes, and are busy upon a staging round the top, where the most difficult part of the work—the removal of the 32 tons of iron blocks which form the cap—is to be met with. The men on top look no larger than dolls.

Last year the Berwick and Tweedmouth Gas Company had an income of £5770, and an expenditure of £4575; and out of the net profit of £1194 a dividend at the rate of 10 per cent. has been paid.

A floating gasholder is not a thing unknown; but it is not like the ordinary gasholder, with which all are familiar. These holders are used for the conveyance of gas, under pressure, to the various buoys and lights in estuaries round the coast, in which gas is kept burning. It is announced to-day that the Northern Lights Commissioners have placed an order with Messrs. Hawthorns and Co., Limited, of Leith, for the building of a powerful twin-screw vessel for this service, to be placed upon the east coast. Such a service must be maintained at all costs; and where lights are in exposed situations, the boats which attend to them must be made sufficiently powerful to approach them, in an emergency, in almost any sort of weather.

Plans for the gas-works of the newly formed Monifieth Gaslight Company, have been prepared. They show works capable of producing 10 million cubic feet of gas per day. It is anticipated that they may be ready for the supply of gas during next winter. The plans were before the Dean of Guild Court on Wednesday. One of the members of the Court objected to his colleagues sitting, as they were shareholders in the Company; and he pointed to a clause in the Burgh Police (Scotland) Act, which provides that it shall not be lawful for any member of a Dean of Guild Court to sit when any matter in which he is personally interested is under consideration. The Clerk, however, explained that the restriction did not apply to a shareholder in a company, but only to a person sitting in judgment upon anything in which he had the sole interest. The objector left the Court; and the plans were then approved of, and warrant granted for the erection of the works.

In connection with the water supply of Ayr, a note of alarm has been more than once lately sounded by the authorities as to the extraordinary consumption of water. And there is surely ground for anxiety when the consumption reaches 83 gallons per head per day—undoubtedly the highest of any town in the kingdom. To hold a record is sometimes a creditable achievement; but it may be doubted if the town of Ayr has reason to be proud of this record. It may prove to be more expensive in the upkeep than the ratepayers may care for, if, as has been asserted, the enormous consumption of water in the district requires the laying of an additional pipe-line to the source of supply, and the construction of other supplementary works.

## GAS AND WATER COMPANIES STOCK AND SHARE LIST.

Referred to on p. 186.

| Issue.         | Share. | When ex- Dividend. | Dividend or Dividend & Bonus. | NAME.                           | Closing Prices. | Rise or Fall in Wk. | Yield upon Invest- ment. | Issue.         | Share. | When ex- Dividend. | Dividend or Dividend & Bonus. | NAME.                            | Closing Prices. | Rise or Fall in Wk. | Yield upon Invest- ment. |
|----------------|--------|--------------------|-------------------------------|---------------------------------|-----------------|---------------------|--------------------------|----------------|--------|--------------------|-------------------------------|----------------------------------|-----------------|---------------------|--------------------------|
| £              |        |                    | p. c.                         |                                 |                 |                     | £ s. d.                  | £              |        |                    | p. c.                         |                                  |                 |                     | £ s. d.                  |
| GAS COMPANIES. |        |                    |                               |                                 |                 |                     |                          | GAS COMPANIES. |        |                    |                               |                                  |                 |                     |                          |
| 590,000        | 10     | Apr. 15            | 10½                           | Alliance & Dublin 10 p. c.      | 23½-24½         | ..                  | 4 5 9                    | 75,000         | 5      | June 29            | 6                             | Malta & Medn., Ltd.              | 4½-5½           | ..                  | 5 14 3                   |
| 100,000        | 10     | "                  | 7½                            | Do. 7 p. c.                     | 16-17           | ..                  | 4 8 3                    | 541,920        | 20     | June 10            | 6                             | Monte Video, Ltd.                | 14-15           | ..                  | 6 13 4                   |
| 910,000        | 100    | July 1             | 5                             | Australian 5 p. c. Db.          | 105-107         | ..                  | 4 13 6                   | 617,946        | Stk.   | Feb. 24            | 9½                            | Newcastle & Gateshead Con.       | 235-240         | ..                  | 4 1 3                    |
| 200,000        | 5      | May 26             | 6                             | Bombay, Ltd.                    | 64-67           | ½                   | 4 8 11                   | 262,355        | Stk.   | Jan. 3             | 3½                            | Do. 8½ p. c. Db. Stk.            | 115-120         | ..                  | 2 18 4                   |
| 40,000         | 5      | "                  | 6                             | Do. New, £4 paid                | 44-5            | ..                  | 4 16 0                   | 150,000        | 5      | May 26             | 8                             | Oriental, Ltd.                   | 7½-7½           | ..                  | 5 8 3                    |
| 890,000        | Stk.   | Feb. 24            | 12                            | Brentford Consolidated          | 280-285         | ..                  | 4 4 3                    | 135,000        | 5      | "                  | 8                             | Do. New, £4 10s. pd.             | 6-6½            | ..                  | 5 10 9                   |
| 240,000        | "      | "                  | 9                             | Do. New                         | 215-220         | 2½                  | 4 1 10                   | 15,000         | 5      | "                  | 8                             | Do. do. 1879, £1 pd.             | 1½-1½           | ..                  | 4 11 5                   |
| 60,000         | "      | June 10            | 4                             | Do. 5 p. c. Prf.                | 140-145         | ..                  | 3 9 0                    | 60,000         | 5      | Mar. 11            | 7                             | Ottoman, Ltd.                    | 5-6             | ..                  | 6 6 2                    |
| 159,375        | "      | "                  | 4                             | Do. 4 p. c. Db. Stk.            | 130-135         | ..                  | 2 19 3                   | 500,000        | 100    | June 1             | 6                             | People's Gas & 2nd M. of Chicago | 103-108         | ..                  | 5 11 1                   |
| 220,000        | Stk.   | Mar. 30            | 11½                           | Brighton & Hove Orig.           | 268-273         | ..                  | 4 4 3                    | 848,070        | 10     | May 26             | 6                             | River Plate Ord.                 | 9-9½            | ..                  | 6 6 4                    |
| 218,820        | "      | "                  | 8½                            | Do. A. Ord. Stk.                | 195-200         | ..                  | 4 5 0                    | 250,000        | Stk.   | June 29            | 4                             | Do. 4 p. c. Db. Stk.             | 66-68           | ..                  | 4 1 8                    |
| 937,500        | Stk.   | Feb. 24            | 5                             | Bristol, 5 p. c. max.           | 127-132         | ..                  | 3 15 9                   | 250,000        | 10     | Apr. 29            | 10                            | San Paulo, Ltd.                  | 15½-16½         | ..                  | 6 1 3                    |
| 420,000        | 20     | Mar. 30            | 11½                           | British                         | 53-55           | ..                  | 4 1 9                    | 135,000        | Stk.   | Mar. 30            | 10                            | Sheffield A.                     | 24½-248         | ..                  | 4 0 8                    |
| 60,000         | 10     | Mar. 11            | 11½                           | Bromley, Ord. 10 p. c.          | 25-27           | ..                  | 4 5 2                    | 209,053        | "      | "                  | 10                            | Do. B.                           | 245-248         | ..                  | 4 0 8                    |
| 75,000         | 10     | "                  | 8½                            | Do. 7 p. c.                     | 20-22           | ..                  | 3 17 3                   | 447,427        | "      | "                  | 10                            | Do. C.                           | 245-248         | ..                  | 4 0 8                    |
| 600,000        | 10     | Apr. 29            | 6                             | Buenos Ayres (New) Ltd.         | 9-9½            | ..                  | 6 6 4                    | 5,531,250      | Stk.   | Feb. 24            | 5½                            | South Metrop. 4 p. c. Ord.       | 142-145         | ..                  | 3 12 5                   |
| 98,122         | Stk.   | June 29            | 4                             | Do. 4 p. c. Db. Stk.            | 98-100          | ..                  | 4 0 0                    | 1,460,001      | Stk.   | July 14            | 3                             | Do. 3 p. c. Db. Stk.             | 100-103         | ..                  | 2 18 3                   |
| 150,000        | 20     | July 14            | 8½                            | Cagliari, Ltd.                  | 30-31           | ..                  | 5 6 5                    | 60,000         | Stk.   | Mar. 11            | 12                            | Tottenham and A.                 | 285-295         | ..                  | 4 1 4                    |
| 100,000        | 10     | June 10            | 7                             | Cape Town & Dis., Ltd.          | 15-16           | ..                  | 4 7 6                    | 60,000         | "      | "                  | 9                             | Edmonton B.                      | 205-215         | ..                  | 4 3 9                    |
| 60,000         | 50     | May 3              | 6                             | Do. 6 p. c. 1st Mort.           | 58-60           | ..                  | 5 0 0                    | 182,380        | 10     | June 10            | 7                             | Tuscan, Ltd.                     | 12½-13½         | ½                   | 5 8 8                    |
| 550,000        | Stk.   | Apr. 15            | 13½                           | Commercial Old Stock            | 315-335         | ..                  | 4 3 1                    | 149,900        | 10     | July 1             | 5                             | Do. 5 p. c. Dbs. Red.            | 100-103         | ..                  | 4 17 1                   |
| 200,750        | "      | "                  | 10½                           | Do. New do.                     | 252-257         | ..                  | 4 1 8                    |                |        |                    |                               |                                  |                 |                     |                          |
| 200,750        | "      | June 10            | 4½                            | Do. 4½ p. c. Db. dc.            | 148-153         | ..                  | 2 18 10                  |                |        |                    |                               |                                  |                 |                     |                          |
| 800,000        | Stk.   | June 10            | 12                            | Continental Union, Ltd.         | 207-212         | ..                  | 5 13 2                   |                |        |                    |                               |                                  |                 |                     |                          |
| 200,000        | "      | "                  | 9                             | Do. 7 p. c. Prf.                | 195-200         | 3                   | 4 10 0                   |                |        |                    |                               |                                  |                 |                     |                          |
| 51,000         | Stk.   | Feb. 24            | 14                            | Croydon A 10 p. c.              | 310-315         | ..                  | 4 8 11                   | 746,164        | Stk.   | June 29            | 10½                           | Chelsea, Ord.                    | 313-318         | ..                  | 3 6 0                    |
| 168,400        | "      | "                  | 11                            | Do. B 7 p. c.                   | 255-265         | ..                  | 4 3 0                    | 150,000        | "      | "                  | 5                             | Do. 5 p. c. Prf.                 | 170-175         | ..                  | 2 17 2                   |
| 60,000         | Stk.   | Feb. 24            | 5½                            | Crystal Palace Ord. 5 p. c.     | 125-150         | ..                  | 4 0 9                    | 160,000        | "      | "                  | 4½                            | Do. 4½ p. c. Prf. Stk., 1875     | 148-152         | ..                  | 2 19 3                   |
| 60,000         | "      | "                  | 5                             | Do. 5 p. c. Prf.                | 142-145         | ..                  | 3 9 0                    | 175,785        | "      | Mar. 30            | 4½                            | Do. 4½ p. c. Db. Stk.            | 157-162         | ..                  | 2 15 7                   |
| 456,090        | 10     | Jan. 27            | 11                            | European, Ltd.                  | 238-24½         | ..                  | 4 9 9                    | 1,720,560      | Stk.   | Apr. 15            | 8                             | East London, Ord.                | 227-232         | 2                   | 3 9 0                    |
| 354,060        | 10     | "                  | 11                            | Do. 47 10s. paid                | 17-18           | ..                  | 4 11 9                   | 654,740        | "      | June 29            | 4½                            | Do. 4½ p. c. Db. Stk.            | 157-160         | ..                  | 2 16 3                   |
| 5,922,110      | Stk.   | Feb. 10            | 12½                           | Gaslight & Coke, A. Ord.        | 297-302         | ..                  | 4 1 1                    | 390,000        | "      | "                  | 3                             | Do. 3 p. c. Db. Stk.             | 163-165         | ..                  | 2 17 2                   |
| 100,000        | "      | "                  | 4                             | Do. B, 4 p. c. max.             | 120-125         | ..                  | 3 4 0                    | 700,000        | 50     | June 29            | 7½                            | G'd Junction, 10 p. c. max.      | 115-118         | ..                  | 3 3 7                    |
| 665,000        | "      | "                  | 10                            | Do. C, D, E, 10 p. c. Prf.      | 303-313         | ..                  | 3 3 11                   | 310,000        | Stk.   | Mar. 30            | 4                             | Do. 4 p. c. Db. Stk.             | 140-145         | ..                  | 2 15 2                   |
| 80,000         | "      | "                  | 5                             | Do. F, 5 p. c. Prf.             | 154-158         | ..                  | 3 3 3                    | 708,000        | Stk.   | Feb. 10            | 13                            | Kent                             | 360-365         | ..                  | 3 11 3                   |
| 1,300,000      | "      | "                  | 7½                            | Do. G, 7½ p. c. do.             | 230-240         | ..                  | 3 2 6                    | 160,000        | "      | "                  | 7                             | Do. New, 7 p. c. max.            | 213-218         | ..                  | 3 4 3                    |
| 463,000        | "      | "                  | 7                             | Do. H, 7 p. c. max.             | 195-200         | ..                  | 3 10 0                   | 1,043,800      | 100    | June 29            | 7½                            | Lambeth, 10 p. c. max.           | 298-303         | ..                  | 3 6 0                    |
| 476,000        | "      | "                  | 10                            | Do. J, 10 p. c. Prf.            | 303-313         | ..                  | 3 3 11                   | 406,200        | 100    | Mar. 30            | 4                             | Do. 7½ p. c. max.                | 227-232         | 2                   | 3 4 8                    |
| 1,061,150      | "      | "                  | 6                             | Do. K, 6 p. c. Prf.             | 181-188         | ..                  | 3 3 10                   | 850,000        | Stk.   | Mar. 30            | 4                             | Do. 4 p. c. Db. Stk.             | 140-145         | ..                  | 2 15 2                   |
| 124,850        | "      | June 10            | 4½                            | Do. 4 p. c. Db. Stk.            | 131-133         | ..                  | 3 0 2                    | 500,000        | 100    | Feb. 10            | 13                            | New River, New Shares            | 432-437         | ..                  | 2 19 6                   |
| 958,000        | "      | "                  | 6                             | Do. 4½ p. c. do.                | 198-203         | ..                  | 2 18 10                  | 1,000,000      | Stk.   | Jan. 27            | 4                             | Do. 4 p. c. Db. Stk.             | 141-146         | ..                  | 2 14 10                  |
| 70,000         | 10     | May 12             | 8                             | Do. 6 p. c. do.                 | 198-203         | ..                  | 2 19 1                   | 902,300        | Stk.   | June 29            | 5                             | Southwark & Vxhall, Ord.         | 163-168         | ..                  | 3 11 5                   |
| 8,900,000      | Stk.   | Feb. 1             | 4                             | Hongkong & China, Ltd.          | 131-14½         | ½                   | 5 10 4                   | 126,500        | 100    | "                  | 5                             | Do. do. 7½ p. c. max.            | 155-160         | ..                  | 3 15 0                   |
| 376,400        | 100    | Feb. 1             | 10                            | Imperial Continental            | 218-215         | ..                  | 4 13 0                   | 489,200        | Stk.   | "                  | 5                             | Do. do. 5 p. c. Prf.             | 168-172         | ..                  | 2 18 2                   |
| 473,600        | Stk.   | Feb. 10            | 3½                            | Do. 4 p. c. Dbs. Red.           | 98-104          | ..                  | 3 19 8                   | 1,019,585      | "      | Apr. 15            | 4                             | Do. 4 p. c. A. Db. Stk.          | 141-144         | ..                  | 2 15 7                   |
| 590,000        | 100    | Apl. 1             | 5                             | Do. 3½ p. c. Db. Stk.           | 103-106         | ..                  | 3 6 0                    | 1,155,066      | Stk.   | June 10            | 10                            | West Middlesex                   | 297-302         | ..                  | 3 6 3                    |
| 250,000        | 100    | "                  | 4½                            | Met. of Mel- bourne 5 p. c. Db. | 110-112         | ..                  | 4 9 3                    | 200,000        | "      | "                  | 4½                            | Do. 3½ p. c. Db. Stk.            | 162-165         | ..                  | 2 14 7                   |
|                |        |                    |                               | Do. 4½ p. c. Db.                | 107-109         | ..                  | 4 2 7                    | 200,000        | "      | Mar. 11            | 8                             | Do. 4 p. c. Db. Stk.             | 104-106         | ..                  | 2 16 7                   |

† Next dividend will be at this rate.



## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, July 23.

**Sulphate of Ammonia.**—The greater activity in the market referred to in the last report has been continued throughout the week, at advancing prices; and the closing quotations are £9 7s. 6d. to £9 10s. per ton f.o.b. at the ports. The bulk of the purchasing has again been for covering sales for July delivery; and some difficulty has been experienced in securing supplies. Consumers have only bought a limited quantity; for the most part they have held back, on the chance of doing better later. In the forward position, too, there has been more doing; and £9 10s. per ton f.o.b. Leith has been paid for July-December delivery. Beckton quotations have been advanced to £9 10s. July-September; to £9 7s. 6d. October-December; and £9 10s. is now quoted for January-March, 1899, delivery—all Beckton terms.

**Nitrate of Soda** is a shade firmer on spot; and 7s. 6d. per cwt. is the quotation for fine quality.

LONDON, July 23.

**Tar Products.**—There is no improvement in this market, which is as quiet as it well can be. Benzols are neglected and weak; both 90's and 50's being quoted at the same price. The value of pitch is maintained; but no business is being transacted—the shipping season being now closed for some weeks. Creosote is said to be scarce; and in some localities higher prices than those quoted below are obtained. The speculative element, notwithstanding disastrous past experiences, seems to still exist among some tar distillers, as one or two contracts have recently been let at several shillings above their actual value. The outlook of products does not warrant any sanguine anticipations of better prices for some time; and, on the face of it, it seems foolish to pay more money for raw material than the position warrants.

The average quotations for the week are: Tar, 12s. to 15s. Pitch, east coast, 23s. 6d.; west coast, 19s. Benzols, 90's and 50's, nominal, 10d. Toluol, 1s. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 1d. Crude, 30 per cent., naphtha, 4½d. Creosote, 2½d. to 2¾d. Heavy oils, 42s. 6d. Carbolic acid, 60's, 2s. Naphthalene, 52s. 6d.; salts, 30s. Anthracene, nominal, "A," 4½d.; "B" 3½d.

**Sulphate of Ammonia.**—A decided improvement has taken place during the last two or three days; and buyers are willing to pay a little more money for prompt delivery, and at one or two ports for forward also. A large business is reported, and heavy shipments are being made. Most makers are well sold; and the article is undoubtedly scarce. It is stated that the higher values of sulphate are influencing nitrate. If this be so, it is the first time it has ever done so, and is truly an illustration of the "tail wagging the body." Values may be averaged at from £9 6s. 3d. to £9 8s. 9d., less 3½ per cent., in all positions.

**Brynmawr and Blaina Gas Company.**—At the meeting of the Directors of this Company held on the 21st inst., it was decided to pay the maximum dividend (10 per cent.) for the half year ended the 30th of June. The Board considered this highly gratifying, in face of the coal strike.

## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—A slow but steady business in house-fire qualities, with an active inquiry for other descriptions of fuel, and prices firm, is the general position throughout the coal trade of this district. The better sorts continue in more than average request for the time of year; and though some of the house-fire coal-pits have had to go on short time, the average working, taking it all through, is not much less than four to five days per week. Prices, for the most part, are maintained on much the basis of last winter's rates. The lower classes of round coals are in a decidedly strong position. For steam and forge purposes the inland demand is brisk; and requirements for shipment continue more than sufficient to take away any surplus supplies that collieries may have to offer. At the pit mouth, best Wigan Arley coals remain steady at 10s. to 10s. 6d. per ton; with Pemberton four-feet and seconds Arley ranging from 8s. up to about 9s. in special cases, and common round coals, from 7s. up to 7s. 6d. per ton. With regard to round coal contracts, colliery proprietors are holding firmly for advances over last year's rates, averaging 6d. per ton as the minimum to 9d. per ton in some cases. For shipment, good ordinary steam coals are fetching 8s. 6d. to 9s. per ton delivered at the Mersey ports. In exceptional cases 9s. to 9s. 3d. per ton is quoted; but large buyers are very cautious about entering into engagements where anything above what may be termed the ordinary average prices is asked. In gas-making coals there is no specially new feature to notice; contracts in these being generally placed on pretty much the basis previously reported. At the pit mouth ordinary gas coals, such as Wigan four-feet, average 6s. 9d. to 7s. 3d. per ton; and good screened Arley gas coals, 7s. 9d. to 8s. 3d. Though there is no general scarcity of slack in the market, supplies being plentiful in some of the outside districts, many of the Lancashire collieries are short; and in not a few cases quotations have been advanced 3d. per ton. Except, however, on forward contracts, or in special cases, advanced rates are not being readily obtained; but the general quotations at the pit mouth may be given at 3s. 6d. to 3s. 9d. per ton for common, 4s. to 4s. 3d. for medium, and 4s. 6d. up to 5s. for the best qualities of engine fuel.

**Northern Coal Trade.**—There has been a fuller trade in coal; and prices have been higher, owing to the relative scarcity of coal, both steam and gas. The continuance of the strike in South Wales, and the occurrence of local holidays have made the demand temporarily in excess of the supply, and to ensure supplies higher prices have had to be paid in many cases. Best Northumbrian steam coals are generally quoted at 13s. 6d. per ton f.o.b.; but there have been sales as high as 14s. Second class steams are about 12s. 9d. per ton f.o.b.; while steam smalls have risen to 6s. per ton. Household coals are very dull, as is usual in weather so warm. Bunker coals have been scarce, and have sold as high as 10s. 6d. per ton f.o.b., while the usual price ranges from 9s. 6d. to 10s. 3d. per ton. In the gas-coal trade there has been a strong demand, and for occasional cargoes 10s. 6d. to 11s. per ton f.o.b. have been paid; while one large producer of best Durham gas coals has asked 12s. per ton. The quantities of gas coals sent to the Metropolis have been very large;

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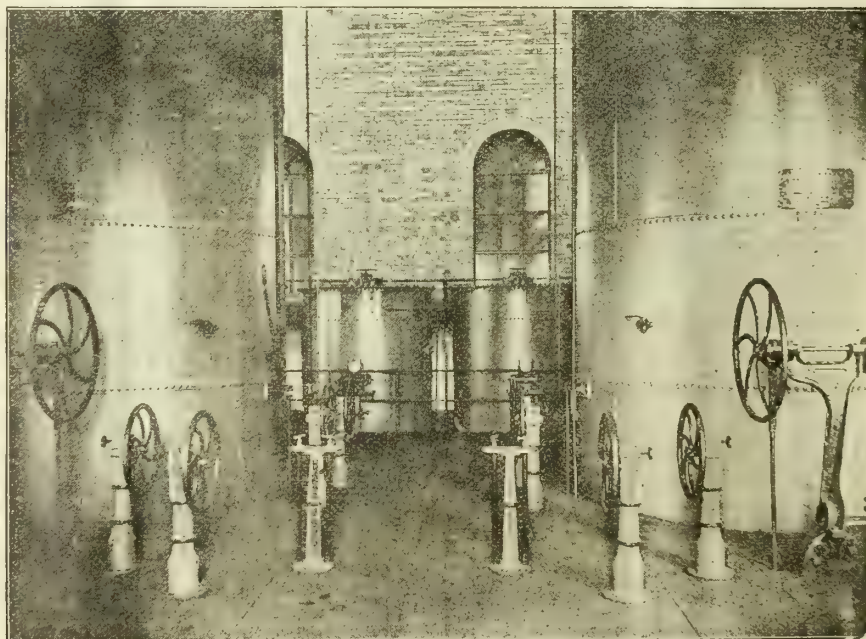
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and the gas cooking and heating stoves have raised considerably the consumption of gas in many of the local towns, and have thus made the use of gas coal much larger than is generally the case at this season of the year. There is very little alteration in the demand for manufacturing coals; but the price is firm, and new contracts are at rather higher rates. In coke, the market is very firm, and the article is rather scarcer in both kinds. Gas coke is being produced in comparatively limited quantities; and stocks are only moderate, except in some of the inland towns. Prices are unaltered this week.

**Scotch Coal Trade.**—Trade is still in an inanimate condition, on account of the miners being idle. Inquiries are being made for delivery during August; and the prices quoted are: Main, per ton, f.o.b., Glasgow, 8s. 9d. to 9s.; ell, 9s. 6d. to 9s. 9d.; and splint, 9s. 6d. to 9s. 9d. The shipments for the week were 227,940 tons—a decrease upon the preceding week of 19,250 tons, but an increase upon the corresponding week of last year of 55,407 tons. For the year to date, the total shipments have been 4,983,184 tons—an increase upon the corresponding period of last year of 883,646 tons.

**The London County Council and Gas Testing.**—The Public Control Committee of the London County Council have reported that, in consequence of the Metropolitan Gas Referees having prescribed a new standard for testing the illuminating power of gas, it is necessary that a new portable photometer and standard pentane lamp should be obtained of the description notified by the Referees. The agenda for the meeting of the Council to-day contains a recommendation that a new photometer and lamp should be procured of Messrs. Alexander Wright and Co.

**Reduction in Price.**—The Directors of the Cannock, Hednesford, and District Gas Company have reduced the price of gas in the Hednesford district from 4s. 2d. to 3s. 9d. per 1000 cubic feet as from the 1st inst., with discounts of 5, 10, and 15 per cent. for consumptions above 25,000 and up to 200,000 cubic feet per quarter, 20 per cent. beyond this, and 30 per cent. for gas used in engines, if accounts are paid within one month of each quarter day. These prices are the same as those charged at Cannock. The Directors have also decided to charge 5d. per 1000 cubic feet less for all gas used for cooking and heating purposes. This is the second reduction in eighteen months, or a total of 10d. per 1000 cubic feet since the amalgamation of the undertakings.

**Extensions at the Saltley (Birmingham) Gas Works.**—The members of the Birmingham Corporation Gas Committee, including the Lord Mayor and the Chairman (Alderman Pollack), last Friday inspected the extensions which are being made at the Saltley Gas Works. The visit was an interesting one; and the Committee expressed satisfaction at the progress that is being made with the work. To the No. 5 gasholder two additional lifts are being added, thereby increasing its capacity from 2 million to 4 million cubic feet. The guide-framing is being extended for one lift; but the fourth lift will run above the top of the framing. A new holder is being constructed which will have a capacity of 8½ million cubic feet. It will be 264 feet in diameter and 42 feet deep, and will have four lifts, to three only of which the guide-framing will extend.

**The Filey District Council and the Gas and Water Works.**—Opposition to the further progress of the Filey Water and Gas Bill has been withdrawn; and the proposed purchase of the undertaking of the Filey Water and Gas Company by the District Council is in course of completion. The price is to be about £55,000. The original offer of the Council was the maximum dividend for 20 years, and 28 years' purchase for the shares. This was declined, as was also a subsequent offer amounting to £47,000.

**Explosion at the Plymouth Gas-Works.**—An explosion (of which somewhat exaggerated reports have appeared in the local papers) occurred at the Plymouth Gas-Works last Tuesday evening, causing slight injury to five persons. It appears that a temporary obstruction took place in the water-gas plant which has been in continuous operation for the last six months. Gas making was at once stopped; and, after taking due precautions to clear the apparatus of gas, the cover of the bottom manhole of the scrubber was removed. Subsequently, a slight explosion took place; and the resulting flame burnt Mr. Ernest Cutler (who was visiting the gas-works, where Messrs. Cutler and Sons are at present engaged in laying down duplicate sets of the apparatus) and four workmen. Mr. Hoyte, the Assistant Manager, who was in charge of the works during the temporary absence of Mr. A. Wharton, the Manager, rendered such aid as he could until the arrival of the doctor, under whose direction Mr. Cutler and two of the men were removed to the hospital, where, as since reported, they are progressing favourably. The other two men were able to proceed to their homes. No damage was done to the plant; and the only effect in the building which contains the apparatus was the breaking of a few panes of glass. Gas making was resumed a few hours afterwards.

**Sales of Stock and Shares.**—On Monday last week, Mr. Alfred Richards offered for sale, at the Mart, Tokenhouse Yard, £15,000 of new stock (1881) of the Brentford Gas Company, by order of the Directors. It ranks for a dividend of 7 per cent., subject to the sliding-scale; but the last dividend on similar stock was at the rate of 9 per cent. per annum. The highest price realized was £215 per £100, at which figure a good deal of the stock was purchased; the lowest price was £203—the average being £208 16s., which returned £4 6s. 3d. per cent. on the investment. There was a good deal of competition for the stock. On the following day, Mr. C. A. Joel sold, at the offices of the Newcastle and Gateshead Water Company, £40,000 of 5 per cent. preference stock of the Company, under the provisions of their Act of 1894, at prices ranging from £165 to £172 per £100 of stock. On the same day, ten fully-paid shares in the Needham Market Gas Company were sold at £11 7s. 6d. each; five similar shares realizing £11 5s. apiece. In accordance with the announcement which recently appeared in the "JOURNAL," Messrs. J. M. Leeder and Son offered for sale by auction last Friday, at the Royal Hotel, Swansea, £20,000 of new ordinary stock of the Swansea Gas Company; being part of the additional (5 per cent.) capital authorized by the Company's Act of the present session. The new capital is required for carrying out the coin-meter system in the district, extending the works, &c. The highest price paid per £100 of stock was £124 10s.; the lowest, £123 10s.—the average being £123 12s. 4d.—a total of £24,723 15s.



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**Northampton Corporation Water Department.**—The Borough Accountant of Northampton (Mr. S. Hull) shows, in his abstract of the accounts for the year ending March 25, that on the revenue account of the Water Department there was a balance of £18,035. This has been carried to the net revenue account, which, however, discloses a balance of £2926 due to the general district rate. The receipts on capital account total to £343,791; and on the date named there was a balance of £2177.

**Reading Water Supply.**—At the last meeting of the Reading Town Council, it was decided to adopt a special report presented by the Water Committee setting forth details for an extension of the water-works, for which preliminary plans have been prepared by the Water-Works Manager (Mr. A. T. Walker). It is proposed to construct a reservoir on high land in the parish of Tilehurst, and connect it with the existing works. Additional pumping power may eventually be required at the Bath Road works for raising the water to the proposed new reservoir; and this it is proposed to supply, when the proper time arrives, by means of Worthington engines of the same type as the existing ones. The total cost of the works above indicated is estimated at £45,000; but the Committee state that it will probably not be necessary to incur more than £30,000 of the estimated expenditure for many years to come.

**Morpeth New Water-Works.**—New water-works for Morpeth are nearing completion at Tranwell; and the Engineer (Mr. Dinning) has reported to the Council on the yield of water. He says that he finds the delivery from the boreholes averages 85,000 gallons of pure spring water every twenty-four hours. During fifteen or sixteen hours of the day, the quantity is below the demand; and during the other hours of the night, it is in excess—the deficiency during the height of the day being made up by drawing from the storage reservoirs. By constructing a chamber to hold 35,000 gallons, in which to store the water running to waste during the night, the water from the springs would, the Engineer remarks, be sufficient to supply all the needs of the town even during those hours when the demand is greatest. Such a chamber could be made for £200. The Council have, however, decided to conclude the present contract before entering on any additions.

**The High-Level Water Supply of Bradford.**—In submitting the usual monthly statistics as to the condition of the water supply at the last meeting of the Bradford City Council, Alderman Holdsworth made a statement which shows that the consumption of water on the high level at the present time is nearly as large as on the low level; and this has been the state of things for at least a month. Taking into consideration that the quantity of storage in the low level is five times that in the high level, the position is somewhat serious. Notwithstanding that the Corporation have more water than last year, they are worse off. They have no water to pump to the high level, because the conduits only carry what is sufficient for the low level. It is hoped that in a few months the Barden reservoir will be made into a high-level storage reservoir. In the meantime, matters are strained; and it is just a question whether it will not be necessary in the course of a week or so to put the whole city on short supply.

**Westbury Water Supply.**—At the last meeting of the Westbury (Wilts.) District Council, the Clerk reported that the Local Government Board had sanctioned the borrowing of £8000 for works of water supply for the parishes of Westbury and Dilton March. The Board had made several concessions as to protective area, which practically limited the restriction to 39a. 2r. 31p. belonging to Lord Ludlow, and a small portion of Sir Massey Lopes' land inside the purchase area. The total effect of the concessions made would mean a saving of about £25 a year. The Chairman (Mr. J. S. Whitaker) said the Council were indebted to Lord Ludlow for his action in respect to the Local Government Board, and also for reducing his price to 10 guineas. He proposed that the thanks of the Council be conveyed to his Lordship; and also to the Clerk, for the energy he had shown in pushing the matter forward. The propositions were unanimously carried.

**Water-Works for Kirkby-in-Ashfield.**—Under a contract entered into some ten years ago, the Sutton-in-Ashfield District Council have furnished water to Kirkby-in-Ashfield; but the inhabitants have been dissatisfied with the supply both in respect to its quantity and quality. The District Council have therefore decided to have works of their own; and they have adopted a scheme propounded by Mr. Radford, of Nottingham. The cost is estimated at £9200; and an application to borrow this sum was the subject of a Local Government Board inquiry last Tuesday. The evidence given by Mr. Radford showed that it was proposed to sink a well, which he estimated would provide a minimum supply of 300,000 gallons per day; but it was proposed at present to make provision for only 150,000 gallons. The quantity now taken from Sutton-in-Ashfield was 93,000 gallons. At the conclusion of the inquiry, the Inspector visited the chief places concerned, and promised to report in due course.

**The County Council's Parliamentary Expenses.**—The Parliamentary Committee of the London County Council report that their expenditure during the year ended March 31 last, in connection with the promotion of, and opposition to, Bills in Parliament, exceeded the amount of their annual estimate by £2334. In asking the Council to sanction the excess, they point out the extreme difficulty experienced in estimating probable parliamentary expenditure. The heaviest expense was incurred when contests took place before Select Committees of Parliament; and at the time of forming the estimate, it was absolutely impossible to say in which cases such contests would take place, or in which they might be avoided by arrangement. Their estimate of expenditure was originally £19,000; but it was reduced to £10,000 in consequence of the rejection of the Council's Water (Purchase) Bills. A considerable sum was, however, spent before this took place. The Southwark and Vauxhall Water Company's Bill, introduced late in the session, and not contemplated at the time the estimate was made, largely contributed to the excess expenditure. The Council's opposition to the New River and East London Water Bills, among numerous others, led to a good deal of expense; and the estimate was further drawn upon in respect of small amounts in connection with the promotion of the Council's Private Bills of the present session.

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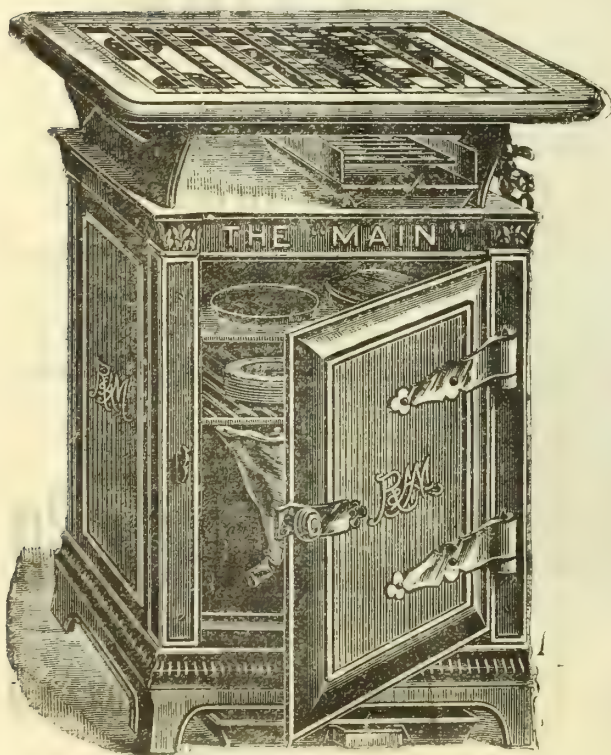
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## EDITORIAL NOTES.

## Report and Accounts of The Gaslight and Coke Company.

THE report of the Directors of The Gaslight and Coke Company, and the statement of accounts relating to the working of the undertaking for the past half year, are issued, in preparation for the ordinary general meeting called for next Friday. It has already been announced, as usual, that the profit balance enables the Directors to recommend a dividend at the statutory rate, which is now reduced to 12½ per cent. per annum, and leaves a sum of £51,854 to be carried forward to the credit of the current half year. The preliminary announcement in question has been well received; the market probably being strengthened by the information that, at whatever cost, the long series of deficits has been arrested. The report assigns the cause of the increase in the price of gas by 2d. per 1000 cubic feet as from the beginning of the summer quarter to "the depletion of the reserve fund," and "the large reduction" "in the quantity of gas sold in the month of January." It is stated that there was a "satisfactory improvement" "in the sales during the subsequent months;" so that the net increase of consumption for the entire half year was after the rate of 1.66 per cent. This being so, it might well be argued that the Directors were wrong to take such alarm at the returns for the single month of January as to use them as a justification for raising the price of gas. Similarly, coke and sulphate have come to their rescue, in a manner that might not have been beyond the range of prevision. There is a paragraph of the report, following those relating to the increased price of gas and the residuals trade, which is of ominous import. It is stated that "the Directors" "have entered into contracts for the Company's coal requirements for the current twelve months at prices materially higher than those paid last year. The advance in" "prices is attributed to the greatly increased demand for gas" "coal and to an anticipated increase in the cost of production consequent upon recent legislation." The proprietors will be well advised to require much fuller information upon this matter. Some short time ago, the reports of the northern gas coal market in "The Times" and in our own columns conveyed a good deal more intelligence respecting the coal contracts of The Gaslight and Coke Company than is vouchsafed in the official statement. This information was to the effect that the Directors had had to pay an average increased price of 1s. 1d. per ton for their supplies, whereas the South Metropolitan Company had managed to get theirs at something like one-third of this advance. It will not do to excuse this airily by a reference to the "greatly" "increased demand for gas coal" and a fling at recent legislation. If the demand for gas was so very slack that the Company suffered on this account, whence comes the increased demand for gas coal? Besides, would not the carburetted water-gas plant help the Company? Or has the price of oil risen also?

The report briefly records the passing of the Company's Stock Consolidation Bill through both Houses of Parliament, and states that the measure only awaits the Royal Assent. Mention is then made of the proposed parliamentary investigation into the charges for gas in London; and it is remarked that "the Directors welcome the proposed inquiry, the result of which, they feel assured, will be the removal of those misconceptions which at present exist in some quarters as to the conditions of the gas supply in the different parts of the Metropolis." If there are yet any "misconceptions" prevalent in this regard, it is a bad compliment to those who have these years past striven to explain, to the credit of Horseferry Road, those inequalities of charge which have led to the parliamentary action in question. As will be seen from a paragraph which appears elsewhere, the Committee has been nominated, and its appointment was moved for yesterday. The report mentions in fitting terms the death of one of the Directors, the Hon. Henry Noel. "The vacancy in the Court has been filled" "by the election of" "Mr. John Miles"—and there was no time lost about it, either!

Turning to the accounts, we find several points of interest. Carbonizing wages show a drop from £165,591 to £162,920. Is this an indication that the use of labour-saving methods is beginning to tell at last? The total expenditure on revenue account shows an increase of £9642. On the other side of the account, gas is shown



to have brought in £60,080 more. Coke improved from £190,445 to £220,864; and sulphate of ammonia returned £71,641, as compared with £56,137. Altogether, the revenue rose from £1,809,482 to £1,919,227, or an increase of £109,745, whereof the smaller part only is attributable to the heightened price of gas for the summer quarter. Several questions might be put upon the other accounts. Notably, the fittings account, for the automatic meters, has increased to £296,373. The stocks of saleable residuals have been sensibly depleted.

It is the duty of those proprietors who take an intelligent interest in the conduct of the Company's affairs to attend Friday's meeting. Perhaps, now that the dividend has actually gone down, some of them may wish to know how, with such uniformly optimistic reports half year after half year, this state of things has come about, and why the administration of the undertaking is so persistently attacked both in and out of Parliament.

#### The South Metropolitan Report.

THE report of the Directors of the South Metropolitan Gas Company for the past half year will be found in another column. There has been an increase of nearly 5 per cent. in the quantity of gas sold, notwithstanding the mildness of the winter months. Upon this satisfactory expansion of business comes the improvement in the residuals trade, reinforced by a further slight reduction of the carbonizing charges, to make a satisfactory balance to the credit of profit and loss. The same dividend as last paid has been earned, with a surplus of £19,463. Including £1802 brought forward from the last account, there is now a sum of £168,265 to be dealt with. The statutory dividend on the consolidated stock, with the price of gas standing at its present figure of 2s. 3d. per 1000 cubic feet, is 5½ per cent. per annum. It has not been the policy of the Company to pay the full statutory dividend; but on this occasion the Directors think themselves justified in recommending a slight increase up to the somewhat strange rate of 5½ per cent., which happens to be divisible into even pence for all amounts of stock. This will leave a remainder amounting to £4666 to be added to the reserve fund, which brings up the total to £100,458. There will still remain £14,265 to be carried forward to the next account. The increase in the number of ordinary and prepayment consumers continues satisfactorily. It is mentioned that the tale of the latter has attained the really striking figure of 72,288, all in rather less than six years. The expansion of the Company's business since the year 1892 has been provided for at a capital charge of £2 13s. 4d. per ton on the additional coal carbonized. The report concludes with the statement that a resolution will be submitted to the meeting for putting in force the workman-director scheme; the necessary condition precedent being now fulfilled. This will, of course, be only the first stage of a process which must be carried out in accordance with an elaborate statutory programme. We shall publish next week the accounts accompanying the report.

#### The North British Association Meeting.

THE meeting of the North British Association of Gas Managers in Glasgow last week must be pronounced a decided success. There was, first of all, a very good attendance, which is always the case when the meetings are held in Glasgow. Then there was a full programme—no fewer than five different subjects having been submitted for discussion. And, lastly, there was an excellent Chairman, in the person of Mr. Thomas Wilson, of Coatbridge. It is true that there was neither the low fare nor the high thinking which have been experienced at some previous meetings of the Association; but the quality of both the papers which were read and the discussions which followed them was more satisfying than would have been either of the above, whether singly or together.

To make a passing remark upon the short address by the President, it was such as might have been expected from a gentleman of wide experience like Mr. Wilson. Mr. Ewing, in his paper upon retort-settings, described his experiences with an adaptable form of generator settings which he has found to give excellent results, and for the devising of which he claims no credit. The setting was characterized as unscientific; but the real point to be looked at is that Mr. Ewing gets certain results in working, and that others, in similar circumstances, would do the same. The value of the communication lay in making it plain that science is many-sided, and that the situation must determine how

it is to be applied. Economy in the manufacture of gas is the first object of the gas manager; and it was consequently fitting that this subject should have received the leading place on the programme, as it did in the consideration of the members. But there are many concomitant subjects, which must occupy the attention of every gas manager; and several of these—such as cheapening and automatically facilitating the distribution of gas, the sale of gas by the agency of prepayment meters, its use in gas-engines, and the preparation of coke for the market—fitly found a place on the agenda.

So many subjects are taken up at a Scotch meeting that it may be regarded as a sort of annual field-day. On this occasion, although they were numerous and varied, thanks to good management there was neither overcrowding nor overlapping; and there was much interchange of opinion, which must be beneficial. Less than usual was said at the meeting about distinctively Scotch features of gas manufacture, which may or may not be an unmixed blessing. It may be too soon to say these Scotch features are dying out, and that before long gas manufacture will be a homogeneous process over the entire Kingdom. But, judging from present appearances, the suspicion may be hazarded that this is the case. The exhaustion of cannel, the advent of other enrichers, and the circumstance that every gas manager in Scotland as well as in England may now receive his education in the principles of his profession in the schools of the City and Guilds of London Institute, are all forces impelling in this direction; and they are advancing forces which may be expected to tell more and more in years to come. There was an element wanting at the North British gathering which may occasion some surprise. No action was taken, or even proposed, with reference to the position of the owners of gas-works under the Workmen's Compensation Act. This is remarkable, because the frugality of the Scotch is proverbial, and their foresight at least not shorter than that of other nationalities. But the explanation probably is that, under good management, accidents are so few that it is considered to be unnecessary to make special provision for compensation in respect to them.

#### Acetylene at the Imperial Institute.

THE exhibition of acetylene apparatus at the Imperial Institute, the material elements of which are described in our columns, has been of some public service so far as the condition of the technic of acetylene lighting has permitted. It must be recorded to the credit of Professor Vivian B. Lewes, who introduced commercial calcium carbide to the British public—with the assistance of an article in the "JOURNAL"—characterized at the period as "sensational"—that he early discerned and published the limitations of the new "gas of 240-candle power." His judgment has been fully verified. As a gas for lighting in bulk, or for carburetted poorer illuminating gases manufactured in bulk, acetylene is not commercially available. For isolated lighting plants on a small scale, thanks to the "Naphy" burner, which is really an "atmospheric" burner, acetylene has advantages. At a period well within the recollection of gas engineers not yet "middle aged," a considerable trade in the aggregate was done in so-called "portable" gas-making appliances. Without exception, the various patterns of this kind of apparatus belonged to what the Americans, with their genius for apt nomenclature, style the "greased air" category of "gas" producers. That is to say, they did not make gas at all; but merely carburetted air more or less efficiently. To judge from a curious report published in last week's "JOURNAL," the prospects of this description of "gas" are not exhausted in some parts of the world. The advent of commercial electric lighting, however, was the end of the "greased air" era for Europe. Electric lighting for isolated mansions and small settlements is not all that fancy paints it. Things will go wrong, somehow, in the course of time, with the best-regulated electric lighting plant capable of being looked after by the traditional stable-boy or "handy man about the place." And when this happens with the nice adjustments of oil-engine and dynamo, the village blacksmith can hardly be depended upon to set matters straight. In the fulness of time, acetylene appeared and private gas-works again became possible—with, if, anything, simpler manufacturing plant than of old.

The display at the Imperial Institute shows that the opportunity for opening up a new line of gas-lighting plant has not been neglected. As we have stated repeatedly,



there is nothing in the generation of acetylene gas from calcium carbide to call for any particular display of inventive skill on the part of the maker of the necessary apparatus. As one of the exhibitors at Kensington confesses, the manipulation of carbide of calcium with this object is no more difficult than stoking a fire. Many of the designers of acetylene plant, however, have set themselves to solve the by no means easy puzzle of making an automatic, safe, and reliable generator. It is not obvious why the generation of acetylene from calcium carbide should be more "automatic" than the manufacture of gas from coal. Let anybody essay to make a coal-gas retort self-acting, and he will find his work cut out for him. At the same time, a man with a shovel is automatic enough for all practical purposes, so long as he has a gasholder at his back; and the latter can by no means be dispensed with in any arrangement of gas-making plant. We do not presume, however, to sit in judgment upon the Kensington exhibits, most of which doubtless fulfil their immediate purpose of being something to sell, and of fostering the demand for calcium carbide. A good deal has been heard, in connection with this young trade, as to the exaggeration of claims by those who have endeavoured to persuade the public that acetylene light is the thing for which the world has pined in utter darkness until they came along with their little plant. A certain tinge of the ludicrous is produced when different manufacturers of acetylene specialities are brought together and forced to compete with one another. To all appearance, however, the great British public takes them all very calmly.

#### Municipalism Rampant.

As we have occasion to mention in another column, Sir Frederick Bramwell has been writing to "The Times" to denounce what he calls "the mischievous system of municipal trading" which is having the effect of hindering the progress through Parliament of the new schemes for generating and supplying electricity in bulk. It is not for us to discuss here the manifold questions raised by these proposals; but it would be a great mistake for Municipalities in the affected regions to regard schemes of the kind as bearing only on their electricity supply ventures, where such exist either in fact or in prospect. Local Authorities have hitherto rested content upon the fancied security of their pre-eminent rights under the Electric Lighting Acts. These statutes, it has been fondly imagined, secured to Local Authorities a position of vantage in respect of electric lighting which the early legislators did not seize in regard to either gas or water supply. Municipalities thought they could take in hand the business of electricity supply as and whenever they chose; none being able to make them afraid. All this sense of security has vanished before the spectre of schemes like that of Niagara. The irrepressible individual speculator threatens to send electrical power broadcast over the industrial parts of the kingdom, regardless of the comparatively peddling electric lighting undertakings of Local Authorities. He is going to work railways and tramways, pump mines, drive mills, and maintain electric lamps, at prices which small or even large Municipalities cannot touch. So much the worse for them if they cannot stop him betimes. So, as Sir F. Bramwell shows, they are trying to do it in no other spirit than that which inspired the retail shopkeepers twenty years ago to set their legislators in opposition to the "Stores."

The point to be considered here is that this kind of opposition is no more respectable because it comes from Local Authorities than it would be if it emanated from any other traders. Municipalities are entitled to be heard in regard to their place in the constitution whenever they speak as governing bodies, in the public interest. But since they went so largely into trade, they have fallen into the trick of sending for the Lord Mayor in his robes and chain of office to expostulate across the counter with anybody who dares to threaten to take his custom to another shop. When a Municipality goes into a new business, as the supplying of gas or electricity, the moving spirits do not deny the attendant risk of the venture. Indeed, after the plunge has been made, they rather exaggerate the trade risk, as an excuse for making a considerable amount of profit in the interest of the ratepayers, upon whom the risk is supposed to fall. They take very good care, however, that there shall not be any real hazard about the business; and the one thing municipal traders hold in the greatest possible abhorrence is competition in any shape or

kind, which they accordingly very promptly repel with all their forces. Now there is a nearer prospect of competition in a particular branch of municipal trading activity than was thought possible even a year ago. Parliament has declared that progress and enterprise in the electrical industries are not to be made subservient to municipal interests. Cheap electricity in bulk will have to be kept out of manufacturing towns, not by statutory barriers, but by cheaper local products, both electric and gas. The policy of heavily subsidizing local rates at the expense of consumers of gas and electricity provided by municipalized undertakings will have to be reconsidered in the light of electricity imported in bulk and kept on tap at 1d. per unit—which is equivalent to gas at from 10d. to 1s. per 1000 cubic feet. No amount of profit distribution in the present will compensate the ratepayers for the risk of this state of things in the future. The only valid protection will be found in a policy so liberal that the customer at the municipal shop will have no inducement to change.

#### The "Fair Wages" Clause in London County Council Contracts.

A NOTEWORTHY lesson in the working out of Progressive ideas in local government is supplied by the recent publication of some correspondence between the London County Council and Messrs. Yarrow and Co., of Poplar, respecting a contract for the building of a fire-boat for the Metropolitan Fire Brigade. It is unnecessary to recapitulate the part already played by the firm in withstanding militant Trade Unionism; and the remarkable circumstance is that they should have once more run into the very jaws of the enemy, ensconced behind the London County Council. It appears that the Fire Brigade wanted a "float," of a pattern for which Messrs. Yarrow have a speciality; and so the firm agreed to make the necessary designs to suit the requirements of the Brigade. The job was practically settled; but when the County Council's form of contract was sent to the firm, they found in it all manner of restrictions, calculated in the interest of Trade Unionism, referring to supervision of work in progress, hours of labour, rates of wages, power of appointing and dismissing foremen, and so forth. These conditions Messrs. Yarrow, of all people, objected to most strongly. Having so lately made such sacrifices for the sake of retaining the command of their own business, they could not see their way to letting the whole thing slip through their fingers at the demand of a casual customer. Consequently, the County Council were notified that these conditions were impossible, and that the contract could not be signed unless they were modified. This the Committee stated they were unable to do, as the terms were only in accordance with the Standing Orders of the Council relative to contracts. They declared, moreover, that the requirements of the Council in such contracts are matters of notoriety. Messrs. Yarrow, in reply, stated that they do not govern themselves by public notoriety, but by official information; and they asked that, as the job was of an exceptional character, the Standing Orders applying to competitive contracts should be suspended. The request was refused, with a great show of virtuous indignation on the part of the Trade-Union-loving County Council and their backers of the "popular" Press. So it appears that the London Fire Brigade will have to go without an appliance which it is to be presumed was wanted in the interest of public security, because the County Council have a "fair wage" clause in their contracts which is interpreted as a cast-iron rule. Granting, for the sake of argument, that a stipulation of the kind is desirable to prevent underbidding on the part of competing contractors, it is surely the very woodenness of bureaucracy to impose it on all and sundry manufacturers of specialities to whom the temptation to cut prices does not appeal.

**The Reproductive Undertakings of Municipal Corporations.**—In the House of Commons yesterday, Sir H. Fowler moved for a return of the water, gas, tramway, electric lighting, and other reproductive undertakings carried on by municipal boroughs in the following form: (1) Name of undertaking, and date when Corporation commenced working. (2) Total capital provided by Corporation. (3) Amount of capital borrowed. (4) Amount of capital paid off. (5) Balance of capital now outstanding. (6) Average annual income for the last five years, or, if the undertaking commenced during that period, from date of commencement. (7) Average annual working expenses for the period mentioned. (8) Average annual net profit for the same period. (9) Average annual amount set apart for depreciation. (10) Mode in which the average annual net profit has been applied.



## WATER AND SANITARY AFFAIRS.

MR. REGINALD E. MIDDLETON, who held the post of Assistant Commissioner to the Royal Commission on Metropolitan Water Supply presided over by Lord Balfour, has laid before the present Commission some very striking and valuable evidence with respect to the quantity of water obtainable in the neighbourhood of London. He acknowledges that he is in some respects at variance with the conclusions arrived at by Lord Balfour's Commission; but he is confident as to the substantial accuracy of his own statistics. On referring to the report of that Commission, it will be seen that a question having been raised as to a reduction in the level of rivers and wells, and a diminution in the volume of certain springs, owing to the abstraction of water for the supply of London, Mr. Middleton was instructed to make an independent inquiry into the facts; and so much importance was attached to this particular question that he was requested to visit the localities said to be affected, and to thoroughly investigate the circumstances. The Commissioners inserted Mr. Middleton's report in their Appendix, and spoke of it as "dealing exhaustively with the whole subject." A more authoritative witness, therefore, could scarcely have been found, and if the Commissioners failed to agree with all that Mr. Middleton had to say in regard to this matter, it may yet be presumed that he was not without warrant in the views which he advanced. Indeed, we find the Commissioners expressing their disbelief that the pumping by the New River and East London Companies had produced a permanent appreciable depression of the water-levels in Hertfordshire and in the upper part of the Lea Valley. The Commissioners only hesitated to say that the Companies could continue increasing the quantity pumped from the chalk with equal immunity until it had been increased to five times the quantity already taken.

Mr. Middleton now comes forward with a complete re-assertion of his former conclusions. He laid before the Commission last week a series of tables and calculations for the purpose of showing that it was possible to obtain within a certain area adjacent to the Metropolis as much as 645 million gallons of water per day. At 35 gallons per head daily, this would suffice for a population exceeding 18 millions, and would therefore correspond to a period far beyond 1931, when Lord Balfour's Commission reckoned that the population of Greater London, together with the outlying parts of "Water London," would amount to 11½ millions. Of course it may be asked, If all this water is taken, how much will be left? Mr. Middleton appeals to the calculations of Sir Benjamin Baker and Mr. Deacon to support his statement that it would be possible to obtain from the Thames something more than 400 million gallons per day while yet leaving 200 million gallons to flow over Teddington Weir. The difference between Mr. Middleton's calculations and the conclusions adopted by Lord Balfour's Commission consist, in the first place, in taking 400 million gallons per day—or rather 402 million gallons—from the Thames, in place of 300 million gallons—the extra two millions being considered as obtainable from the new well of the Southwark and Vauxhall Water Company. In the next place, Mr. Middleton adds 123 million gallons per day to the productiveness of the wells and springs in the chalk of the Lea Valley, thereby making the quantity 163 million instead of only 40 million gallons per day. The estimates for the River Lea and for the wells of the Kent Company remain as before; being 52½ million gallons per day for the former source, and 27½ million gallons for the latter. There is something still more astonishing in the circumstance that Mr. Middleton considers it quite practicable to add to these figures as much as 190 million gallons per day, "probably more," by sinking further wells in the chalk basin of the Thames. Major-General Scott remarked that this was in direct contradiction to the conclusion arrived at by Lord Balfour's Commission. Mr. Middleton was aware of this, but relied on the evidence he had obtained when making explorations up and down the Thames, and in the Hertfordshire area.

It is interesting to observe that the Royal Commissioners of 1892-3 left the way somewhat open for an extension to their figures. Thus we find them saying that, although Sir John Evans thought otherwise, there seemed no reason to doubt that water is constantly passing in considerable

volume from the north and north-west to the south-east under the pumping-stations in the Lea Valley, and ultimately finding its way into the bed of the Thames some distance below London. "We have," however, said the Commissioners, "been unable to procure any evidence whatever as to the quantity so discharged, and this is not to be wondered at, for in the nature of things it is practically immeasurable." The Commissioners doubtless intended to say "unmeasurable." We have on former occasions quoted a passage in the same report which is of considerable importance, the Commissioner saying, "We are further of opinion that a large supply of water might be obtained from the chalk area east of the Kent Company's district, in the basin of the Medway, and in the district further east, without any risk whatever of damage to that area." Such a source would at least be nearer than the valleys of Mid-Wales. Preceding the evidence given by Mr. Middleton last week, Mr. Pember, as Counsel for four of the Companies, suggested that the witness should be allowed to add to his evidence of the previous week respecting the increase of population, and on the point of 300 million gallons daily being the maximum yield of the Thames, because the Companies could not help feeling they were entitled to give substantive evidence that a greater quantity than this could be safely obtained. Mr. Pember's remarks were well timed—though he would have offered them a week earlier, had he known that Mr. Middleton was to be examined at that date. It would, indeed, be unfortunate if the present Commissioners were to feel themselves so bound by the conclusions of their predecessors as to adhere to the figures already recorded, while evidence was forthcoming to show that such figures were capable of receiving substantial addition. We even think, as already mentioned, that the report of Lord Balfour's Commission leaves the way open for other figures to be adduced.

As signified by the learned Counsel to whose remarks we have referred, Mr. Middleton's evidence is that of the first of a series of witnesses for the Companies. A new view of the question is thus presented, and a starting-point has been obtained which may lead on to important consequences. Mr. Middleton seems to have taken the Commissioners somewhat by surprise, as when he showed the enormous excess of cost in the case of the Welsh scheme compared with a supply from the watershed of the Thames. The quantity of water obtainable from the home source is now set forth on a scale which materially affects the whole subject, and carries the question on far beyond the limit of forty years from the date of the former inquiry. Unless a very large deduction is to be made from the quantity of water which Mr. Middleton reckons upon, and for which he is able to give so much of positive evidence, the Welsh scheme is relegated to a period so remote as to put it practically out of sight. Concerning the purity of the water supply, Mr. Middleton has quoted from Sir Edward Frankland; and we may also refer to the report of Lord Balfour's Commission. Mr. Middleton has not yet finished his evidence; and all further proceedings are suspended until November next. But enough has been said to indicate that the Companies have a case which is a strong one, because it is in full accordance with the interests of the consumers and the ratepayers.

**Lighting by Acetylene.**—The Allgemeine Carbid und Acetylen Gesellschaft, of Berlin, have secured a contract to light the railway station at Oliva by acetylene for the Prussian State Railway Authorities.

**The Metropolitan Gas Inquiry.**—In the House of Commons yesterday, the promised Committee to inquire into the charges of the Metropolitan Gas Companies was nominated, as follows: Mr. W. Abraham, Mr. Baldwin, Mr. Banbury, Mr. Brigg, Mr. Cohen, Sir F. Dixon-Hartland, Sir J. Dorington, Mr. Gilliat, Mr. Brynmor Jones, Mr. Lough, Mr. Lowles, Mr. Nicol, Mr. Pickersgill, Sir A. Scoble, Mr. Steadman—five to be a quorum.

**The Sunlight Incandescent Company's Patents.**—We are informed that the determined attempts which have been made by the Welsbach Company to prevent the Sunlight Incandescent Company from amending their patents were brought to a head last Wednesday by an appeal before the Law Officers, when the Solicitor-General (Sir R. B. Finlay) finally allowed the amendment confirming the decision of the Comptroller of Patents in the same sense. This will no doubt definitely settle the question as to the validity and legal status of the Sunlight Company's mantle patents. We also learn that the Company are opposing the issue of the Kern patent, under which the Welsbach Company are making their new burner, and threaten to apply for an injunction as soon as the Kern burner is put upon the market.



## ESSAYS, COMMENTARIES, AND REVIEWS.

## GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 268.)

BUSINESS on the Stock Exchange last week was at a decidedly low ebb. There were many more detractors from, than incentives to, activity. It was Goodwood week, it was Account week, it was the short week before Bank Holiday, and the weather in the earlier part of it was hot and enervating. Every department therefore was extremely quiet; and most of them flat from lack of support. Few suffered more than Consols, and the choicest of the gilt-edged class—a movement which was perhaps prompted by the increasing firmness of rates of discount. On the conclusion of the settlement, the attendance became much attenuated, and things fell dull indeed. Prices, of course, are weaker all round. In the Money Market, short loans could be had on almost any terms; while lenders successfully held out for higher discount rates. Business in Gas was very light—on some days there being, in fact, only one or two bargains to relieve it from absolute stagnation; and the market was almost devoid of all characteristics. The changes in quotation, apart from mere *ex div.* variations, are limited to a couple. They are, however, in the upward direction; and, taking transactions all round, they indicate a generally favourable tendency. Gaslights were as quiet as they well could be. Until the closing day of the week, the sum total of transactions in the “A” stock was only four. But the appearance of the half-yearly accounts seemed to awake attention; and the last day was busier than all the rest of the week. The accounts present the agreeable feature of an increase of £110,000 in the revenue, counterbalanced by an increase of only £10,000 in the expenditure. South Metropolitan was steady and unchanged; and the like may be said of Commercial. Among Suburban and Provincial Companies, Crystal Palace advanced. The accounts of this Company and of the Brentford Company show an improvement upon the corresponding period of 1897. The Continental Companies were very quiet, and unchanged. Of the rest, River Plate debenture was the only one to move—gaining one point. The Water Companies were as destitute of interest as the Gas Companies; and the only variation was an advance of a point in New River debentures.

The daily operations were so small and unimportant as not to call for the detailed notice. Suffice it to say that on Tuesday Crystal Palace advanced 2, and River Plate debenture 1; and on Thursday, New River debenture improved 1.

## ELECTRIC LIGHTING MEMORANDA.

Local Opposition to the General Power Distributing Bill—Nature of the Opposition—Municipal Interest not to bar Progress—The Real Question of Expediency.

It was noticed last week in the “JOURNAL” (p. 194), that the House of Commons had accorded exceptional treatment to an Electricity Supply Bill. This measure is entitled the General Power Distributing Company Bill; its object being to afford statutory protection for the generation and supply of electricity in bulk over an area of a circle with 26 miles radius, the centre being at Warsop, Nottinghamshire. It is one of a group of Bills of similar character, which led to the appointment of the Joint Committee of Lords and Commons to consider the novel problems presented by these extensive projects. We have placed it upon record that the Joint Committee reported favourably to the general idea of these schemes, though they lay outside the scope of the existing Electric Lighting Acts. Some of the Bills in question therefore went forward on their merits, and others were lost. The Warsop scheme, however, only got through the Lords to find arrayed in the Commons a formidable opposition instigated by the Municipalities of certain towns lying within the proposed area of supply. The nature of this opposition will be understood when it is perceived that the radius of 26 miles from Warsop, the colliery centre of Nottinghamshire, includes Sheffield and numerous other towns where electricity supply is in the hands of the Local Authority. The promoters of the Bill propose to repeat, with improvements, the idea of the Niagara power-distributing scheme. Twenty-six miles is quite as far as contemporary electrical science can undertake to distribute electrical power to advantage—perhaps farther. Beyond this the coal-bag beats the wire. Within the radius, there is at least a chance that electricity from Warsop may prove more economical than electricity generated (say) at Sheffield for local consumption; and accordingly the Sheffield Corporation wish to stop the proceedings of the Company.

It was regarded as at least possible that the representatives of the opposing Municipalities in the House of Commons might elect to carry out their instructions by simply blocking the further progress of the measure, and in this way compel the promoters to bring it in again next session. To their credit be it recorded that they have declined to follow this Old Bailey pattern of procedure, and have agreed to the hanging-up of the Bill over the session, upon the understanding that its consideration shall be resumed next year at the stage where it has now been left off. This is only fair to the promoters, whose time has been lost through no fault of their own, but simply because

Parliament desired very properly to give due consideration to the general principle of power generation and supply in bulk. The point to be remembered in connection with this municipal opposition to the General Power Distributing Company Bill is clearly made out by Sir Frederick Bramwell in a letter to “The Times” of the 25th ult. The Municipalities are opposing, not as local authorities responsible for good government and public security in the area covered by the Bill, but strictly as traders in electricity supply, whose commercial interests are, or may be, affected by what is proposed to be done. Sir F. Bramwell shares with Lord Grimthorpe the knack of putting matters of this kind straight before the public; and his letter is in his best form. He begins by recalling the fact that in 1882 he wrote to protest against the then nascent industry of electricity supply being tied up for the sake of the Municipalities in a way that had not been applied to gas, or even to railways. Notwithstanding this protest, the Act of 1882 was passed, with its option of purchase in the interest of Municipalities at the end of 21 years and every succeeding period of seven years. “As was to have been expected under such provisions as these, no private capitalists would risk their money and go to work; and for six years England lagged behind all the other nations in this industry.” This is Sir F. Bramwell’s way of saying “I told you so!”

By 1888 it had become obvious that something was stopping the way of central station electricity supply in England; and the Amending Act was passed extending the 21 years to 42 years. “But the vicious principle of municipal trading still prevailed in that Act; and at the end of 42 years the undertaking was to be acquired upon the then value of the mere material.” So the case of electricity supply stood until the present year, when certain individuals thought the time ripe for another type of central station electricity generation and supply undertaking, differing fundamentally from anything contemplated by the Acts of 1882 and 1888. Parliament, acting through the Joint Committee of the Lords and Commons, agreed with the suggestion in a general way, and reported against checking the progressive development of a new industry merely because Acts of Parliament had imposed upon the earlier stages of the industry restrictions conceived in the public interest, as it was understood at the period. Municipalities were empowered by the Acts in question to expropriate local electric lighting companies; but this privilege did not convey the consequential right of keeping all such undertakings strictly local. The Joint Committee did not think so, at any rate; but the Local Authorities who are opposing the Warsop scheme are acting as if it did. Sir F. Bramwell says of these bodies that “by every means in their power they hope to render the report of the Joint Committee a dead letter, and to continue to uphold the mischievous system of municipal trading.”

It is a little unwise to burden the statement of a broad principle with question-begging qualifications. Sir F. Bramwell knows this quite well; and he probably deliberately introduced the word “mischievous” into his exposure of the conduct of the trading Municipalities now in question for the sake of sharpening up his argument. It is nevertheless superfluous. Whether Municipalities should or should not be permitted or encouraged to embark upon what might be called commercial undertakings is a question that does not remain to be settled. All that can be done is to keep Parliament and the public fully reminiscent of the only good and sufficient reason for municipalizing any undertaking, whatever its nature—which is that such an operation is “expedient” in the public interest. Every case must be adjudged upon its merits, by this measure of policy. That there should be confusion in the municipal mind as to what is expedient, and that it should be regarded in some quarters as a point of principle to municipalize everything, from sewerage to milk supply, is only as much as to say that slipshod thought and short-cuts to opinions are the fashion of the day. What the Local Authority (say) of Sheffield require to be taught is that they have no divine right to compel the people of Sheffield to take electricity from the Corporation, if it can be had cheaper from an outside source. While it is only a question of one small local generating station against another, a municipalized service may be—not necessarily, but presumptively—a more expedient arrangement than one which is carried on as a private undertaking. It is not, however, for the Municipality to stand in the way of a cheaper or better service than they could provide. The risk of such competition is one they should weigh before going into the business.

**Working of Ventilation Devices.**—Information is often published concerning the arrangements whereby it is designed to ventilate and warm schools and other public buildings. The student of the subject, however, is very properly desirous of knowing how these provisions answer in practice; and this information is rarely obtainable. But some useful hints on the subject may be found in a recent report to the Local Government Board by Mr. W. Napier Shaw, Lecturer on Experimental Physics at Cambridge, on the ventilation and warming of the Metropolitan Poor-Law Schools. Mr. Shaw examined ten schools as they actually were, paying particular attention to the condition of the ventilating arrangements; and generally speaking, it is a defect of all public buildings that those who have to use or live in them habitually suppose that the ventilation was provided for when the building was erected, and need not be further considered.



## THE REPORT OF THE COMMITTEE ON OLD-AGE PENSIONS.

It is to be presumed that most employers of labour in a large way will feel it incumbent upon them to procure a copy of the Blue Book containing the Report of the Committee on Old-Age Pensions briefly discussed in the "JOURNAL" for the 12th ult. We mentioned on that occasion the points of contact between employers and the labours of the Committee; and gave, a week later, our reasons for regarding the net result of the inquiry as disappointing. Unsatisfactory as the conclusions of the Committee are, however, their work is of sufficient importance to call for extended notice of the kind we are in the habit of bestowing upon parliamentary and departmental investigations into economic and industrial matters.

The reference to the Committee was in the following terms: "To consider any schemes that may be submitted to them for encouraging the industrial population, by State aid or otherwise, to make provision for old age; and to report whether they can recommend the adoption of any proposals of the kind, either based upon, or independent of such schemes, with special regard, in the case of any proposals of which they may approve, to their cost and probable financial results to the Exchequer and to local rates, their effect in promoting habits of thrift and self-reliance, their influence on the prosperity of the Friendly Societies, and the possibility of securing the co-operation of these institutions in their practical working." It has already been remarked in our columns that the Committee interpreted the terms of this reference as excluding all schemes involving anything like "the German method of deduction by employers from wages paid by them, assisted by a contribution levied from the employers." They called the principle of all schemes of this kind "compulsion," whereas their instructions started with the suggestion of "encouragement;" and this distinction made a clean sweep of the most interesting of all the divisions of the subject with which the Committee had to deal. Besides, inasmuch as the division comprised the only schemes that are in actual operation, its exclusion reduced the inquiry to a mere criticism of theoretical plans. Old-age provision, under the more familiar name of superannuation, is made in Germany by the State, and in England by the administrations of many public and private undertakings. It is a familiar entry in gas companies' accounts especially; and why the Committee ignored this partial solution of the problem is a mystery. Every working superannuation scheme is at least capable of being used as a source of statistical information. Moreover, it is a significant fact that no superannuation scheme, on howsoever liberal a scale founded and worked—say, in the case of one of the amalgamated London Gas Companies—ever made an appreciable addition to the working expenses of the undertaking. This is a consideration which does not seem to have received the attention it deserves.

However, the Committee decided that they could not give their attention to superannuation schemes involving the principle of "compulsion." They forthwith found that a good deal of the ground left to them, after this great exclusion, had been prospected by an earlier band of investigators—the Royal Commission on the Aged Poor. They considered the majority and minority reports of this Commission, and agreed that much had been said since their presentation as to the desirability of something being done to further the realization of the ideas of the minority of the Commission. Unfortunately, in the end the Committee found themselves driven into agreement with the majority of this Commission, who had left the problem presented to them as insoluble. Of more than a hundred schemes, none was found free from fatal defects. One suggestion after another was taken into consideration, only to be uncompromisingly rejected. Whether it was a case of independent relief, or of relief given through a friendly society or a trade union, the verdict was the same. The criticism of the latter is instructive. The Committee find that many trade unions offer superannuation benefit; but their position in this regard must be measured by the following facts: "(1) That, as a rule, their funds are not hypothecated to any particular purpose, but are subject to other liabilities, such, for instance, as those entailed by trade disputes. (2) That members are liable to forfeit their rights on account of the breach of trade regulations, which have nothing to do with sickness or superannuation benefits. (3) That trade unions are not bodies corporate, and are not liable to be sued by any member for the breach of a benefit obligation." Consequently, it is concluded that "whether or not some of the trade unions might be willing to make their assurance benefits indefeasible, it is clear that, as at present constituted, trade unions would be an insecure foundation on which to build a system of State-aided pensions."

The bearings of these observations on the *status* of trade unions are of great significance. They go to show how small and unreliable is the aid which a trade union can promise to a subscribing member, apart from the debatable "trade" benefits. And there is no legal remedy for default of the trade union. The Committee sought for information as to the trade union view of the subject from several very prominent Trade Unionists, going in the first place to Mr. John Burnett, Chief Labour Correspondent of the Board of Trade, and ex-Secretary of the Amalgamated Society of Engineers. This authority stated that though superannuation benefit was granted by some trade societies, this is only by grace of the Central Executive, upon

whom no member has any claim at law. Asked whether there is any desire on the part of Trade Unionists generally for old-age pensions, Mr. Burnett could only reply that "there is a considerable difference of opinion on the subject." Naively enough, he did not think there would be much objection to the idea, "if the funds were to be raised from the general taxation of the country." On the other hand, he did not think the trade unions would care for any system of old-age pensions which involved State management of the necessary subsidy, or the use of their own funds for this purpose. With reference to the position of friendly societies in the same respect, Mr. Burnett admitted that most of them are not solvent; while not one of them actually has in operation an old-age pension scheme of its own. The trade unions are better than this; for Mr. Burnett was able to hand in a statement showing that 26 trade societies had 7254 members on superannuation benefit at the end of 1895. The amount of the payment by all the trade societies of the United Kingdom in the shape of old-age pensions is under £150,000 a year. Less than 1 per cent. of the members of these societies draw this form of benefit. No society has yet faced the problem of making proper provision for these payments on a sound actuarial basis. Both trade unions and friendly societies are in the same boat in this respect; being actuarially insolvent, but depending upon levies for making both ends meet.

After Mr. Burnett came Mr. Robert Knight and Mr. Thomas Allen, representing the Boilermakers' Union. The former was in favour of granting an old-age pension to the deserving poor; but there was a difficulty about the definition of the qualification. The witness was unable to say more than that the character of poor people is "pretty well known to the authorities." Mr. Knight, like the rest of his order, was disinclined to take an actuary's opinion as to the solvency of his Society. He was very strong, however, on the point of the non-liability of the men of the Society to go out on strike. He was pressed on the point; but remained firm in the position that the Boilermakers do not strike. Altogether, the conversation between Mr. Knight and the Committee is well worth reading; and it may be freely conceded that this witness deserved the thanks offered to him by the Chairman, Lord Rothschild, for his statements.

It is impossible to go through the minutes of evidence contained in the Blue Book. As with most publications of the kind, a mass of useful information is given in the form of appendices. A very valuable statement is offered by Mr. R. P. Hardy, a Fellow of the Institute of Actuaries, who discusses the subject of the superannuation funds connected with certain large private and semi-public undertakings, such as the railway service. Mr. Hardy remarks that the benefits differ slightly in the various funds, and he does not think that, as a rule, they are sufficient. But he makes the following observation, which goes to the root of the principle involved. He says: "From my intimate knowledge of these funds, and from repeated and constant inquiries I have made into this point of the subject from members of all ranks of the service, I entertain no doubt but that, scanty as may be the old-age provision derived therefrom, these funds do represent a kindly and most praiseworthy attempt by the companies to recognize the claims their dutiful servants have upon the body corporate; that a provision is secured that many of the members, if left to themselves, would neglect to make until the rising cost would render it quite impossible for them to support; that the interests of the service, and consequently those of the public, are well served by the freedom obtained of placing upon a pensioned list any well-behaved servant who has become past the work of his department, and of replacing him by one still in the vigour of activity." This is the case for superannuation in a nutshell. It could have been desired that Mr. Hardy had been acquainted with some typical arrangements of the kind as operating in connection with other statutory industries.

On the general question, Mr. Hardy holds that grave objections exist to any plan of old-age pensions requiring an employer to contribute towards the fund, or to his being obliged to make a deduction from the wages on that account for payment over to a local or a general fund. He says on this head: "It is very doubtful if an employer's contribution does not fall back upon the workmen, in the shape of reduced wages." As to this, we venture to suggest that new and additional charges upon employers, of the kind under consideration, are not so likely to take the shape of a reduced wage, as that of preventing an otherwise natural rise of wages. Mr. Hardy is to be commended also for declaring that "thrift is quite a relative term; and the mere saving of money, to the neglect of other duties, is not to be held up as the sole virtue of a citizen. To stint the education of children, to continue to overburden a woman with domestic duties, to stand churlishly aside from support of all great humanitarian movements, with the object of saving something for personal old age, would deteriorate the nation far more than even the present pauperism does."

As a matter of fact, saving for old age does not commend itself to the average British workman. The friendly societies have offered inducements to this course; but the response has been practically nothing. In the whole Manchester Unity of Odd Fellows, with some 700,000 members, only 500 have up to now insured themselves for the old-age provision under tables prepared so long ago as 1882. The Manager of the Prudential Assurance Company testifies to the same effect. And so for the



present the question rests. A more humanized society wishes to make better provision for the comfort in old age of the necessitous poor who have been unable to provide sufficiently for themselves. But actuaries, economists, and men of affairs unite in declaring that they cannot see a way corresponding to this vague goodwill; and the Blue Book we have been considering states their case with ample evidence and irrefragable logic. Still, the wish will not die.

### THE ACETYLENE EXHIBITS AT THE IMPERIAL INSTITUTE.

(Continued from p. 198.)

THE Acetylene Gas Corporation, Limited, are the owners of Professor Fourchotte's patent for apparatus for generating acetylene gas, which was described with the aid of an illustration in our "Register of Patents," Vol. LXIX., p. 1136. The apparatus made by the Corporation differs in some details from that claimed in the patent specification referred to. For instance, the carbide is placed upon trays, instead of in a simple perforated basket. The adoption of trays for the carbide may be observed in many other cases—one other has been already mentioned, in which a simple basket only was used by the inventor of the apparatus. Undoubtedly the consensus of opinion in favour of trays indicates that experience has proved such an arrangement of the carbide to be beneficial in almost every apparatus which is not of the so-called "chute" type. Thus early in the history of the acetylene industry we can observe the disposition of manufacturers of generators to recognize certain points as essential. These admitted essentials of a successful apparatus cannot be seriously claimed as proper objects of an application for letters patents; and their general adoption corroborates the views already expressed in the "JOURNAL" on the value of acetylene patents [Vol. LXX., p. 625]. For the rest, Professor Fourchotte's apparatus is as good as any of those in which the carbide is in excess at the *locale* of the reaction. The method of controlling the supply of water to the carbide according to the movements of the storage gasholder is very ingenious, and simple withal. The fall of the bell of the gasholder seals a tube, the top of which is attached to the crown of the bell. As the bell continues to sink, the air within the tube becomes compressed, and its pressure is partially exerted on the water within one limb of a U-tube, the other and longer limb of which passes into the generator. The pressure eventually becomes sufficiently great to force the water over the rim of the longer limb on to the carbide. The gas generated by the contact of the water and carbide passes into the holder, and relieves the pressure of the air confined in the tube; thereby causing a cessation of the overflow of water to the carbide. The control of the generation of gas is thus effected without the complications of chains, levers, or cocks, which are apt to stick or jam at the critical moment. In other respects, we think the apparatus made by the Acetylene Gas Corporation a good one of its class. We do not, however, approve of many of the statements by which the Corporation hope to convince the public as to the merits of acetylene. It is said by them that in a "room of 350 cubic feet, 140 cubic feet of acetylene would have to be introduced to cause danger." However safe an atmosphere containing rather less than this proportion of acetylene might be for respiration, we certainly should not care to introduce a light in it, though the Corporation assert in the preceding paragraph that the danger of explosion with acetylene is small.

M. Raoul Pictet is well known to the modern student of chemistry as one of the two men who simultaneously, yet independently, accomplished the liquefaction of oxygen in 1877. Though the honour of being the first to liquefy one of the elements which had up to that year been generally regarded as permanent gases under all conditions of temperature and pressure belongs as much to Cailletet as to Pictet, his achievement none the less placed the latter in the foremost rank of scientific workers; and he has diligently maintained his claim to that position by his subsequent labours. When it became possible to produce acetylene on a commercial scale, M. Pictet endeavoured to render its transport an easy matter by reducing it to the liquid state. The critical point of acetylene is high compared with that of oxygen, and therefore the difficulties of liquefying acetylene apparently were not great. But the fact that acetylene is a compound that, under certain conditions, readily breaks up into its elementary constituents renders precautions in its liquefaction necessary which need not be observed when oxygen is being dealt with. M. Pictet overcame all the difficulties of liquefying acetylene with safety; but the experiences he underwent in the researches he undertook in order to accomplish this end appear to have imbued him with an uncommon fear of the dangerous character of acetylene. Recognizing that chemical changes are suppressed or restricted by cold, M. Pictet abstracted heat from the acetylene throughout the process of compression, and he thus was able safely to liquefy the gas. The liquefaction of acetylene on a commercial scale cannot be contemplated in this country, and therefore M. Pictet's process for liquefying the gas has no practical importance to us. But having learnt the absolute necessity of working at low temperatures and on nearly pure acetylene when liquefaction is attempted, M. Pictet applied similar ideas to the

generation of the gas. In a patent for the manufacture of acetylene, dated Aug. 17, 1896 ["JOURNAL," Vol. LXIX., p. 27], he lays great stress on the advantages of obviating a considerable rise of temperature in the generation of the gas. In another patent, No. 18,208 ["JOURNAL," Vol. LXVIII., p. 1292], of the same date, he describes an elaborate system of purification, in which also low temperatures are stated to be very advantageous. The keynote of M. Pictet's views on acetylene appears to be the maintenance of a low temperature, whether it be the generation, the purification, or the liquefaction of the gas that is in question.

The rights of the patents mentioned above have been acquired by the British Pure Acetylene Gas Syndicate, Limited, who exhibit at the Imperial Institute three types of generators made according to M. Pictet's views. The principal generator is of the non-automatic class, and therefore is provided with a gasholder capable of storing the whole of the gas evolved from a full charge of calcium carbide. The apparatus is of the third or "chute" class; and the charge of carbide is usually fed in by hand. Provision has, however, been made for putting the whole of a charge of carbide into a suitable receptacle with a small orifice, and then dropping the receptacle, with its contents, down the shoot into the water. The generation of gas then proceeds without further attention until the charge is exhausted and the gasholder is nearly completely filled. Between the generator and the gasholder is inserted a purifier containing one or more of the purifying agents mentioned in M. Pictet's patent. The apparatus, as made by the Syndicate, is simple in the extreme; and the manipulation of it could be very easily mastered by any intelligent man. There appears, however, to be some disposition on the part of the Syndicate to depart in certain respects from the precise methods claimed by M. Pictet. Less importance than he ascribed to it seems to be attached to the thorough purification of the gas. We are inclined to think that M. Pictet held the right view, and that a little time and trouble given to the purification of the gas will be well repaid by the improvement in the results. Putting aside for the nonce the question of purification, the generator has many good points, among which is that common to most generators of the "chute" class—viz., the relatively low temperature which prevails owing to the presence of a large excess of water throughout the time of generation. It is intended, under normal conditions, that the generator should be recharged daily, but the labour of charging it is very little. We are disposed to regard the apparatus with favour; but we do not like many of the statements in the prospectus of the Syndicate, and in a report by a Liverpool analyst who has examined the system.

The majority of inventors of acetylene generators contemplate recharging daily or at frequent intervals; and most of the generators shown at the Imperial Institute accommodate a charge of from 2 to 10 lbs. only of carbide. One apparatus of a different order is that exhibited by the Acetylene Beacon-Light Company, Limited. The generator at the Exhibition takes a charge of 1 cwt. of calcium carbide, and is almost the smallest size made by the Company. The apparatus receives so large a charge, not in order that it may supply a larger number of burners than the generators of other manufacturers, but in order that it may work without interruption and without needing a fresh charge of carbide for weeks, or even months. The inventors are Messrs. Morton, Brown, and Maundrell; and the lengthy patent specification filed by them is dated Oct. 12, 1896. An abstract of it was given in our "Register of Patents" last year (Vol. LXX., p. 383). A drum of coarse iron gauze or netting receives the whole of the charge of carbide, and is supported within an iron box on a horizontal spindle which may be rotated by means of an exterior handle. Above the box is a cistern which contains sufficient water for the decomposition of the charge of carbide. From the cistern the water passes through a long V-tube to a drip-pipe arranged above the drum containing the carbide. The flow of water from the cistern to the drip-pipe is controlled by a valve which is operated automatically according to the rise and fall of the bell of the holder, which receives the gas as it is generated. The bell is covered by a gas-tight hood, which serves to guide it and to prevent gas penetrating from the seal to the surrounding atmosphere. Any gas which escapes into the hood is conveyed through a pipe to a distance. The mechanism by which the controlling valve on the water supply is actuated is of a simple nature. The gas is cooled before it enters the holder. The uncommon feature of the system is the state in which the residual lime is obtained. Instead of being the usual pasty mass or sludge, it falls from the carbide cage as a dry powder, when the cage is rotated once or twice a day. It is removed from the base of the generator at the rare intervals when the latter needs re-charging. There naturally arises the question: By what means is this uncommon condition of the residue attained? At the sphere of the action of the water on the carbide, there is a large excess of carbide, and there must necessarily be a considerable development of heat locally. The heat evidently suffices to drive off more water than is retained by the lime in the state of hydration in which it is afterwards found as a dry powder. What this precise state of hydration is we cannot say, though the knowledge would enable a fairly correct estimate to be made as to the temperature attained by the particles at the sphere of reaction. The state of hydration



of the residual lime would probably be found to vary with the frequency with which the cage was rotated and the residue detached from the carbide. A few analyses of the residual lime recovered under various conditions would throw light on the operation of this apparatus. We should like to be satisfied by the results of an exhaustive examination of the residue that it is not the product of an excessively high temperature; and that it is to all intents and purposes free from undecomposed carbide. If the results of such an examination are not against the process, there should be a good opening for it. The advantage of working for a long period with no more attention than the occasional revolution of a handle is one which will recommend the generator to many users of acetylene. The gas as it passes from the holder to the burners is dried by contact with calcium carbide, and it then traverses a safety chamber, consisting of a box packed with fine wire gauge and asbestos fibre. The object of the chamber is to arrest the passage of a flame through the pipes to the holder, should at any time an explosive mixture in the pipes be fired. It is a well-known fact that the explosive wave or flame will not traverse orifices of less than a certain diameter; and in their safety chamber the inventors of this apparatus have endeavoured to avail themselves of this fact.

(To be continued.)

#### A RECENT TENDER FOR PUBLIC LIGHTING BY ELECTRICITY.

In another column we give the full list of tenders for the public lighting recently submitted to the Mayor and Corporation of the City of Winchester by the local Gas and Electric Companies respectively. The estimate from the Winchester Water and Gas Company, which was accepted without public discussion, calls for no special mention; but that emanating from the Winchester Electric Light and Power Company may be examined as an illustration of the tactics likely to be adopted in provincial towns with a view of inducing the City Fathers to believe that, by the aid of electricity, they may secure a very superior kind of public lighting as compared with that hitherto afforded by means of gas. Coming from a firm of London Engineers who are largely concerned in the fortunes of electricity at Winchester and elsewhere, one might reasonably suppose that a scheme, apparently claiming to show the citizens how the streets and thoroughfares may be better and more efficiently lighted than is possible under the present system, would be an embodiment of the latest phases of knowledge on the subject of public lighting. It would not, of course, enter into scientific details; but simply set forth the most recent conclusions in a popular style. But a very cursory perusal will be sufficient to elicit the fact that it might have been written 20 years ago, before Mr. Trotter read his well-known paper before the Institution of Civil Engineers, or Mr. Webber wrote the series of articles on "The Science and Practice of Lighting" that were published in these columns, and subsequently in book form, to say nothing of the labours of Mr. Preece, Mr. W. Sugg, and many others. These gentlemen have not arrived at any agreement as to the degree of illumination that does or does not constitute effective public lighting; but they have accurately laid down the conditions that prevail—the data for determining the degree of illumination at any particular point, and so on. Yet the authors of this scheme are very indistinct upon such elementary points as the difference between candle power and illumination, or what in other words is called "illuminating power and illuminating effect."

A prominent feature of the first paragraph in the tender is the brave assertion that a 20-candle electric glow lamp is equal in effect to an ordinary Welsbach gas-burner. This will come as a surprise to all who have candidly and without bias examined both systems of lighting. Even in shops, where the light is aided by reflection from polished or light coloured surfaces, three or four times as many glow lamps will be found necessary to produce an effect equal to Welsbach burners. And the writers appear to be doubtful on this point, as further on in the report they credit the Welsbach with double this power, or 40 candles. But the assumption in the first paragraph is capped by that in the second, when the authors state that "the most effective means of lighting public streets is by means of arc lamps." A great deal might be said on the subject of the most effective way of lighting streets; and if high-power lights are the best, they can be furnished by means of gas at a rate very much lower than the charge for arc lamps. But modern authorities are decidedly in favour of moderate power lights at comparatively short distances apart, rather than high power at long distances. The proposition, in the present case, is to place arc lamps at about 80 yards apart; and it is claimed that this arrangement would result in "vastly better illumination." The author of this statement would do well to consult Mr. Trotter's calculations and diagrams of the lighting of Whitehall by means of Sugg's gas-burners, and of the lighting of Queen Victoria Street by means of arc lamps at a distance apart of something like one-half of 80 yards. This "vastly better" system, after being before the public for 20 years or so, has really met with but a very limited degree of favour; and has elicited the fact that, in order to avoid an unpleasantly uneven illumination (or as Mr. Webber has put it in his book, an undesirably large

ratio between the main degree of illumination in the immediate vicinity of the lamps, and the minimum at a point farthest away—i.e., half way between two of the lamps), the lamps must be very much nearer than 80 yards apart. If the lights must necessarily be widely spaced, there are two ways of meeting the case. The power of the lights may be increased, and longer posts may be used so as to bring them at a greater height above the surface of the ground. But the effect of increasing the power of the light is to increase the ratio between maximum and minimum; and there are physiological reasons why this ratio should not exceed a certain proportion. It is obvious, then, that beyond a certain limit—very much below 1000 candles—not only is there no advantage in increasing the power of the light, but an actual increase of uneven and unpleasant effect. As regards the reduction of the maximum illumination by increasing the height or length of the lamp-post, the possibilities in this respect are limited by questions of first cost, of maintenance, and of waste of light. The line of maximum illumination may be represented by a horizontal line joining two lights. If the posts are 12 feet high, this is situated 12 feet above the roadway. If 30 feet high, it is 30 feet above the roadway; and the greater the height of the line of maximum illumination, the greater will be the proportion of light wasted in illuminating the top storeys and the roofs of houses, or dispersed uselessly through the atmosphere.

Having written the Welsbach lamp down to 20 candles, one might expect that the authors would make some deduction for the electric light. But they credit the 500 watt arc lamp with the full theoretical value of 1000 candle power, and base their calculations of the practical value of electric lighting on that factor—quite ignoring the fact that nothing like this value is ever realized in practice. Even if the light evolved through a reasonably wide angle is equal to 1000 candle power, there is the fact that the glare emitted by it is so intensely irritating that it must be obscured by a ground glass or opal globe, which means a sacrifice of about one-half of the light, and by increasing the height of the lamp-post, which, as just remarked, means a further waste of light. But for years there has been a general understanding to the effect that the lighting power of an arc lamp, in practice, is not more than one-third or one-fourth of the nominal value at which it is rated. Bearing all these points in mind, it is evident that the respective effective values of a Welsbach and of an arc light are very different from that of a 20 and a 1000 candle light; and no one in his senses would contend that the arc lamp yields 50 times as much practical illuminating value as a Welsbach. This is claimed, by inference, in the tender, which also sets forth that each arc lamp would replace three Welsbachs, from which it is evident that the latter are spaced 80 feet apart. Even under the most favourable circumstances the intensity of the light diminishes as the square of the distance; and therefore the arc must be at least nine times as powerful as the Welsbach to get an equal minimum effect, and there is no evidence whatever as to where "vastly better illumination" comes in.

In order to reduce the cost of arc lighting, each lamp is to be replaced at 11.30 p.m. by two 10-candle glow lamps, which are to do duty for the remainder of the night. On this point it would be interesting to hear the views of the local police as to the value of 10-candle lights, 80 yards apart, for preventing crime, identifying suspected persons, &c. The luckless wayfarer after that, however, would certainly have to resort to the old-fashioned practice, belonging to the days of 3-feet and 4-feet gas-burners, of climbing a lamp post in order to see the time by his watch.

A comparison of the relative candle power from gas and electricity is made on the assumption that candle power is the same thing as money value. The inaccuracy of this argument is obvious; but yet the authors lead up to the conclusion, based on their own estimates, that the arc lamp affords  $8\frac{1}{2}$  times as much light as gas at three times the cost, and that light for light electricity is about one-third the cost of gas. But the fact that this applies only to 1000-candle lights in one case, completely upsets the practical value of the comparison. Even accepting the figures quoted, it is quite possible, by using a large number of lights placed comparatively near together, to utilize 1000 candle power in such a manner as to secure an equal minimum, and a more even, pleasant, and effective degree of illumination than can by any possibility be obtained from four lights of 1000-candle power each.

We have thought it worth while to direct attention in this way to these few points, as although the methods of estimating and measuring the actual illumination of streets or open spaces have been clearly laid down and defined by the authorities above mentioned, opinions differ considerably as to what is or is not a proper degree of light for a public thoroughfare. An old negro once went to buy a pair of shoes for the first time, and when the shopman came to take his measure he said, "Never mind about the measure, but make them as large as you can for the money." The public demand for street lighting seems to run on similar lines. We know that the lighting should be even, with the smallest possible ratio between maximum and minimum; but the latter limit, from financial considerations, must necessarily be lower than theory would require. And, therefore, a gas engineer who is called upon to propose a scheme for public lighting which will be submitted and considered in competition with one based on arguments similar to those now under review,



finds himself placed at some disadvantage. He has his own ideas as to the amount of light that is really necessary or desirable; but he cannot say how far the municipal surveyor or the lighting committee may be disposed to agree with him. Given some definite standard—such, for example, as a reliable minimum illumination test—by which the authorities could form an idea for themselves, and indicate to contractors, the value or quality of the lighting service required, the contractors would simply give in their price. But when each contractor has the right to express his own views as to the quality of the service offered as well as the cost, and the estimates have to be valued by gentlemen who have no practical or professional knowledge whatever of the matter in hand, there can be no accurate judging or assessing of the value of each estimate on its merits, and the ultimate result is, to a large extent, a matter of chance.

### THE EXAMINATIONS IN GAS MANUFACTURE.

#### The Prize-Winners in the Last Examinations.

IN the "JOURNAL" last week we announced that Mr. H. E. Smith had gained the second prize (£2 and a bronze medal) in the Honours Grade at the last examinations in "Gas Manufacture" of the City and Guilds of London Institute. We learn from the complete list of prize-winners which has now been issued that the first prize in that division (£2 and a silver medal) was gained by Mr. A. T. Cowper-Smith, who last year carried off the highest prize in the Ordinary Grade (£1 and a silver medal), which this time has been taken by Mr. J. Inman Emery. Mr. S. E. Halliwell has secured the second prize (£1 and a bronze medal), and Mr. G. Duncan the third (a bronze medal) in that division. It may be of interest to mention that Mr. Cowper-Smith and Mr. Emery were both students at the Regent Street Polytechnic, where the classes for "Gas Manufacture" are conducted by Mr. Walter Grafton, F.C.S., who, it will be remembered, has recently contributed to our columns a series of articles on "Photometric Standards." Mr. Grafton's pupils have obtained three of the seven first-class Honours prizes awarded throughout the kingdom, and five of the twenty first-class Ordinary prizes, besides second-class passes. Mr. Cowper-Smith was also the gainer of the third prize and certificate on the result of the Polytechnic examination; while Mr. Emery secured the first prize—a bronze medal and a certificate. As the result of the London County Council's examinations, the question-paper in which is given below, he was awarded the scholarship (£15) and a certificate. We heartily congratulate both these young men on their success, and shall watch their future career with much interest. Considering that Mr. Emery knew very little about gas making until he joined the Polytechnic classes, and is only twenty years of age, he has shown a remarkable grasp of the details of gas-manufacturing operations, and has made a good start upon what we trust may be a brilliant professional career.

The following is the question-paper above referred to:

- 1.—Give an account of the chief varieties of coal used for gas manufacture, and the chief points of difference in the products of distillation.
- 2.—What is the average composition of coal gas? On what constituent does the illuminating power chiefly depend? How would you prove this?
- 3.—Give a sketch of a scrubber, and explain its action on the gas passing through it.
- 4.—Describe the action of lime and oxide of iron in the purification of coal gas. When spent lime is only used, what chemical compounds is it found to contain?
- 5.—How would you determine the amount of (a) carbon monoxide and (b) sulphuretted hydrogen in a sample of coal gas?
- 6.—Describe the experiments you would perform in order to determine the illuminating power of a sample of coal gas.
- 7.—Give a short account of the manufacture of water gas.
- 8.—How would you determine the calorific value of a sample of coal gas?
- 9.—Give a short description, with a sketch, of the action of a gas-meter.

"Specification" is the title of a quarterly publication issued from the office of the "Builders' Journal" and the "Architectural Review," with the object of furnishing architects, surveyors, and engineers with facts, precedents, and special information which will be useful to them when making out specifications. In order to ensure accuracy, the matter contained in the volume has been revised by acknowledged authorities on the particular subjects entrusted to them. For example, the section devoted to "Gas-Fitting" has been corrected by Mr. Frank Livesey, who has brought together a number of rules which should be borne in mind when the fitting of houses for gas supply is under consideration. The sections are accompanied by specification clauses, hints as to the preparation of bills of quantities, legislative and other regulations, as well as a glossary of English, Irish, and Scotch technical terms; and blank leaves are provided for memoranda. Lists of London architects, builders, and contractors will be found at the end of the book, which is very well got up.

### OBITUARY.

The death is announced of Mr. G. OXENDALE, the Chairman of the Northallerton Gas Company.

Mr. HUDSON REAH, the Borough Surveyor and Water Engineer of Preston, died on the 16th ult., after a short illness, resulting from a paralytic seizure. He was appointed in 1878, in succession to Mr. R. W. Hunter. Deceased, who was in his 59th year, leaves a widow, a son, and three daughters.

We regret to hear of the death last Tuesday of Mr. R. F. PATERNOSTER, who was for many years in the service of the Ipswich Gas Company. Most of the members of the Eastern Counties Gas Managers' Association who had the good fortune to be able to attend the Ipswich Meeting last September will remember that Mr. Paternoster was present, and assisted in looking after the comfort of the visitors, and in giving them, during the trip on the Orwell, much information concerning places of interest that came within view. The deceased gentleman was 51 years of age.

### PERSONAL.

Mr. R. B. REEVES succeeds the late Mr. T. G. Browning as Manager of the Whitstable Gas Company.

Mr. G. H. STEWART has been appointed Manager of the Ennis Gas Company, in succession to Mr. J. G. Tooms.

In the "JOURNAL" last week we announced the appointment of Mr. G. W. YOUNG, of Carlow, as Manager of the Kilkenny Gas-Works. Mr. Young now informs us that he has decided to remain at Carlow; the Company having increased his salary.

The Directors of the Plymouth and Stonehouse Gas Company have shown their appreciation of the services of Mr. ARTHUR WHARTON, the Manager, and Mr. P. S. HOYTE, the Assistant-Manager of the works, by increasing their salaries by £100 and £80 a year respectively.

The Birmingham City Council last Tuesday authorized the Gas Committee to retain until Oct. 31, 1899, the services of Mr. E. D. GODDARD, Superintendent in the Gas Department, who had attained the age of 65 years. It was explained that Mr. Goddard would then have been in the service of the Committee and their predecessors for forty years.

Dr. PERKIN, F.R.S., is the ex-Master of the Leathersellers' Company; and at a ladies' banquet given by the Company last month, at their hall, a life-sized portrait, representing the Doctor delivering an address at the Society of Arts, was placed upon an easel for inspection. The portrait has been painted by Mr. H. Grant, who has produced an excellent likeness.

The appointment recently advertised in the "JOURNAL" of Assistant-Manager of the Pará (New) Gas Company, Limited, has now been filled up; the present Engineer (Mr. Hislop) being retained in the Company's service. Mr. JAMES STEEL JOHNSON is the successful candidate. For six years he was at the Gorleston Gas-Works, Great Yarmouth, and subsequently for four years at Beckton. During the past twelve months he has been under Mr. Carpenter at the Great Yarmouth Gas-Works. Mr. Johnson has a first-class Honours Certificate in "Gas Manufacture," as well as in the "Coal Tar Distillation," "Chemistry," "Building Construction," "Machine Construction," and "Mechanics" sections of the City and Guilds of London Institute examinations. Mr. Johnson starts for Pará to-day on a three years' engagement with the Company.

### NOTES.

#### The Practice of Dyeing with Coal-Tar Indigo.

It is reported by Kurz, after working with as much as 350 kilogrammes of the synthetic indigo prepared by the Badische Anilin und Soda Fabrik, that this artificial indigo possesses real advantages over the natural dye-stuff. Compared with dyeings from a natural indigo vat, Kurz found that his sample goods were dyed an equally heavy shade, the colour being much finer and brighter, less green, and just as red as with ordinary indigo, which, by comparison, appears dull and grey. Besides, the goods dyed with the artificial product do not rub so much, and while being equally fast to washing and soaping, do not lose their brilliancy when exposed to light, but only becomes slightly lighter. A careful comparison of the cost of dyeing gives a result about 2½ to 3 per cent. in favour of artificial indigo. It is further stated that the Badische house are prepared to supply thousands of kilogrammes of the artificial indigo, and have, moreover, entered into an arrangement with the Farbwerke Höchst, who will also be shortly in a position to supply indigo. This announcement is taken from the "Journal of the Society of Chemical Industry;" and it will be worth noting whether the final commercial success of coal-tar indigo, thus signalized, will have any effect upon the market for coal-tar products.

#### Terrestrial Coronium.

The process of adding to the number of gaseous components of the atmosphere goes on. Hardly have Professor Ramsey and his colleagues succeeded in introducing the civilized world to



three or four more unsuspected constituents of common air which share with argon the distinction of possessing no known chemical affinity, than Professor Nasini, of Padua, announces the discovery of a remarkable gas in the emanations from the earth in the Italian volcanic region. For some time past Professor Nasini, with Messrs. Anderlini and Salvadori, have been engaged in an extensive study of the gases emanating from volcanic grottoes and earth crevices; and at Pozzuoli they at length discovered a gas yielding a spectrum which was never before seen in connection with an earthly product. It was coincident spectroscopically with solar coronium—a previously undiscovered element which should be lighter than hydrogen. Hitherto nothing has been known of such a substance except that it apparently exists in the solar corona. It is credited with a vapour density far smaller than that of hydrogen; yet the fact of its existence in the midst of solar prominences or sun spots, where the lines of hydrogen and other known elements are contorted, has been taken as indicating that it is a permanent body. This terrestrially unknown substance appears now to have been captured on earth—probably in association with other hitherto unnoticed substances.

#### Effect of Coal Gas upon Vegetation.

The alleged injury to vegetation through the saturation of the soil by coal gas, resulting from leakages or fractures in the pipes, was dealt with a short time since by Herr Pfeiffer in the "Journal für Gasbeleuchtung." Official investigations into the subject were carried out in Berlin in 1871, and subsequently by Böhm. They showed that injurious effects were produced on trees and shrubs artificially exposed to the influence of coal gas, and that these effects proceeded from absorption at the rootlets. On the other hand, Herr Freytag found that neither hydrogen, paraffins, nor alkylens affected vegetation, though small amounts of tar products, especially of phenol vapour, were actively injurious; and Herr Poselger maintained that coal gas was not at all deleterious to plant life. Many other causes may contribute to the low vitality of the trees of towns; and the question can hardly be satisfactorily settled in any particular case unless some means be found of detecting the presence of coal gas in the soil where the sickening of trees leads it to be suspected. The author experimented with a sample of soil which had been impregnated with coal gas by passing the gas over it for ten days in a 4-inch gas-pipe. Neither ammonia nor cyanogen could be detected; and though diazobenzene-sulphonic acid gave indications of phenolic bodies, yet investigation showed that similar results were obtained from many of the products of decay of animal and vegetable substances. Ultimately, the determination of the alkylens by absorption with bromine was found to give satisfactory results; titration of the gas-impregnated earth, after many months' exposure to air and drying, showing that it still retained the whole of the alkylens.

**Water Supply by Meter.**—Water-meters were made obligatory on all consumers in Cologne in 1894-5; and in that year the annual consumption was reduced to about 2375 million gallons. Next year it increased to 2680 million gallons; and in 1896-7 to 3040 million gallons, or about 27½ gallons per head daily.

**New Sight-Feed Lubricator for Gas-Engines.**—Messrs. Hartley and Co., of Manchester, are bringing out a new sight-feed lubricator, which has been specially designed for use on gas and oil engines, air-compressors, and similar purposes. It is arranged to be connected direct to the cylinder; and the firm claim that it is the first and only sight-feed lubricator for gas-engines that can be applied in this manner. Another special feature is that the feed can be regulated in drops, as in a steam-engine cylinder sight-feed. The pressure of air is regulated by means of a valve, and the flow of oil by a feed-valve which is fitted with a stop-feed device, and can be shut off and opened again at any time without disturbing the feed. A plug is provided which can be taken out, when a new glass has to be inserted, and then replaced. The size of the glass is  $\frac{3}{8}$  inch by  $2\frac{1}{8}$  inches; and the lubricator is made in the half-pint and pint sizes.

**North of Ireland Association of Gas Managers.**—The annual meeting of this Association will be held in the Young Men's Institute, Portadown, next Tuesday, under the presidency of Mr. J. Nisbet, the Manager of the local gas-works. According to the programme issued by the Hon. Secretary (Mr. James Whimster, of Armagh) there will be a tolerably full day's work. The President will deliver his Inaugural Address; the medal will be presented to Mr. Egan for the competition paper of last year; Mr. R. Ross, of Dungannon, will recount his "Experience with Prepayment Meters;" Mr. H. Fitzsimmons, of Magherafelt, will read a paper entitled "Occasional Observations;" and discussions will be opened on the Workmen's Compensation Act, 1897, and on the subject of standardizing meter-unions, by Mr. A. Gibb and Mr. J. W. Auchterlonie respectively. In addition, Professor W. Ivison Macadam will deliver a lecture on "The Chemical Testing of Coals for Gas and Steam Raising." By the courtesy of the Directors of the Portadown Gas Company, luncheon will be provided in a hall adjoining the place of meeting. On the following day, the members and their lady friends will be invited by Mr. D. D. Macpherson, of Manchester, one of the extra-ordinary members of the Association, to a cruise on Lough Erne, with luncheon and tea.

## TECHNICAL RECORD.

### NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

#### Review of Proceedings at the Annual Meeting.

The Thirty-Seventh Annual Meeting of the North British Association of Gas Managers was held in the Merchants' Hall, West George Street, Glasgow, on Thursday last. Mr. THOMAS WILSON, Manager of the Coatbridge Gas Company, the President, took the chair shortly after eleven o'clock, by which time there was a goodly number of members of the Association in the building. The Association were pleased to see in their midst Mr. W. Carr, of Stalybridge, who, on invitation, took part in their proceedings. In the course of the day, Mr. W. Foulis, the Engineer to the Glasgow Corporation Gas Department, looked in; and he also, exercising his rights as a member, contributed to the discussions. The meeting was held in probably the finest chamber which the Association have ever been privileged to occupy for their annual session.

The President's address is given in another column. The first paper read was by Mr. Ewing (Hamilton), on "Retort Settings and Practical Results Obtained." The title of the communication sufficiently indicates its nature. The discussion which followed upon it was by Mr. Myers, Mr. Carr, Mr. M'Gilchrist, Mr. Vass, Mr. R. F. Hislop, Mr. Macpherson, and others. Mr. Alex. Wilson, of Perth, gave a paper on "Prepayment Meters," which also was a record of experiences, and did not elicit much discussion, although what there was was sufficient to indicate that, of recent years, the attitude of gas managers has changed towards these meters, and that they now regard them much more favourably than they did in earlier days. Mr. Gilbert Little, of Birmingham, an old friend of the Association, read a description of plant—illustrated by various diagrams of installations which he has erected in different towns—for conveying and sorting coke, &c. Regarding this paper it may be said that hitherto it has been considered that, generally speaking, gas-works in Scotland are too small to make such plant profitable. But Mr. Little succeeded in dissipating this opinion; and it is now recognized that there are many works which it might be very advantageous and profitable to have mechanical appliances at hand for conveying and otherwise handling material. Mr. W. Carmichael Peebles, of Leith, a son of Mr. D. Bruce Peebles, one of the honorary members of the Association, read a highly technical paper on "The Modern Commercial Gas-Engine." Mr. Peebles has a thorough grasp of the subject, as he showed at Ayr last year; and his communication was welcomed as a valuable one on a subject which is not very well understood. The last paper was by Mr. J. Hepworth, of Edinburgh, a Director of Messrs. W. & B. Cowan, Limited. It was descriptive of "The Cowan Pressure System"—a method by which the pressure of gas in outlying districts is controlled by an electrical appliance, thereby giving automatic and immediate relief in cases of sudden changes of pressure. A question, Mr. Hepworth said, had been sometimes put as to whether an electrical apparatus was reliable. But he pointed out that the whole of the railway system is controlled by electric signalling apparatus; and if the agency be good enough for railway purposes, it must be equally so for the control of gas pressure. All the speakers were thanked for their papers; and, in accordance with custom, the President was presented with a gold medal, as a mark of appreciation of his services during the year.

One incident of the meeting ought to be taken special notice of. It was that, on the recommendation of the Committee, Mr. G. T. Myers, late of Broughty Ferry, who has now retired into private life, was unanimously elected an honorary member of the Association. Mr. Myers was one of the three gentlemen who originated the Association, now thirty-seven years ago; and on this account his elevation to the rank of honorary member is a well-merited recognition of service at an interesting period in the history of the organization.

#### Report of Proceedings.

On taking the chair,

The PRESIDENT expressed his pleasure at seeing the members who were present, and gave them all a hearty welcome. He hoped they would have a pleasant and profitable gathering, and would all go home the better for their meeting there.

#### THE COMMITTEE'S REPORT.

The SECRETARY (Mr. Robert S. Carlow, of Arbroath) read the report of the Committee, in which the following passages occurred:—

The Benevolent Fund in connection with our Association has not been drawn upon this year.

In terms of powers conferred on the Committee of the Association at the last annual meeting, to consult with the Councils of the Gas Institute and the Institution of Gas Engineers, and other Associations of Gas Managers in the United Kingdom, with the view of taking common action in connection with the adoption of a standard of meter-unions applicable to the United Kingdom, the Committee have to report that they instructed the Secretary to communicate with every Gas Managers' Association in the United Kingdom. To the circular which they issued, the Secretary received replies from a large number of the Associations, stating that they would be glad to co-operate with the North British Association in their endeavours to bring this matter to a successful issue, and would be prepared to attend any meeting convened for the discussion of the proposal. [The report contained a narrative of the action taken by the Committee, all of which has been fully set forth in the "JOURNAL."] The Secretary of The Gas Institute



retained possession of the standard couplings prepared by our Association, and your Secretary holds a receipt for same.

The Committee unanimously recommended that the name of Mr. G. T. Myers, late of Broughty Ferry, be added to the list of Honorary Members of the Association, seeing he was one of the originators of the Association.

Mr. J. B. TERRACE (Brechin) moved, and Mr. T. DOUGLAS HALL (Montrose) seconded, the adoption of the report, which was agreed to without remark.

#### THE ROLL OF MEMBERSHIP.

The SECRETARY submitted the following report as to the membership of the Association: Removed from the roll: Wm. Cheyne, Briton Ferry; Francis Chaliners, Stevenston; A. C. R. Dow, Tranent; John Hall, St. Andrews; Samuel Langlands, Coleraine; Alex. McLennan, Lennoxton; Jas. Martin, Ladybank; J. McCulloch, West Calder; Jas. Walker, Glasgow; and John Royal, Arbroath. Transferred to ordinary roll: David Easson, Maybole; and Alex. Masterton, Edinburgh. The membership, after these changes, consisted of: Ordinary members, 149; extraordinary members, 58; associate members, 11; and honorary members, 8—a total of 226. The following new members were added to the roll: Ordinary members—Jas. Baxter, Berwick-on-Tweed; Edwin Davis, Lochwinnoch; C. S. Gillespie, Wick; J. B. Scott, Inellan; Thomas Wm. Ward, Stevenston. Extraordinary members—Robert Grant, Glasgow; T. Cuthbert Stewart, Glasgow; Archibald MacKay, Edinburgh. Associate member—George Christie, Arbroath. Honorary member—George T. Myers, late of Broughty Ferry. The total membership now numbers 235—the same as it was last year.

#### THE ANNUAL ACCOUNTS.

The PRESIDENT said the members had all received a copy of the annual accounts, and he asked if anyone had anything to say upon them.

The accounts showed, in the General Fund, an income of £145 18s., and a balance of £37 13s. 9d.; in the Benevolent Fund a charge of £235 14s. 7d., which included a deposit receipt for £200; and annual subscriptions amounting to £28 13s.; in the Research Fund a charge of £83 11s. 3d., and £65 on hand.

Mr. J. NAPIER MYERS (Saltcoats) said he thought the Committee were much to be congratulated on carrying out the wish of the last meeting by furnishing each of the members with a copy of the accounts; and he would have had very great pleasure in moving the adoption of the accounts but for one item in the Benevolent Fund account. On the discharge side of the account, the only entry was the Secretary's allowance. While feeling that there was much work connected with the carrying on of the Association which could not be done for nothing, he thought it was a misfortune that so large an amount of the discharge should be the Secretary's allowance, and that it should be debited to the Benevolent Fund. He certainly took exception to nearly 30 per cent. of their funds being put down to the expense of collecting them. To mark his dissatisfaction with the arrangement he would move that the Secretary's allowance be reduced from £8 8s. to £8. It was not that he wished to reduce the sum payable for what the Secretary had done, but simply that he wanted to register his dissatisfaction at so much being taken from this particular account.

The PRESIDENT thought it would be a great pity if their reports were not to be approved of because of the difference of eight shillings. The Committee had duly considered the matter; and he might explain that the eight guineas covered expenses connected with the issuing of circulars and other matters. If they had any recommendation to make, he presumed that the Committee would be very pleased to hear it; but he thought it was a pity that their accounts should not be approved of.

Mr. J. RENFREW (Langbank) asked for an explanation of the first item in the General Fund Account—"Travelling Expenses of Members attending Committee and other Meetings."

The SECRETARY explained that the "other meetings" were meetings where expenses were only charged for reporters, and for his own clerk attending to assist in the matter of excursion and dinner tickets and the like. That was the whole matter.

Mr. D. VASS (Edinburgh) said he had much pleasure in moving the adoption of the accounts, which, he thought, were highly satisfactory. There was no doubt that the charge against the Benevolent Fund, which had been referred to, looked large; but it was very much a question of book-keeping. If the whole of the expenses were divided up among all the accounts, the charge upon the Benevolent Fund would be very little different. He was highly gratified that the idea had been carried out of putting a copy of the accounts into the members' hands, because it gave them much more freedom in looking into matters.

Mr. R. B. MAIN (Glasgow) seconded the motion. He thought Mr. Myers was under a misapprehension about the charge to the Benevolent Fund. He did not know of any Association in Glasgow, or anywhere else, where the expenses of the Secretary were not charged against the funds. He thought the charge was perfectly legitimate, and should be allowed to remain.

Mr. D. M. NELSON (Glasgow) thought it must be a source of great satisfaction to the members of the Association to find that, while in the preceding years £40 was voted for benevolence, last year it had not been found necessary to vote anything from their funds.

The motion for the adoption of the accounts was then put and agreed to.

#### THE MURDOCH MEMORIAL FUND.

Mr. J. M'GILCHRIST (Dumbarton), the Convener of the Sub-Committee in charge of the Murdoch Memorial Fund, said he had great pleasure in submitting the final report as to the fund. Since their last meeting they had sent a copy of the book "Light Without a Wick," to all the members of the Association, to all the Public Libraries of the United Kingdom, to all the Universities and Colleges in the United Kingdom, to the leading Professors, to all the newspapers in Scotland, and to all the Presidents and Secretaries of Gas Associations in the United Kingdom; and, after paying every charge against the Murdoch Memorial Fund, and the accounts having been audited by Mr. R. B. Main, there was a sum of £11 12s. 10d. in favour of the fund. This amount, along with a balance of some hundred copies of "Light Without a Wick," the Sub-Committee suggested might be handed to the Committee of the Association to be dealt with by them as they thought fit. Seeing that there was a long programme before the meeting that day, he would not take up their time further than just to state that he had had great pleasure in working in connection with the gentlemen who had acted on the Sub-Committee. They had the late Mr. John M'Crae, of Dundee, and Mr. David Terrace, now of Middlesbrough, who rendered very great assistance in carrying out the objects of the fund. They also had Mr. Alexander Bell, their Past-President, who was now the Chairman of the Sub-Committee. He was very pleased to say that the newspapers in the country had very favourably criticized their publication of the work "Light Without a Wick;" and he had had hundreds of testimonials from other sources, all indicating that they had done the right thing. He was very pleased to think that, among the other things which they had done in connection with the Murdoch Memorial Fund, they had been able to put a bust of the great Scotsman, Murdoch, along with his brother kings and poets, in the National Valhalla in the Wallace Monument. He did not know that he could add anything further; but he wished to thank all the members for the kind way in which they had assisted him in the work, since the year 1882. He moved the adoption of the report and the recommendation of the Sub-Committee.

Mr. A. BELL, sen. (Dalkeith), seconded the motion. Mr. M'Gilchrist, he said, had kindly mentioned that he was Chairman of the Sub-Committee. Well, he was sorry that he should be in that position, because he was only a simple stopgap, and had done nothing for the fund, in any way. He had simply filled up the position held by the late Mr. John M'Crae. Therefore, in anything he might say he was not seeking any glory or praise to himself—Mr. M'Gilchrist was the man. Upon him all the glory lay. It was nearly twenty years since the fund was started; and Mr. M'Gilchrist had all along been indefatigable in the working of it. As this was the last meeting at which the subject would be considered, he thought the least thing they could do was to render Mr. M'Gilchrist very hearty thanks indeed for all his labour. The other members of the Committee had, no doubt, done their fair share of the work; but Mr. M'Gilchrist alone had carried it through. He thought that he deserved the thanks of the Association, and of the Gas Industry in bringing forward their compatriot and the initiator of the gas industry. He therefore proposed that Mr. M'Gilchrist should get a very hearty vote of thanks for his labours.

The PRESIDENT said that, as an Association, he thought that their thanks were also due to the Sub-Committee for their labours in getting up the memorial; and also for handing the balance of nearly £12 over to the Association. If the proposal met with their acceptance, he was quite certain that the money would be safe in the hands of the Committee.

#### THE PRESIDENT'S ADDRESS.

The PRESIDENT then delivered the following

#### INAUGURAL ADDRESS.

Gentlemen,—Before beginning my address, allow me to thank you most heartily for the honour conferred on me by appointing me President of this Association. I shall do my best in conducting the business of this meeting so that it may not be behind those which have preceded it. We are promised some valuable papers to-day; and I will, therefore, not detain you with a long address, believing that a practical paper followed by a profitable discussion is of much more value to the practical manager.

In selecting a subject for my address, I have experienced some difficulty, as all the latest discoveries and improvements are so well made known through the columns of our trade journals that it would almost be superfluous on my part to attempt to enlighten you further on them. I would just like to make a few comments in a general way on one or two matters which affect gas managers and the industry they represent.

Some years ago the Board of Trade, in fixing the relative value of electricity and gas, allowed 10 units of electricity as an equivalent for 1000 cubic feet of 15-candle gas; but since then it has been discovered that it takes fully 13 units instead of 10. Electricity is a splendid light, and well suited for public and private lighting; but at the same time it is an expensive light, and may only be looked upon as a luxury.

I daresay many are surprised that electricity succeeds as it does. But this is not to be wondered at, when it is considered that quite a number of public boards are willing to encourage enterprise, whatever the cost—whether from public spiritedness, or from the fact that the money does not come out of their own



pockets, I will not say. I happen to know a case where a Town Council ordered the erection of eight electric lamps, and contracted for a supply of electricity at the rate of £21 5s. each, for the lighting season—or a total of £170. These eight electric lamps took the place of 35 gas-lamps at £2 each per season, or a total of £70. Thus the Town Council referred to, who were supposed to be practising economy in the interests of the ratepayers, paid out for electricity alone the sum of £170, while for the sum of £70 they could have had the same area lighted with gas.

In the case of private lighting, it takes 13 units of electricity, as I have already said, to give a light equal to 1000 cubic feet of 15-candle gas, using a batwing or union-jet burner. It will, therefore, take 21 units to equal 1000 cubic feet of 25-candle gas—this being the average quality of Scotch gas. So that it will be seen, if electricity is taken at 5d. per unit, and Scotch gas at 2s. 11d. per 1000 cubic feet (both fair average prices), the cost of electricity as compared with gas is three times as great; and further, if the new Welsbach incandescent burner, which requires no funnel or chimney, is what is claimed for it—viz., that with an hourly consumption of 2 cubic feet of gas it gives a light equal to 50 candles—it is clear that, by using gas with this burner, the luminosity of English gas is increased some eight times, and Scotch gas a little over five times.

A great deal has been said of acetylene gas as an opponent to coal gas; but this is mere talk, as acetylene is not likely to compete successfully with coal gas as an illuminant on anything like a large scale. To begin with, like electricity, it is much more expensive, and is attended with a considerable amount of trouble and danger—being a very explosive gas. Oil is, in my opinion, the greatest opponent we have; and it is largely used by the artisan classes. Although it is a much cheaper illuminant than electricity or acetylene, it is also attended with too much trouble and a great amount of danger. The reason that oil commends itself so largely to the classes mentioned, is because of the possibility of purchasing small quantities at a time; but this has been effectively provided for in the gas industry by the introduction of prepayment meters. With gas-engines, stoves, and fires, brought as they are to such perfection, gas has nothing to fear either as a cheap illuminant, motive power, or heat producer; and it is sure to hold its own against all comers.

I should like to say a word or two regarding the treatment of workmen in gas-works. In many cases, the workman or stoker begins on the 1st of January and finishes on the 31st of December—never getting a holiday. Not even on the Sunday is he allowed to rest. It would appear that slavery is not yet abolished; and the time has now arrived when we, as managers, should put an end to it, so far at least as gas making is concerned. With a little judicious planning, in the majority of gas-works, the stokers could be relieved from duty at least for twelve hours on Sundays. This would cost a little extra, as the furnaces or producers have to be kept heated. But it will be repaid by obtaining a better class of workmen and a larger amount of work done during the rest of the week.

I may here state that in Coatbridge, we have had no stoking on Sundays from 6 o'clock in the morning till 6 o'clock in the evening during the past eighteen years, with the very highest results; also all our workmen are allowed a day off at the New Year and eight days off during the summer as holidays, and are paid full wages for these holidays. With all this, our stoking wages do not exceed 1s. 6d. per ton of coal carbonized. The Scotchman is famous all over the world for keeping the Sunday (and all he can lay hands on), and I hope that we, as gas managers, may do our best to maintain the Scottish reputation.

Another matter I should like to mention, which affects very much our position and credit as gas managers. It is the aim of every manager, to sell gas of good quality at as cheap a price as possible. To do this the raw material must be procured in the cheapest market, and every economy exercised in the manipulation of same, both in the carbonizing of the coal, and cooling and purifying the gases, while every care should be taken to sell as much gas as possible. In looking over the returns of our Scotch gas undertakings, I observe that the unaccounted-for gas varies from 5 to 20 per cent. Now I do not think that the leakage in any well-conducted concern can possibly amount to anything like 20 per cent. The possibility is that something else is at fault—either the cooling or purifying plant is insufficient, causing the gases to be registered at the station meter at a very much higher temperature than they are likely to be at the consumers' meters, and which will account in many instances for a considerable difference. It may be that the consumers' meters are not being attended to with water in the case of wet meters, or getting out of repair, as is often the case with dry ones. The attention to consumers' meters is a very important matter, and should have first consideration. In coal-mining districts there is a considerable leakage caused through subsidences of the ground; and these towns so situated are always more liable to have a higher percentage of unaccounted-for gas than those removed from coal fields. While a gas manager may be striving hard, and doing his best to make the concern a success, and attain for himself a name, he is often prevented by members of his committee stupidly interfering. It is amusing to witness the performances of some of these individuals. It may be the green-grocer or billposter, whose knowledge of things in general outside their own small business is not very great, sitting in all the pomp which characterizes such a class of men, and all the dignity

befitting a judge, dictating to the manager, how to conduct the affairs of a gas-works, while the manager may have spent the best of his years or perhaps a lifetime in studying his business. If there was less of such interference, things would be better managed, and the public get a cheaper light.

I know of several cases where gas undertakings have suffered very considerably through the wanton interference of certain members of the gas committee. A corporation or company, in selecting a manager, should appoint a thoroughly competent and trustworthy person, paying him a proportionate salary, and should then leave the management in his hands; and the manager, I would say for his own credit, will do his very best. We, as managers, should resent such interference, especially if we are fully convinced that we are quite competent, and trustworthy enough, to be left in full charge of the management; and we should take up a strong position accordingly. I believe that this sort of treatment is much more common in small than in large concerns. The committees of the latter are usually composed of business and commercial gentlemen, and with men of sound business training one usually gets good common sense.

One other matter I should like to mention before finishing—viz., insuring against accident under the Employers' Liability Act, which came into operation at the beginning of this month. It is very essential for small concerns to cover themselves against all risks. The cost of so doing, even at 12s. 6d. per cent. of the wages paid, should not be considered too heavy a burden, and it will relieve the company or corporation of great responsibility. In the case of larger concerns it is not so essential, as provision is usually made in their Acts of Parliament, to lay aside a reserve or insurance fund with which to meet such contingencies.

I thank you, gentlemen, for the patient hearing you have given me; and I hope my remarks have not been uninteresting.

Mr. W. EWING (Hamilton) proposed a hearty vote of thanks to the President for the address that he had delivered. It was an address which they would appreciate in their quiet moments. There was one remark the President made, with regard to gas committees, to which he might refer, if it were not invidious of him to make any remark upon it; but he had always found that with a good convener, the gas manager always got justice in the end.

The PRESIDENT returned thanks.

#### THE READING OF PAPERS.

The reading of papers was then proceeded with, as follows: "On Retort Settings and Practical Results Obtained," by Mr. W. Ewing, of Hamilton; on "Prepayment Meters," by Mr. Alex. Wilson, of Perth; on "The Automatic Manipulation of Coke," by Mr. Gilbert Little, of Birmingham; "Some Notes on the Modern Commercial Gas-Engine," by Mr. W. Carmichael Peebles, of Edinburgh; on "The Cowan Pressure System," by Mr. J. Hepworth, of Edinburgh. These papers, along with the discussions upon them, will be given in the next and subsequent numbers of the "JOURNAL."

#### THE ELECTION OF OFFICE-BEARERS.

The PRESIDENT reported the result of the examination of the voting-papers for the election of office-bearers, by the Scrutineers—Mr. A. Mackenzie, of Edinburgh, and Mr. Grant, of Glasgow. There were 155 papers sent out, but only 45 were returned. The result of the vote was as follows: President, Mr. Hubert Pooley, of Dunfermline; Vice-Presidents, Mr. W. Ewing, of Hamilton, and Mr. J. Carmichael, of Barrhead; Secretary and Treasurer, Mr. R. S. Carlow, of Arbroath; Committee, Mr. W. R. Herring, of Edinburgh, Mr. J. McGilchrist, of Dumbarton, Mr. A. Yuill, of Alloa, and Mr. J. Wilson, of Tradeston, Glasgow.

#### PLACE OF NEXT MEETING.

The annual meeting next year was fixed by ballot to be held at Stirling.

#### THE PRESIDENT'S MEDAL.

Mr. BELL said they had now come to the end of the business portion of their programme; and it became his duty, as having last passed the chair, to present the President's Medal for the year. He thought he was only echoing the sentiments of the meeting when he congratulated Mr. Wilson on the happy way he had conducted the business that day. He hoped that Mr. Wilson would be long spared to wear the medal.

The PRESIDENT returned thanks, and proposed a vote of thanks to the Secretary, to whose attention, he believed, the success of their meeting was mainly due.

Mr. MYERS said he also wished to congratulate Mr. Carlow on the success of the meeting.

Mr. CARLOW returned thanks.

The members of the Association and their friends afterwards dined in the North British Station Hotel, under the presidency of Mr. Wilson. The company included a number of ladies.

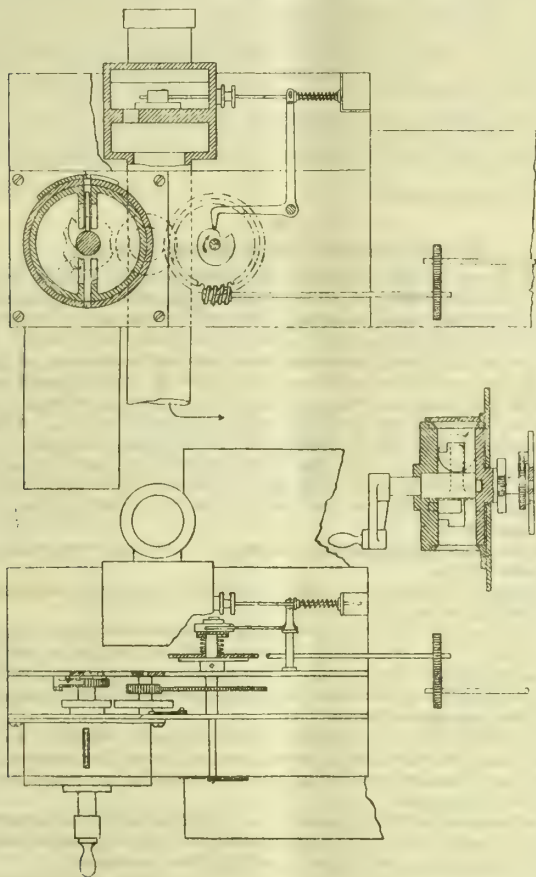
On Friday, about 150 ladies and gentlemen enjoyed an excursion from Glasgow to Lochranza, on the west side of the Island of Arran, under the auspices of the Association. Train was taken from the St. Enoch Station of the Glasgow and South-Western Railway, to Fairlie, where the company joined the excursion steamer "Strathmore," and were landed at Lochranza about mid-day. Some five hours were spent on the island, and Glasgow was reached on the return journey about eight o'clock.



## REGISTER OF PATENTS.

**Delivering Prepaid Quantities of Gas.**—Elster, S., and Sommerfeld, C., of Berlin. No. 16,267; July 9, 1897.

In this prepayment meter the coin is inserted into a slot, and slides into one of two coin receptacles, situated opposite one another, in a drum rotatably arranged in the casing. The coin receptacles are so formed that a cam on a freely rotatable shaft within the drum can, previous to the insertion of the coin, be moved in the drum without coming into contact with either the coin receptacle or the drum. After the coin has passed into one of the receptacles, it rests with the lower portion of its circumference upon the cam-shaft, and is laterally held in place by the coin receptacle. If now the cam-shaft be rotated by an exterior crank or hand-wheel (as shown), the cam meets with, or strikes against, the face of the coin held in the receptacle, and, through the medium of the coin and receptacle carries along the drum, prevented from return motion, so that the latter is turned through an angle of 180° (when the coin drops into a collecting receptacle). This movement of the drum is exactly limited by an internally arranged catch for the cam.



The transmission of the rotary motion of the drum upon the gearing which serves for opening the gas feed-valve takes place through the medium of two friction wheels, the driving wheel of which is provided with two diametrically opposite notches. In this way, after each complete rotation about an angle of 180°, the two friction wheels are thrown out of gear; so that the valve-actuating gear can be freely turned back by the measuring drum, and thereby the valve be gradually re-closed.

The driving gear for opening the gas feed-valve may, for example, consist of a shaft with a non-circular disc, moved from the axle of the driven friction wheel, which non-circular disc acts upon a suitable lever connected to the valve. The return motion of the valve, through the medium of the measuring drum, may be effected by a worm wheel, loosely arranged thereto by a friction coupling; and, being held fast, during the opening of the valve, by the appertaining worm, it allows of the shaft or axle being rotated in or on its hub.

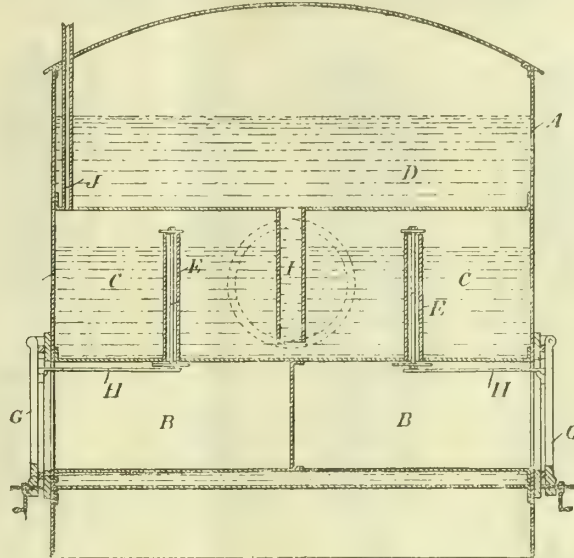
**Producing Acetylene.**—Thiersant, H. de, of Fulham Road, S.W., and Coulson, W. A., of Kyverdale Road, N. No. 1584; Jan. 20, 1898.

This apparatus for producing acetylene gas (more especially for small vehicle lamps), consists of a casing containing a chamber communicating with an escape-valve, and in which chamber a holder containing carbide of calcium is carried. The holder is provided with a conical depending piece and a spiral perforated tube, through which the water comes into contact with the carbide when required. The casing or cylinder contains an air inlet-tube, prolonged towards the centre, which may be screwed into the end of the casing containing the receiver and carbide holder. The tap or valve in the casing containing the carbide of calcium holder is so arranged that the water may pass from one casing to the other by inverting the apparatus as required. An outlet or escape valve in the casing containing the carbide holder allows any surplus gas to escape.

**Acetylene Gas Generator.**—Williamson, A., of Greenock. No. 9545; April 26, 1898.

This generator (as shown) is composed of a cylindrical vessel A divided into compartments, one of which serves as a carbide of calcium chamber or chambers B; a second surrounding or enclosing the carbide chamber serving as the water and gas supply chamber C; and the third serving as a water overflow chamber D. The chamber B, extending across the vessel A, has a central partition dividing it into compartments, so that

it may be conveniently charged from either end, and the compartments be alternately used as generators. Over each compartment is fitted a water-inlet tube E, normally closed by a valve made in the form of a rubber disc extending over the inlet, and fitted with a central spindle depending through the tube E, and terminating in a splash disc, which serves to scatter the water on entering over the carbide placed in the chamber B. Each end of the carbide container is closed



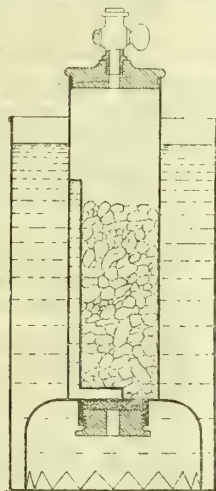
by a gas-tight hinged door G. On the inner face of each door is secured a light rod or arm H, which, just as the door is tightly closed by the final turn of the wing-nut after charging the chamber B with carbide, comes into contact with, and slightly raises, the valve spindle. Thereupon water enters by the inlet E and mixes with the carbide, so that acetylene is generated and rises through E into the water and gas supply chamber C. Part of the water with which this chamber is filled is displaced and forced by the gas pressure through a dip-tube or trap I into the overflow chamber D, until equilibrium of pressure of the gas and water within the chamber C is established. A gas outlet pipe J is connected to the upper end of C, through which the gas is drawn off.

As the gas is consumed and the pressure within the chamber C is reduced, the water from the overflow chamber D descends by the pipe I into the chamber C until the level of the inlet E is attained. Thereupon more water is admitted to the carbide chamber B, and more gas is generated, and flows into the chamber C, again displacing part of the water, and forcing it under the level of the inlet-tube E—thus preventing further admission of water.

**Acetylene Generators.**—Kitchen, J. G. A., of Manchester. No. 17,793; July 29, 1897.

The feature of novelty in these generators for producing acetylene from calcium carbide and water is the use and interposition of a porous compressible material (such as felt) between the water and the carbide, and means for compressing it so as to regulate its capacity for the percolation of moisture through it.

As shown, there is a closed vessel to contain the carbide, having a charging hole and cover on one side; while on another side (which is preferably the lower one) there is a small orifice or grating covered on the exterior by a stuffing-box provided with a gland, and packed with some absorbent material such as felt, cotton wool, or other similar material. There is a rim-facing formed round the lower side or bottom of the vessel encircling the orifice in the gland; and internally there is a closed passage leading from the bottom of the vessel near the lower orifice to the upper part. The internal side of this passage is preferably perforated with small holes on the inside surface, and is in some cases filled with a wick or similar absorbent. This carbide-holding vessel is disposed in a larger vessel, which contains water. It is preferably bell-shaped at the bottom, so that, when the exit-pipe is closed, the gas remaining or evolved after the pipe is closed will force back the water in the bell and act as a safety-valve, or as a receptacle for the gas produced. After the closing of the exit, the pressure of gas increasing forces back the water in the bell from contact with the absorbent, and further production of gas is stopped.



**Incandescent Gas-Burners.**—Himmel, G., of Tübingen, Germany. No. 9084; April 19, 1898.

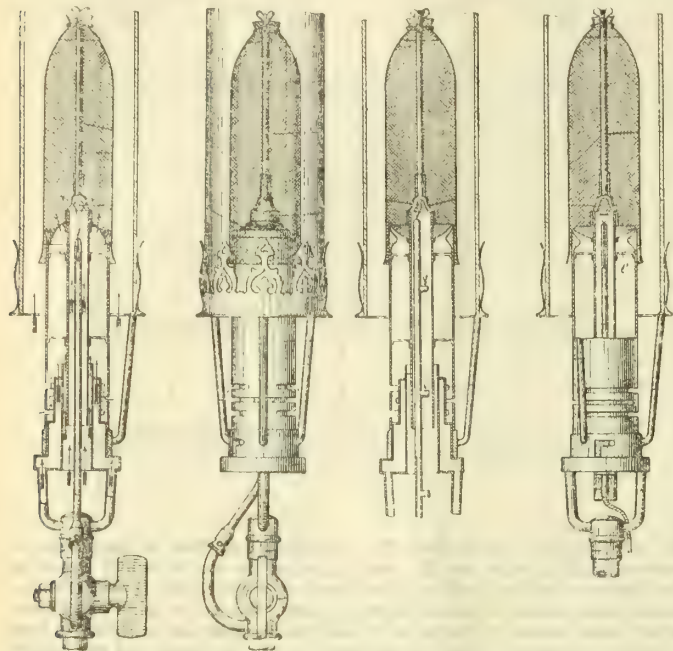
This invention has for its object partly to protect the incandescent body from damage when lighting the lamp, and against any shocks which may arise, and partly to obtain "a better mixture and division of the compound of gas and air, and of producing an entirely quiet and noiseless burning." A further and important point is that, in the case of lighting the gas from a distance by means of a permanent flame or an electric lighting apparatus, the parts of such lighting devices which were hitherto placed in the gas combustion chamber are, according to the present invention, arranged in a chamber wherein they are thoroughly protected and constantly cooled by the continuous inflow of the atmospheric air for the combustion, and are thus protected against rapid deterioration.

The burner (see engraving next page) differs even outwardly from



those hitherto employed, in that it is formed of only one cylindrical part, while the former burners were made of two conoid parts put together—the upper one forming the actual burner being passed over the lower which formed the mixing-pipe of the bunsen burner.

The burner is characterized by the air-pipes being prolonged upwards, and carrying the burner sieve and the incandescent body, and by there being a separate air-supply pipe arranged in the longitudinal axis. This pipe is carried at the top through the burner gauze, and bears a cap



provided with perforations, by which means air can pass directly into the interior of the incandescent body and assist the combustion. The lower end of the pipe is arranged to open into the larger internal pipe of the gas nozzle, so that air strikes against the outflowing gas both internally and externally, and secures a more thorough admixture of the gas and air. The arrangement of slots in the lower part is such that the upper part of the burner which carries the incandescent mantle "is elastically yieldable in all directions, whereby, if the lamp receive jolts or shocks, the susceptible incandescent body is not damaged."

#### APPLICATIONS FOR LETTERS PATENT.

- 15,665.—SHAW, J., "Unions for joining or coupling the end of pipes." July 18.  
 15,683.—FIRTH, G. H., and ANDERSON, W., "Incandescent gas-burners." July 18.  
 15,713.—DUNCAN, J. H. H., "Incandescent bodies suitable for use with gas and other burners." July 18.  
 15,731.—SHEPTEL, M., "Mantles or equivalent means of lighting by incandescence." July 18.  
 15,732.—LAKE, H. H., "Controlling the supply of feed-water to acetylene gas generators." A communication from Hermann Spanier. July 18.  
 15,818.—BOULT, A. J., "Incandescent gas lighting." A communication from Ernst Salzenberg. July 19.  
 15,878.—THOMPSON, W. P., "Igniting combustible or inflammable gases and vapours." A communication from Angelo Simonini. July 20.  
 15,882.—HUBERT, P. L., "Kindling and extinguishing a light by the movements of a door." July 20.  
 15,957-8.—KOHL, G., "Glow bodies for incandescence burners." July 21.  
 16,009.—FRASER, J., "Gas for illuminating and other purposes." July 22.  
 16,026.—HAWKINS, H., "Generating acetylene gas." July 22.  
 16,027.—BRESLAUER, E., "Automatic gas lighting appliances." July 22.  
 16,042.—ROSENTHAL, K. E., and BILLWILLER, J., "Impregnating the packing (tightening) material employed for the tightening of joints, &c., in pipe conduits, gas reservoirs, and the like." July 22.  
 16,043.—ROSENTHAL, K. E., and BILLWILLER, J., "Rendering the sides or walls of gas reservoirs, pipe conduits, and the like, gas-tight." July 22.  
 16,049.—GRIGIONI, G., "Burners for acetylene gas." July 22.  
 16,079.—CLAYTON, R., and WARD, T., "Gas and other fire grates for heating purposes." July 23.  
 16,090.—DANT, H., "Acetylene gas generators." July 23.  
 16,120.—HARRISON, H. T., "Prepayment apparatus suitable for use in connection with electricity and other meters." July 23.  
 16,131.—LAKE, H. H., "Gas grates or stoves." A communication from Charles André. July 23.  
 16,132.—LAKE, H. H., "Gas cooking apparatus, ovens, and the like." A communication from Charles André. July 23.

**Gas and Electric Lighting at Leicester.**—The Leicester Corporation Gas and Electric Lighting Committee have reported to the Council that, during the six months ending June 30, 69,155 tons of coal were carbonized. The quantity of gas made was 708,164,000 cubic feet, as against 683,953,000 cubic feet in the corresponding period of the previous year; being an increase of 24,211,000 cubic feet, or 3·54 per cent. In the matter of illuminating power, the average was: Belgrave Gate works, 16·78 sperm candles; Aylestone Road works, 17·35 candles. With respect to the electric lighting department, the Committee stated that the total output of current from the central station was 224,642 units, as against 145,341 units in the corresponding period of last year; being an increase of 79,301 units. The number of consumers was 393.

## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### Mr. Grafton on Photometric Standards.

SIR,—When liquid pentane and air are brought together in the proportion of 3 cubic inches of pentane to 1 cubic foot of air under the ordinary atmospheric pressure, and at any temperature down to the freezing-point, the pentane volatilizes wholly. Mr. Grafton's air gas, which would not wholly volatilize unless the temperature of the water and holder was "at least above 58°" (see *ante*, p. 150), was either made with a wrong proportion of pentane—perhaps "3 oz." instead of 3 cubic inches—or with pentane insufficiently rectified, or over water on the surface of which lay some less volatile hydrocarbon.

It is a fact which could not have been anticipated that the flame of an argand burner, with its tip screened off, is equally bright whether there is burning pentane vapour with a very small admixture of air, as happens when the saturator is warmer, or a larger admixture of air, as happens in cold weather. Mr. Dibdin and others have, however, proved this fact absolutely. Their experiments are on record; and it might have been well if Mr. Grafton had published the details of the experimental work from which he concludes "that the Dibdin 10-candle standard is not as represented to be," "that the standard light is affected by the percentage of pentane vapour in the air," and "that the pentane air-gas standard is only reliable between the temperatures of 60° and 70° Fahr." Such questions can be settled within the limits of observation by careful experiments; and I believe that these questions were thus settled several years ago.

Oxford, July 27, 1898.

A. VERNON HARCOURT.

### Illuminating Gas From Sewage Sludge.

SIR,—Will you kindly permit me to supplement my letter to you last week upon the above subject. The sewage sludge, containing an average moisture of 33 per cent., naturally involved serious loss of heat in the retorts. It was difficult to wholly carbonize the material by itself. When drawing the retort, it was noticeable there was still a quantity of gas left in it. At the conclusion of the regular tests, I tried a small portion mixed with half coal, and was satisfied that further experiments in this direction would undoubtedly yield vastly improved results. Although sewage sludge would not be economical to carbonize ordinarily, yet in cases of emergency, when coal stocks were short, some such system might be worked temporarily with advantage, especially upon works where an oil-gas plant is available for maintaining the illuminating power to the required standard.

Drying the material apparently had prejudicial effects—evaporating the oils contained in it.

I understand the residue "dust" left in the retort after carbonizing is valuable for filtration purposes.

Singularly enough, the laboratory tests led one to anticipate very much better results. There was evidently serious decomposition of gas in the retort, due possibly to the outside of the material being first carbonized, and the gases evolving from the inner cone having to force their passage through the incandescent coke.

When making the experiments, it seemed most desirable that the material should be stirred up in some manner during the process of carbonizing; and Yeadon's revolving retort occurred to my mind as being suitable for the purpose.

The variableness of the composition of sewage sludge is a characteristic feature of it; and this is clearly demonstrated in the results indicated last week, both as to quantity and quality of the gas made.

Huddersfield, July 29, 1898.

EDWARD A. HARMAN.

### The Testing of Gas.

SIR,—Mr. B. L. Cohen, M.P. for East Islington, has applied for, and obtained, a Select Committee of the House of Commons to "inquire into the powers of charge, and other matters of The Gaslight and Coke Company." The reference to the Committee is somewhat vague, and is the outcome of the announcement of an increase in the price of gas to 3s. per 1000 cubic feet; the "impeachment" of Mr. George Livesey at the last half-yearly meeting; and the subsequent agitation of the consumers, when they strongly protested, and passed resolutions declaring that the price should be 2s. 3d. per 1000 feet as charged by the South Metropolitan Gas Company, where the circumstances were the same.

The clause in the reference to the Committee, "other matters," is a very wide one; and, I am informed, it includes the question of testing. Let us hope that this is so, as there cannot be a doubt that the present arrangements are, to say the least, open to serious question as to their being any protection to the consumer. Indeed, Colonel Makins, in his reply to the "impeachment" of Mr. George Livesey, uses the inadequate testing of the Southern Company as one of the reasons for their charging a higher price in the North. I do not wish to be egotistical; but I do not at all mind telling Colonel Makins that this "shot misses the target," and, had he known as much about testing as some of us, he would never have fired it.

The prevailing opinion, rightly or wrongly, is that the Companies intentionally manufacture a special gas of 16 or 17 candles, which is sent to the testing-stations; and that the bulk of the gas sent to the consumers ranges from 12 to 14 candles. Be this opinion true or otherwise, it is the one held at Spring Gardens and in the City of London; and it is growing in intensity daily.

Many attempts have been made to explain away the great differences in illuminating power found at the fixed stations as compared with those said to have been found by the portable photometer. Some have ascribed it to the "loss by travelling" theory; others, to ventilation; and some, to the partiality or impartiality of the Gas Examiner, and other sound or unsound theories. This debatable question is still with us; and for the credit of the Gas Companies, and in the interest of the consumers, it should be speedily settled.

The worst part of this unhappy business is that no two experts ever agree. Take the following contrast: Mr. W. J. Dibdin, in his report to



the London County Council, says, "That while 16-candle gas is supplied to the testing-stations, at everywhere else, as my experiments prove, it ranges from 12 to 15 candles." Mr. C. R. Bellamy, the Gas Examiner to the Corporation of Liverpool, in his last report to that body, states: "The illuminating power of the gas tested at my office was 20.8 candles, and all over the district, with the portable photometer, 20.6 candles"—naively adding that "this [Liverpool] gas is the most severely tested in the world." As this "severity" of testing has been claimed long ago for London gas (see "JOURNAL"), this is only an old "chestnut," and can be taken for what it is worth.

It appears to me, Sir, that the contradictory statements of these two distinguished authorities, with reference to the fixed stations and the portable photometer, needs some reconciling. So far as London is concerned, I am satisfied; and I hope shortly to pay a visit to Liverpool, with a portable photometer, and satisfy myself there.

After reading the Liverpool Gas Examiner's report, I only felt greatly surprised; but when Mr. King, the Liverpool Engineer, at the meeting of Gas Engineers, held at Whitehall in June, told us that Mr. Bellamy was "a hostile gas examiner," this highly accentuated the extraordinary phenomenon, and intensified what to most people is a profound mystery. One naturally wonders what would have occurred had Mr. Bellamy been a "pacific" gas examiner. Probably the 1000th decimal place would have agreed on the "fixed" and the "portable" instruments.

These two reports, Sir, form an object-lesson that he who runs can read. For my part, I make no remark upon them, but simply treat them as they deserve.

Perhaps I may add that, if Mr. Dibdin is right, Mr. Bellamy is wrong, and *vice versa*. But it does appear strange, Sir, that "such difference should be 'twixt tweedledum and tweedledee," and makes us wonder whether gas can be tested for illuminating power, with anything approaching accuracy.

The human eye cannot be relied on. Professor Huxley has told us that the eye is such an imperfect organ that a respectable optician would be ashamed to send it out of his shop. If this is accepted, it may be as well if the Gas Referees left photometers, photopeds, discs, and other useless articles alone for a time, and turned their attention to the gas examiner. "Here all the error lies."

J. VINCENT TAYLOR.

July 28, 1898.

**The Bandsept and Kern Burners: A Correction.**—Mr. C. E. Masterman asks us to correct the statement in his letter on the above subject in the "JOURNAL" for the 19th ult., that "Technologist" had stated that "Kern had anticipated Bandsept." He should have said Langhans, instead of Kern.

## PARLIAMENTARY INTELLIGENCE.

### HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills reported, with amendments: Keighley Corporation Bill, Paignton Improvement Bill, Wey Valley Water Bill.

Bills read the third time and passed: Mid-Kent Water Bill, Rhymney and Aber Valleys Gas and Water Bill.

Bills Royal Assented: Bacup Corporation Water Bill, Blackpool Improvement Bill, Carmarthen Improvement Bill, Cranbrook District Water Bill, Crawley and District Water Bill, Cromer Gas Bill, Drogheda Gas Bill, East Ham Improvement Bill, Felixstowe and Walton Water Bill, Folkestone Water Bill, Gainsborough Gas Bill, Gas Orders Confirmation Bills (Nos. 1 and 2), Halifax Corporation Bill, Hamilton Water Bill, Higham and Hundred of Hoo Water Bill, Ilford Improvement Bill, Kettering Water Bill, Liskeard Corporation Water Bill, Matlock Urban District Council Bill, Newton Water Bill, Northam Urban District Water Bill, North Warwickshire Water Bill, Norwich City Water Bill, Plymouth and Stonehouse Gas Bill, Sheringham Gas and Water Bill, Southend Water Bill, Southwark and Vauxhall Water Bill, Staines Reservoirs Joint Committee Bill, Stirling Gas Bill, Tottenham and Edmonton Gas Bill, Wigan Corporation Bill, Wishaw Water Bill, Yeovil Corporation Bill.

A petition from owners and ratepayers of Cheltenham was presented last week against the Borough Funds Bill, the provisions of which have been referred to in the "JOURNAL." The Bill, which has been considerably amended, has passed the House of Lords and has gone down to the Commons.

### HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills reported: Bury Corporation Bill, Carlisle Corporation Water Bill, Filey Water and Gas Bill, Forres Water Bill, Heywood Corporation Water Bill, Newcastle and Gateshead Water Bill, Rochdale Corporation Water Bill, Todmorden Corporation Water Bill, Water Orders Confirmation Bill, Wath-on-Dearne Urban District Council Bill.

Bills read the third time and passed: Newhaven and Seaford Water Bill, Tynemouth Corporation Water Bill, Water Orders Confirmation Bill.

Last Friday, the promoters of the General Power Distributing Company Bill were, by special resolution, granted leave to suspend any further proceedings thereon, in order to go on with the same Bill, if they shall think fit, next session.

**Opening of the Barton-on-Humber Water-Works.**—The new water-works for Barton-on-Humber were opened last Wednesday by Mr. W. H. Sissons, in the presence of the Directors and the members of the District Council. The original works were built in 1888. The new well is 120 feet deep, with a borehole 25 feet deep. The pumps are capable of raising 23,000 gallons of water per hour; and the storage tank has a capacity of 120,000 gallons.

## LEGAL INTELLIGENCE.

### SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Thursday, July 28.

(Before the MASTER OF THE ROLLS and Lords Justices CHITTY and COLLINS.)

Southwark and Vauxhall Water Company v. Wandsworth District Board of Works.

This was an appeal from the judgment of Mr. Justice Kekewich (*ante*, p. 160), by which he granted an injunction restraining the defendants from altering the levels of the streets and pathways in their district, without previously relaying the water-pipes of the plaintiffs so that they should be properly protected from frost or other injury when the road was lowered.

Mr. RENSHAW, Q.C., and Mr. CHUBB appeared for the appellants; Mr. WARMINGTON, Q.C., and Mr. GORE BROWN represented the respondents.

Mr. RENSHAW submitted that, the appellants being authorized to improve and alter the roads in their district, the respondent Company had no right to an injunction, but at the utmost could only have a claim for damages in case any injury was caused to their pipes.

Mr. CHUBB followed on the same side, and pointed out the importance of the question to local authorities, as the same principle would apply to gas companies, electric light or power companies, and telephone companies. If the principle laid down in the judgment appealed from were carried to its full extent, no alteration could be made in the level of any road or footway without throwing on the local authority the expense of altering the level of all the pipes, &c., beneath the surface.

Mr. GORE BROWN, for the respondents, submitted that, having certain statutory powers, the appellants were under a common-law duty to so exercise them as, if possible, not to do injury. He said this question had been raised many times, but had never been decided by the Courts. Sometimes the local authority had admitted the claim of the water company, and at other times not.

During the course of the argument, it was arranged that this hearing should be treated as the trial of the action; Mr. Renshaw stating that he had declined so to treat it in the Court below, in order to get the appeal heard speedily.

Mr. RENSHAW having replied, their Lordships reserved judgment.

### ST. ALBANS COUNTY COURT.

Monday, July 18.

(Before Sir A. G. MARTEN, Q.C., Judge.)

Daniels v. Harpenden Gas Company—The Dangers of Open Trenches in Private Roads.

This was an action in which Henry William Daniels, a contractor of Harpenden, sued the Harpenden Gas Company to recover £50 damages for personal injuries caused to him by the alleged negligence or carelessness of their servants, in "leaving unprotected and unguarded, and without proper means of warning to passengers, openings made in the road at Rothamsted Avenue on the night of the 14th of February, whereby the plaintiff fell into such opening, and suffered severe personal injuries."

Mr. H. W. LATHOM appeared for the plaintiff; Mr. G. ELLIOTT represented the defendants.

The plaintiff was called, and stated that he arrived at Harpenden, after a fortnight's absence, about 9 p.m. on the day in question. As he was suffering from a cold, he visited the Cross Keys Inn and had three lots of brandy hot. Soon after ten, he proceeded home along Rothamsted Avenue; and just as he was crossing to Salisbury Avenue, he came upon a heap of clay on his walking side. It was a dark night, and in stepping over the heap he fell into a trench; his face coming in contact with some pipes. There was nothing to protect the trench, no lamp, and no one in charge. As a result of the fall, two teeth were broken off, his lower lip was cut through, and he was confined to his house for a week, thereby losing a contract. He was not drunk, and could have walked home all right if the heap had not been there.

In cross-examination, witness could not say if Rothamsted Avenue had been at that time taken over as a road, but he had used it for three years. He did not know whether the road was at the time the private property of Mr. Steers. He denied that he was wandering about the different building sites.

Dr. W. H. Blake proved visiting the plaintiff about 1 a.m. on the 15th of February. He was lying close to the door, with blood on his face and injury to the jaw in front. He was very cold and shivering, and remained insensible for an hour. Witness attended him for five days, and then advised him to go to a dentist. He did not notice that plaintiff smelt of drink when he first saw him.

Plaintiff's wife said her husband fainted on reaching home, and she saw blood in the trench early on the following morning. The landlord of the Cross Keys and another witness testified that plaintiff was perfectly sober on leaving the house.

Mr. R. B. Longland, Managing Director of the Harpenden Gas Company, and a member of the Harpenden District Council, said that Rothamsted Avenue had not been taken over by the Local Authority at the time of the alleged accident, nor was it lighted; it was not thoroughfare. In February, the Company were having building estate under orders from the owner. The Avenue would not interfere in any way with know of anybody, except the building owner, the road. It was not plaintiff's nearest Avenue. He saw plaintiff on the night being on the best terms with him, said but received no answer—a most unusual called witness's attention to the plaid he was "tight."

In cross-examination, witness said that no trenches open in Rothamsted Avenue



William Gardner, a plumber and contractor, said he was carrying out the work in question for the Harpenden Gas Company at the time, and he agreed with Mr. Longland's description of the road. The fitter had commenced to put some pipes together, and the other men had started on the trench, so as to be ready the next morning. On the following day, he found two little stones, on each of which there was a spot of blood as large as a button. They were a yard from the trench, and nearly 30 feet from the path by which Mr. Daniels would have gone home. The stones had been moved. He did not notice any marks on the pipes. If plaintiff had gone home straight up Rothamsted Avenue, he would not have had occasion to go near the pipes.

In cross-examination by Mr. LATHOM, witness said he did not think Mr. Steers was living in Salisbury Avenue at the time. The gas-pipes were laid on the right-hand side of Rothamsted Avenue, about 10 feet from the edge of the road.

J. Burgoyne, a fitter employed by Mr. Gardner, said the road was in a rough state. There was nothing to show that a man had been in the trench, and the clay lay between the pipes and the trench. On examining the pipes in Salisbury Avenue, they found marks of blood and a hand-mark.

Cross-examined: The last pipe in Rothamsted Avenue was put in two days before the 14th of February; and a man would have to go 10 yards down Salisbury Avenue before any trench could be reached. There was nothing he could have fallen over in Rothamsted Avenue.

Walter Gibbs, another workman, said there was no trace to indicate that anyone had fallen into the trench. Mrs. Daniels told him she did not know whether her husband had fallen down or had been knocked down by some one.

Cross-examined: There were hurdles at both ends of the trench, but not up the sides.

Mr. ELLIOTT, for the defence, contended that negligence on the part of the Company had not been proved. He submitted that the plaintiff was not, legally speaking, a person who was lawfully passing along the highway. Rothamsted Avenue was sufficiently private to make him absolutely a trespasser. Plaintiff knew the incomplete condition of the road; and if he chose to go there late at night, he ought to accept the consequences of taking the risk.

His Honour, in summing up, held it was not proved that plaintiff was otherwise than in a condition to enable him to go home perfectly safe. He had come to the conclusion that, on the whole, Mr. Daniels did not contribute to the accident by any carelessness or negligence on his part. If he had a right to be in the road at all, he had a right to go over any part of it; and it seemed to him (his Honour) that he had a right, therefore, to be protected, whatever his motive was in going there. The plaintiff was consequently entitled to recover. The question of damages had been left; and, therefore, having regard to all the circumstances of the case, he thought £20 would be sufficient. He gave a verdict for this amount, with costs.

## MISCELLANEOUS NEWS.

### GASLIGHT AND COKE COMPANY.

#### Half-Yearly Report and Accounts.

The following is the report on the working of the above Company in the six months ending June 30, which, with the accounts for this period, will be submitted to the proprietors at the half-yearly general meeting next Friday:—

The accounts for the past half year show that, after providing for all fixed charges, there remains a balance of £414,591 11s. 5d., out of which the Directors recommend a dividend at the statutory rate of 12½ per cent. per annum; carrying forward the sum of £51,854 19s. 8d. to the credit of the current half year.

In view of the depletion of the reserve fund and of the large reduction in the quantity of gas sold in the month of January, the Directors raised the price of gas from 2s. 10d. to 3s. per 1000 cubic feet as from the 1st of April last. By the operation of the sliding-scale clauses, this increase in the price of gas involves a reduction of ½ per cent. in the rate of dividend payable.

The period of abnormally high temperature which commenced in the December quarter of 1897 extended throughout January and February of this year; and the demand for gas in those months was, in consequence, seriously reduced. There was, however, a satisfactory improvement in the sales during the subsequent months; and the net increase in the quantity sold for the entire half year has been 174,730,000 cubic feet, or at the rate of 1·66 per cent.

The market for coke has considerably improved during the half year; the better prices which have been obtained being the result of the improvement in the general trade of the country, and, to some extent, of the deplorable labour conflict in the mining district of South Wales. There has also been a substantial increase in the revenue from ammoniacal liquor products.

The Directors have entered into contracts for the Company's coal requirements for the current twelve months at prices materially higher than those paid last year. The advance in prices is attributed to the increased demand for gas coal and to an anticipated increase in production consequent upon recent legislation.

Bill in Parliament for the consolidation and conversion of the several classes of stock has been passed by both Houses, and has received the Royal Assent.

Mr. John, the Member for East Islington, the Chairman of the Company, said:—"That a Select Committee be appointed to inquire into the charge conferred by Parliament on the Company to report as to the method in which the gas is produced, having regard to the differences of opinion as to the method of production." The Directors welcome the suggestion, which, they feel assured, will be the subject of a report which at present exist in some quarters of the public supply in the different parts of the

Metropolis; and they will be prepared, when called upon, to afford the Committee the fullest assistance in their power.

It is with great regret that the Directors announce the death of their esteemed colleague, the Hon. Henry Noel. The vacancy in the Court has been filled by the election of Mr. John Miles, who, as a Director, has had great experience in the management of both gas and water undertakings.

The Court of Directors have been furnished by the several Engineers of the manufacturing and distribution departments respectively with the usual certificates to the effect that all the Company's plant has been maintained in thorough efficiency.

Accompanying the report are the usual statements of account, from which the following particulars are extracted:—

The capital account shows receipts (with premiums, £1,582,800) to the amount of £13,105,800. The expenditure is shown in the following items:—

|                                                          |                  |
|----------------------------------------------------------|------------------|
| Expenditure to Dec. 31, 1897                             | £12,387,612 17 4 |
| Expenditure during the half year to June 30, 1898, viz.: |                  |
| Buildings and machinery in extension of works            | £80,460 19 11    |
| New and additional mains and service-pipes               | 29,739 8 11      |
| Do. do. meters                                           | 32,355 4 7       |
| Do. do. stoves                                           | 16,966 8 8       |
|                                                          | £159,522 2 1     |
| Cr. by sale of surplus land                              | 1,727 2 9        |
|                                                          | 157,794 19 4     |
| Balance of capital account                               | £12,545,407 16 8 |
|                                                          | 560,392 3 4      |
|                                                          | £13,105,800 0 0  |

The revenue and net revenue accounts are given in full on next page.

The balance applicable for division is £414,591 11s. 5d.; and the statement showing how the Directors propose to appropriate it is as follows:—

|                                                       |               |
|-------------------------------------------------------|---------------|
| June, 1897.                                           |               |
| £45,748 .. Net balance brought from last account.     |               |
| 320,805 .. Net revenue for the half year              | 414,591 11 5  |
| 9,355 .. Amount to be withdrawn from the reserve fund |               |
| £375,908                                              | £414,591 11 5 |
| (12½ per cent.) A dividend on the ordinary stock—     |               |
| £375,908 .. 12½ per cent. per annum on £5,922,230     | 362,736 11 6  |
| .. .. Balance carried to next account                 | £51,854 19 8  |

The three statements relating to the reserve, insurance, and depreciation fund show that the balances on June 30 were as follows: Reserve fund, £48,483; insurance fund, £80,309; depreciation fund, £50,085. The insurance fund had to bear in the past half year further payments of £1577 in respect of claims arising out of the explosion of gas in New Church Court, Strand, on Oct. 29, 1895; and a sum of £106, the value of plant destroyed by fire in the Company's district.

The statements furnishing particulars as to working are as follows:—

#### STATEMENT OF COALS USED, Etc.

| Description of Coal. | In Store, 31st Dec., 1897. | Received during Half Year. | Carbonized during Half Year. | Used during Half Year. | In Store, 30th June, 1898. |
|----------------------|----------------------------|----------------------------|------------------------------|------------------------|----------------------------|
|                      | Tons.                      | Tons.                      | Tons.                        | Tons.                  | Tons.                      |
| Common               | 234,048                    | 905,734                    | 1,011,986                    | 2,008                  | 125,788                    |
| Cannel               | 22,865                     | 5,183                      | *8,883                       | 2                      | 19,163                     |
| Total                | 256,913                    | 910,917                    | *1,020,869                   | 2,010                  | 144,951                    |

\* In addition to this quantity, oil and spirit, the equivalent of 51,670 tons of cannel, have been used during the half year.

#### STATEMENT OF RESIDUAL PRODUCTS.

| Description.            | In Store, 31st Dec., 1897. | Made during Half Year. | Used during Half Year. | Sold during Half Year. | In Store, 30th June, 1898. |
|-------------------------|----------------------------|------------------------|------------------------|------------------------|----------------------------|
| Coke—tons               | 62,446                     | 630,496                | 139,923                | 524,023                | 28,096                     |
| Breeze—tons             | 7,457                      | 68,158                 | 27,895                 | 46,686                 | 1,034                      |
| Tar—gallons             | 1,040,955                  | 10,750,767             | 10,961,372             | 26,372                 | 803,978                    |
| Ammoniacal liquor—butts | 20,584                     | 275,922                | 278,373                | 60                     | 18,075                     |

#### STATEMENT OF GAS MADE, SOLD, Etc.

| Quantity Made. | QUANTITY SOLD.                                 |                             | Total Quantity accounted for. | Number of Public Lamps. |
|----------------|------------------------------------------------|-----------------------------|-------------------------------|-------------------------|
|                | Public Lights and under Contracts (estimated). | Private Lights (per Meter). |                               |                         |
| Thousands.     | Thousands.                                     | Thousands.                  | Thousands.                    |                         |
| *11,467,617    | 525,127                                        | 10,192,989                  | 10,869,475                    | 52,250                  |
| †11,263,445    | 527,197                                        | 10,016,189                  | 10,701,406                    | 52,328                  |

\* Including 1,088,099,000 cubic feet of "oil gas."  
† June half year, 1897.

The last statement is the general balance-sheet. It shows that the value of the stores on hand on June 30 was as follows: Coals, £87,586; coke, £13,264; tar and ammoniacal liquor products, £92,896; sundries, £253,999—total, £447,745. The figures for the corresponding period of 1897 were: Coals, £96,884; coke, £46,862; tar, &c., £133,085; sundries, £243,588—total, £520,419. The item "automatic meter supplies (fittings account)" amounts to £296,373, as compared with £247,372 in the six months ending June 30, 1897.



| REVENUE ACCOUNT.      |                                                                                                                         |               |               |                                                                                |               |         |                |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------|---------------|---------------|--------------------------------------------------------------------------------|---------------|---------|----------------|
| Dr.                   |                                                                                                                         |               |               | Cr.                                                                            |               |         |                |
| June Half Year, 1897. |                                                                                                                         | £ s. d.       | £ s. d.       | June Half Year, 1897.                                                          |               | £ s. d. | £ s. d.        |
|                       | To Manufacture of Gas—                                                                                                  |               |               | By Sale of Gas—                                                                |               |         |                |
| £598,739              | Coals, including oil, dues, carriage, unloading and trimming . . .                                                      | 610,791 7 6   |               | Common gas, per meter, at 3s., 2s. 10d., and 2s. 3d. per 1000 cubic feet . . . | 1,468,027 9 9 |         |                |
| 13,778                | Salaries of engineers and other officers at works . . .                                                                 | 14,357 3 0    |               | Public lighting and under contracts—                                           |               |         |                |
| 165,591               | Wages, carbonizing £162,920/19/7 sundries . . . £16,306/19/5                                                            | 173,227 19 0  |               | Common gas . . . . .                                                           | 75,457 7 0    |         | 1,543,511 16 9 |
| 15,790                | Purification, including £16,359/19/8 for labour . . .                                                                   | 34,352 4 4    |               | Rental of stoves . . . . .                                                     | ..            |         | 16,098 8 11    |
| 83,587                | Repair and maintenance of works and plant, materials and labour, less received for old materials, £3587 3s. 4d. . . . . | 146,216 16 6  |               | Residual products—                                                             |               |         |                |
|                       |                                                                                                                         |               | 984,945 10 4  | Coke, less £47,175 3s. 7d. for labour, &c. . . . .                             | 220,864 6 10  |         |                |
| 152,076               | Distribution of gas—                                                                                                    |               |               | Breeze, less £2624 4s. 11d. for ditto . . .                                    | 5,527 2 4     |         |                |
|                       | Salaries and wages of Officers (including Rental Clerks) . . .                                                          | 31,962 18 11  |               | Tar and tar products . . . . .                                                 | 56,948 0 0    |         |                |
| 50,878                | Repair and maintenance of mains and service-pipes . . . . .                                                             | 46,218 2 0    |               | Ammoniacal liquor and sulphate of ammonia . . . . .                            | 71,641 16 10  |         | 354,981 6 0    |
| 43,597                | Repair and renewals of meters . .                                                                                       | 26,493 7 7    |               | Rents receivable . . . . .                                                     |               |         | 4,390 13 5     |
| 24,382                | Stove fixing, repairs, and renewals .                                                                                   | 23,963 3 3    |               | Transfer fees . . . . .                                                        |               |         | 242 2 6        |
| 25,665                | Public lamps—                                                                                                           |               |               |                                                                                |               |         |                |
|                       | Lighting and repairing . . . . .                                                                                        | ..            | 128,687 11 9  |                                                                                |               |         |                |
| 16,712                | Rents, rates, and taxes—                                                                                                |               | 16,690 0 2    |                                                                                |               |         |                |
| 5,543                 | Rents payable . . . . .                                                                                                 | 5,712 10 4    |               |                                                                                |               |         |                |
| 111,001               | Rates and taxes . . . . .                                                                                               | 108,758 13 10 |               |                                                                                |               |         |                |
|                       | Management—                                                                                                             |               |               |                                                                                |               |         |                |
| 2,750                 | Directors' allowance . . . . .                                                                                          | 2,750 0 0     | 114,471 4 2   |                                                                                |               |         |                |
| 200                   | Company's Auditors . . . . .                                                                                            | 200 0 0       |               |                                                                                |               |         |                |
|                       | Salaries of Secretary, Accountant, and Clerks . . . . .                                                                 | 10,089 5 11   |               |                                                                                |               |         |                |
| 9,102                 | Collectors' commission . . . . .                                                                                        | 19,494 11 5   |               |                                                                                |               |         |                |
| 18,433                | Stationery and printing . . . . .                                                                                       | 6,923 5 0     |               |                                                                                |               |         |                |
| 5,849                 | General charges . . . . .                                                                                               | 2,984 3 8     |               |                                                                                |               |         |                |
| 2,941                 | Parliamentary charges . . . . .                                                                                         | ..            | 42,441 6 0    |                                                                                |               |         |                |
| 502                   | Law charges . . . . .                                                                                                   | ..            | 2,383 10 3    |                                                                                |               |         |                |
| 2,778                 | Bad debts . . . . .                                                                                                     | ..            | 1,531 17 3    |                                                                                |               |         |                |
| 6,229                 | Depreciation fund for works on leasehold lands . . . . .                                                                | ..            | 5,286 9 7     |                                                                                |               |         |                |
| 500                   | Annuities . . . . .                                                                                                     | ..            | 500 0 0       |                                                                                |               |         |                |
| 13,411                | Public Officers—                                                                                                        |               | 11,971 19 2   |                                                                                |               |         |                |
|                       | Gas Referees and Official Auditor .                                                                                     | 881 12 11     |               |                                                                                |               |         |                |
| 887                   | Public testing-stations . . . . .                                                                                       | 730 0 0       |               |                                                                                |               |         |                |
| 697                   |                                                                                                                         |               | 1,611 12 11   |                                                                                |               |         |                |
|                       |                                                                                                                         |               |               |                                                                                |               |         |                |
| £1,300,769            |                                                                                                                         |               | 1,310,411 1 7 |                                                                                |               |         |                |
| £98,713               | Balance carried to net revenue account . . . .                                                                          |               | 608,816 6 0   |                                                                                |               |         |                |
|                       |                                                                                                                         |               |               |                                                                                |               |         |                |
| £1,809,482            |                                                                                                                         |               | 1,919,227 7 7 |                                                                                |               |         | 1,919,227 7 7  |

| NET REVENUE ACCOUNT.  |                                                                         |            |              |                                                                             |              |         |             |
|-----------------------|-------------------------------------------------------------------------|------------|--------------|-----------------------------------------------------------------------------|--------------|---------|-------------|
| Dr.                   |                                                                         |            |              | Cr.                                                                         |              |         |             |
| June Half Year, 1897. |                                                                         | £ s. d.    | £ s. d.      | June Half Year, 1897.                                                       |              | £ s. d. | £ s. d.     |
|                       | To Interest on debenture stocks and bonds, accrued to June 30, 1898 . . | ..         | 64,159 12 6  | By Balance from last account . . . .                                        | 302,483 16 9 |         |             |
| £62,660               | Dividend on the preference stocks . .                                   | 73,999 5 0 |              | Amount withdrawn from reserve fund . .                                      | 74,519 8 6   |         |             |
| 74,015                | Dividend on the maximum stocks . .                                      | 47,500 0 0 | 121,499 5 0  | Less dividend on the ordinary capital for the half year to Dec. 31, 1897. . | ..           |         | 577,008 5 3 |
| 47,500                | Interest on temporary loans & sundryfunds, less credits . . . . .       |            | 8,555 17 1   | Revenue account . . . . .                                                   | ..           |         | 377,003 5 3 |
| 3,733                 | Balance applicable to dividend on the ordinary stock .                  |            | 414,591 11 5 |                                                                             |              |         |             |
| 866,558               |                                                                         |            |              |                                                                             |              |         |             |
|                       |                                                                         |            | 608,816 6 0  |                                                                             |              |         | 608,816 6 0 |
| £564,461              |                                                                         |            |              |                                                                             |              |         |             |

SOUTH METROPOLITAN GAS COMPANY.

The Half-Yearly Report.

The following is the report of the Directors of the above Company for the six months ending June 30 last, which, with the accounts for this period (to be given next week), will be presented at the half-yearly meeting on the 10th inst. :—

With an increase of nearly 5 per cent. in the quantity of gas sold, notwithstanding the mildness of the winter months, the operations of the Company during the last half year may be considered satisfactory. This increase of business and the improvement in the values of coke and ammonia, together with a further slight reduction in the cost of carbonizing, and some improvements in other departments, have resulted in a surplus on the half-year's working of £19,463 1s. 9d., supposing the same dividend as the last—viz., 5½ per cent.—be paid.

Including £1802 11s. 4d. brought forward from the last account, there is £168,265 13s. 1d. to be dealt with. The dividend payable under the sliding-scale, with the price of gas at its present figure of 2s. 3d. per 1000 feet, is 5½ per cent. Following the course approved by the shareholders, of restoring the reserve fund to a reasonable amount—only to be done out of divisible profits—the Directors recommend a slight increase of dividend to 5½ per cent. (which will divide into even pence for all amounts of stock), and that the balance of divisible profit of £4666 13s. 4d. be added to the reserve fund, bringing up the total to £100,458. There will then remain £14,265 13s. 1d. to be carried forward to the next account.

The increase in the number of ordinary consumers in the half year has been 1136, and of those supplied by the penny-in-the-slot meters 5728; bringing up the number of the latter to the total of 72,288 in rather less than six years. This extension of the business accounts for the great increase in the expenditure of capital on distributing plant since 1892; but it may be mentioned that the total outlay on capital account since the end of that year has been at the low rate of £2 13s. 4d. per ton on the increase in the quantity of coals used.

Accompanying the report is a draft of the proposed scheme for the election of employee-directors. Extracts from the Acts of Parliament of 1896 and 1897 are printed in, and form, as it were, the preface or preamble to the scheme. Employees are required to hold in the aggregate not less than £40,000 of the Company's stock before the provisions of the Acts can be put into force. This amount is now considerably exceeded. The scheme requires the approval of the proprietors and the sanction of the Board of Trade before it can be put into operation. A resolution will therefore be submitted to the meeting accordingly.

CRYSTAL PALACE DISTRICT GAS COMPANY.

Half-Yearly Report and Accounts.

The Directors of the above-named Company will present a satisfactory report at the meeting of shareholders next Friday. They remark that, considering that, in the first two months of the past half year, owing to the mild and open weather, there was an actual decrease in the quantity of gas used, it is a matter for congratulation that the increase in the latter months not only made up the deficiency, but resulted in an increase of 3 per cent. for the half year over the corresponding period of 1897. This augmentation of business has been accompanied by a reduction of 2223 tons in the quantity of coal used, and by a saving of £912 in carbonizing wages. There is also a great improvement in the receipts for ammonia, due to a largely increased production and to an improvement in the price realized for that product. These, with other minor improvements in working, have produced the result shown by the accounts, that whereas in the half year to June, 1897, the reserve fund was drawn upon to the extent of £3669 15s. 5d., the profit for the past half year is very nearly sufficient to pay all charges for dividend and interest—the deficiency being only £438. The Directors recommend the payment of dividends at the rate of 5 per cent. per annum on the preference stock, and of 5½ per cent. per annum on the ordinary stock, less income-tax.

The accounts accompanying the report show that capital to the amount of £10,786 was expended in the six months ending June 30; bringing up the total to £674,835, and leaving an unexpended balance of £14,488. The revenue from the sale of gas amounted to £66,017; from meter and stove rents, to £2787—together, £68,804; residuals produced £17,720; and the total receipts were £86,536. The expenditure on the manufacture of gas was £56,330 (coals, carburine, and labour) and on distribution, £5605; rents, rates, and taxes £3320; and the total expenses to £65,255, leaving a profit of £21,281. The statements relating to the Company show that in the 1897-8 season 633 tons of cannel, and 34,497 tons of gas were produced under the supervision of Mr. S. Y. Shoubridge; production of gas, of which 538,94 cubic feet sold, and 521,901,000 produced were: Coke, 643,680 gallons; and ammoniacal liquor, 457 ton.



## BRENTFORD GAS COMPANY.

## Half-Yearly Report and Accounts.

The proprietors of the above Company will meet next Friday to receive the Directors' report and the accounts for the half year ending June 30. The report is a brief one, and opens by stating that the sum available for dividend is £59,390, from which the Directors propose a distribution at the rate of 5 per cent. per annum on the 5 per cent. preference stock, 12 per cent. on the consolidated stock, and 9 per cent. on the new stock, 1881. The Directors announce that the increase in the sale of gas in the half year was 6·3 per cent., as against 9·68 per cent. in the corresponding period of 1897. The consumers of gas by the automatic meter system continue to advance; the number of these meters in use on June 30 being 13,312, as against 9567 on June 30, 1897—equal to an increase of about 40 per cent. for the twelve months. It is also mentioned that the new manufacturing plant at the Southall works will be completed and ready for the ensuing winter; and that, a further issue of capital being necessary, the Directors have given instructions for the sale of £15,000 new stock, 1881.

Regarding the accounts, the amount of capital spent in the half year was £23,414, making the total expenditure £956,986, which exceeds the receipts by about £7000. As to the revenue account, in nearly every item the income shows a gain. The total gas-rental was £110,502, as against £104,040, the advance having taken place entirely in private lighting—public lighting and contracts showing a falling off of something like £400. The meter and stove rental totals to £8072—an increase of about £900, notwithstanding that stoves produced about £128 less. In comparison with the June half of last year, the residual products did well—coke being particularly strong. The result was a revenue from residuals of £22,203, as against £19,504. Rents and transfer fees made the total income £140,818, in comparison with £130,744. On the other side of the account, the expenditure reached £102,039, as against £95,801. In the manufacturing department, £71,360 was spent; being an increase of about £3000. For the distribution of gas, £14,412 was required—an advance of about £2000, due to the larger sums spent on repairs. On the lighting and repairing of public lamps £2170 was spent, as against £1999. Rents, rates, and taxes absorbed £7393, as compared with £7181. Management expenses were practically the same—£4999. Among the smaller amounts making up the total is the item of pensions £1293, which is an increase of about £500. The sum carried to profit and loss account is £38,778—making, as already stated, a balance of £59,390 applicable to dividend.

The statements giving the manufacturing results show that 72,390 tons of Newcastle coal and 170 tons of cannel were carbonized; and, in addition, "Solar" oil equal to 7202 tons of coal was used. The quantity of gas made was 806,022,000 cubic feet, as compared with 752,204,000 feet in the June half of 1897; while the total sold was 747,359,000 cubic feet, against 702,946,000 feet. The total accounted for was 759,859,000 cubic feet. The estimated quantities of residuals made were: Coke, 48,366 tons; breeze, 6407 tons; tar, 778,656 gallons; ammoniacal liquor, 19,477 butts of 108 gallons (including 462 butts purchased).

## SALES OF STOCKS AND SHARES.

On Monday last week, Mr. Alfred Richards sold at the Mart, Tokenhouse Yard, E.C. (by order of executors), debenture, preference, and ordinary stocks and shares in several Provincial Gas and Water Companies. Some fully-paid 5 per cent. preference £10 shares in the West Surrey Water Company were sold at £17 5s. each, yielding £2 18s. per cent.; and some ordinary £10 shares at £20 5s. each, yielding £2 14s. 3d. per cent. Two £50 4 per cent. mortgage debenture bonds of the Kingston-on-Thames Gas Company were sold for £103, yielding £3 6s. 3d. per cent.; three fully-paid £50 ordinary shares fetching £145 each, yielding £3 9s. per cent. A 4 per cent. mortgage debenture bond for £1000 of the Hampton Court Gas Company was purchased at par; while some "A" shares (£10) were sold at an average of £24 15s. apiece, and some "B" shares at an average of £17 18s. each, yielding £4 0s. 10d. and £3 18s. 3d. per cent. respectively. Some fully-paid £5 shares in the Sunbury Gas Consumers' Company, Limited, on which the last dividend was 4 per cent. per annum, were bought at £5 15s. each, yielding the purchaser £3 9s. 7d. per cent. A 4 per cent. mortgage debenture bond of the Walton-on-Thames and Weybridge Gas Company for £1130 and one for £300 were sold at par; some "A" shares (£10) fetching an average of £18 4s. 6d. per share, yielding the purchaser £3 16s. 10d. per cent., and some "B" shares realizing an average of £16 7s. each, yielding £4 5s. 8d. per cent. A parcel of fully-paid £5 shares of the Petersfield Gas, Coke, and Oil Company, Limited (last dividend 6 per cent.), were disposed of at an average of £6 1s. each, yielding the investor £4 19s. 2d. per cent. The sale closed with the offer of 50 fully-paid £5 shares in the Woking District Gas Company, Limited, on which 5 per cent. per annum is being paid, which were purchased for £6 7s. 6d. apiece, yielding £3 18s. 5d. per cent. The total amount realized by the sale was £11,295. Messrs. S. R. Force and Son offered for sale, at the offices of the Exeter Gas Company last Thursday, 500 £10 7 per cent. ordinary shares in the Company. The highest price obtained was £18 per share; and the lowest £17 7s. 6d.

**Cockermouth and Workington Joint Water Committee.**—The insufficiency of the water supply in the district over-  
engaged the attention of the Cockermouth and  
Committee yesterday week. A motion was  
authorizing an application to the Local  
Authority to lay down an enlarged  
2 million gallons daily. He said  
more people than was originally  
ities were stipulated for, the whole  
1000. At the present time, the  
quantity was now 184,000  
their population was so much  
being added to the reso-

## EDINBURGH AND LEITH GAS COMMISSION.

## The Financial Position of the Undertaking.

At the Meeting of the Edinburgh and Leith Gas Commission yesterday week—Mr. MITCHELL THOMSON, the Lord Provost, in the chair—the Finance and Law Committee reported that, having considered the Commissioners' accounts for the year (noticed in the "JOURNAL" for June 28, p. 1582), and heard read the Auditor's certificate as to their correctness, they recommended the Commissioners to allow and certify them. They also proposed that, out of the balance of £36,590 at the credit of the profit and loss account, they should debit to revenue account £6000 of the £24,770 expended on carburetted-water-gas plant and the new retort-bench; transfer £2000 from the reserve fund to a special accident fund, from which to meet claims against the Commissioners under the Workmen's Compensation Act; set apart so much for the sinking funds; and carry forward the balance to next year. With reference to the sinking funds, they reported that the statutory minimum contributions were £2203 for the repayment of borrowed money, and £7310 for the redemption of annuities; that in Committee it was moved that these sums should be contributed, and, further, that the contributions be £2203 and £14,621 respectively. But, on a division, the votes were equal; and the Committee thereupon resolved to report the subject to the Commissioners.

Baillie MANCLARK (Leith), Convener of the Committee, in moving the adoption of the report, said there had been some private communications passing between certain parties and the Commissioners regarding the capital account; and he should like to give a short *résumé* of the position of the account. When the gas undertakings were put into the hands of the Commissioners in 1888, the redemption of annuities was based on a 54 years' purchase. They had now reduced this to a trifle less than 43 years. Their liabilities under the capital account might be stated as follows: (1) Value of annuities granted to shareholders of the Edinburgh and of the Edinburgh and Leith Gas Companies, amount payable after this date, £33,360, which, at 28½ years' purchase (the time appointed by their Act of Parliament), would amount to £950,767; but, of course, they could not redeem at 28½ years' purchase until 1908; (2) value of annuities granted to the shareholders of the Portobello Gas Company, £1200, which, at 20 years' purchase, would amount to £24,000; (3) money borrowed on mortgage, £220,398—making a total of £1,195,166. This would have been their liabilities had they done nothing to reduce them. But they had a sum of £10,361 at the credit of the sinking fund for repayment of money borrowed, and one of £73,305 at the credit of the sinking fund for the redemption of annuities. They had in the reserve fund, £3184; and a balance at the credit of the profit and loss account of £36,590—a total of £123,440. Deducting the amount at the debit of the suspense account, being the sum repaid but not allocated as between capital and revenue, £26,163, there was left £97,277; making the net amount of their liabilities on the 15th of May last £1,097,889. The minimum annual contributions to the sinking funds were: (1) In respect of annuities, at the rate of 15s. per cent., £7310 for Edinburgh and Leith and £180 for Portobello; and (2) in respect of money borrowed, 1 per cent., or £2203. Then there was a contribution from the profit and loss account, in respect of mortgages redeemed, of £139 15s.; and of annuities which they had purchased up till now of £1639. They had to pay interest at 3 per cent. on £83,666, the amount of the sinking funds—£2510. This brought out, at 43 years' purchase, £1,108,909. He proposed, however, that they should raise the contribution to the sinking fund in respect of annuities from 2 to 1 per cent.; by which means they would be able to clear off the whole of their capital liabilities in 38½ years. He thought it was clear that they were going on right lines in making this increased contribution.

Baillie KINLOCH ANDERSON seconded the motion. He said he thought they were doing right in increasing the contribution to the sinking fund; and he believed it was quite likely they would be able to continue this rate. On the whole, he thought, the finances of the Commission were very healthy. During the years since the Commission was formed, they had added very materially to the plant at the works. The quantity of gas sold had, in that time, increased by 35 per cent.; and in the same period they had laid out £70,265 upon works and manufacturing plant, apart from the distributory systems. Of this expenditure, £33,584 had been charged to capital account, and the balance of £36,681, though it was capital expenditure, and could quite properly have been charged to capital, had been paid out of revenue. Of the £33,584 which had been charged to capital, £12,519 represented their proportionate charges for the Commissioners' Act of Parliament, and £7600 was expended upon the purchase of land at Leith and property at South Back of Canongate. At the time of the transfer, the manufacturing plant and storage stations stood in the books at the capital value of £242,046. The actual moneys expended and charged to capital on that portion of the undertaking had been only £13,475—an increase of capital expenditure for works and manufacturing plant of only 5·5 per cent. Besides works and manufacturing plant, they had a capital account for main and service pipes, which amounted in 1888 to £143,177, and at the end of last year (15th of May) to £211,467—an increase to the extent of 47 per cent. They had been renewing mains practically throughout the whole of their district. While they had been renewing they had also been enlarging; and only the proportionate charge for enlargements had been placed to capital. They concluded that their mains were now so much extended that the outlay upon them would not be very large for many years. He thought that, on the whole, they had a very good prospect. When they got into their new works, where they would have plant of the most modern description, their manufacturing costs would be very much reduced. With reference to the proposal to create a special accident fund, he thought it would be better, instead of creating such a fund, to pay out of the reserve fund any claims that might arise; and at the end of a year, when they had had experience of how the Act worked, they would be better able to say what they should do.

The motion was adopted, with the exception of the proposal with reference to the creation of an accident fund, which was taken back by the Committee, as several letters on the subject from other bodies had come in.

The Auditor's certificate was to the effect that he had found the



accounts to be correctly stated, and sufficiently vouched; and that with reference to the contributions, in June, 1897, of 250 guineas to the Edinburgh Royal Infirmary, and of 50 guineas to the Leith Hospital, while these payments might seem reasonable, in view of the benefits derived by the works from the institutions named, it was nevertheless doubtful whether they fell strictly within the legal powers of the Commissioners.

## THE PUBLIC LIGHTING OF WINCHESTER.

### Gas v. Electricity.

In another part of the "JOURNAL" will be found an article dealing with the tenders submitted a short time since by the Winchester Water and Gas Company and the Winchester Electric Light and Power Company, Limited, for the public lighting of the city. The following are the tenders referred to:—

*Winchester Water and Gas Company,  
Offices: 19, Staple Garden, Winchester,  
April 30, 1898.*

To the Worshipful the Mayor and Corporation.

My Directors desire to tender for the lighting of the public streets, in accordance with your advertisement, as under:—

#### Three Years' Contract.

|                                                                                                                                                  |            |
|--------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| To light the present 465 incandescent lamps with Welsbach incandescent gas-lights of 60-candle power each, at 50s. per lamp per annum            | £1162 10 0 |
| To continue the lighting of the present six oil-lights at 45s. per lamp per annum                                                                | 13 10 0    |
| To light the 16 large lamps with double incandescent burners (120-candle power) reducing to 60-candle power at 11 p.m., at £4 per lamp per annum | 64 0 0     |
| Total cost per annum (three years' contract)                                                                                                     | £1240 0 0  |

#### Five Years' Contract.

|                                                                                                                                                  |            |
|--------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| To light the present 465 incandescent lamps with Welsbach incandescent gas-lights of 60-candle power each at 48s. per lamp per annum             | £1116 0 0  |
| To continue the lighting of the present six oil-lights at 45s. per lamp per annum                                                                | 13 10 0    |
| To light the 16 large lamps with double incandescent burners (120-candle power) reducing to 60-candle power at 11 p.m., at £4 per lamp per annum | 64 0 0     |
| Total cost per annum (five years' contract)                                                                                                      | £1193 10 0 |

The foregoing charges to be inclusive of all expenses of lighting (within the hours specified by you), extinguishing, painting, and repairs; and all other conditions, as under, and embodied in, the existing contract.

Under a three years' contract the saving to the Corporation will amount to £222, and under a five years' contract to £268, compared with the present expenditure.

It may be added that the Company are in a position to provide higher-power lights, if any addition to the power of the existing lighting is required.

(Signed) FRED. G. DEXTER, Manager.

*Westgate Chambers, Winchester, April 29, 1898.*

To the Mayor and Corporation, City of Winchester.

Gentlemen,—In response to your advertisement for tenders for lighting the streets of the city, we have much pleasure in submitting herewith our proposals.

We are prepared to undertake to light the city throughout by means of incandescent electric lamps, of such power as will light the streets as effectively as they are lit at present and for the same number of hours, for the same sum as is now paid—£1313 per annum; that is, we are prepared to provide the same light for the same cost as can be produced by the existing system of lighting. But we venture to suggest that this lighting can be very much improved on, and therefore submit the following as the scheme we wish to recommend for adoption by the Council.

The most effective means of lighting public streets is by means of arc lamps—and we suggest that the centre of the city should be lit by this means; say High Street, Jewry Street, and City Road, up to the Railway Station approach, these being the chief business thoroughfares, where the traffic is much greater than any other portion of the city, and where most light is therefore required. This system might be adopted all over the city; resulting in a vastly better illumination, but at a seriously increased cost.

This plan has been adopted in one or two towns with success; but the more usual arrangement in those towns where the electric light is used as the means for street lighting is to have the less important streets lit by incandescent electric lamps, either placed in existing lanterns, with special fittings, or in new lanterns on the existing posts. We therefore suggest that the following system of lighting should be adopted:—

On the plan herewith we show the position of the lamps. In High Street, Jewry Street, and City Road, 20 (500-watt) arc lamps (1000-candle power) spaced an average of 80 yards apart on tall ornate posts of the description shown on sketch herewith.\* On each of these posts are also to be fitted two 10-candle power incandescent lamps supported by short brackets with suitable reflectors and globes.

The arc lamps would be used up to 11.30 p.m.; then turned out, and the incandescents turned on instead, as brilliant illumination of the streets is not required after that hour.

We have spaced these lamps about 80 yards apart; the practice in other towns may be of interest: London (City), 33 yards; Glasgow, 53 yards; Wolverhampton, 60 yards; Brighton, 70 yards; Kingston-on-Thames, 90 yards; Hastings, 100 yards.

In all the other streets in the city, one 20-candle power, or two 10-candle power incandescent lamps to be fitted in each of the existing lanterns. When this work is being carried out, if it is decided on, it will be very easy to move any of the standards to more advantageous positions, or add some more if it is desired to do so.

\* The plan and sketch are with the original tender.

It is usual in such cases for the Council to supply any new standards or lanterns which may be required, and the Company any electrical fittings of any sort. The chief outlay on this head will be the standards for the arc lamps, which will cost from £12 to £20 each erected complete, according to the design selected. The post which we suggest as suitable would cost £19 10s.

The Company will be pleased to provide these; charging a portion of the cost with each quarter's account, including interest at 5 per cent. per annum on the unpaid amount.

The hours of lighting proposed are from one hour after sunset to 11.30 p.m., equal to 1640 hours per annum, for the arc lamps; and from 11.30 p.m. to one hour before sunrise, equal to 2004 hours per annum, for the incandescents on the same posts; and for the incandescents on the small posts from one hour after sunset to one hour before sunrise, equal to 3644 hours per annum.

All the lamps in the area would be turned on or off from a few points, so that they would all be lighted and extinguished practically at the same time; and no lamp need be lit earlier or left burning later than it is required.

The cost of the proposed lamps will be as follows:—

|                                                                                                                                                                                              |           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 203-night arc lamps of 1000-candle power each, 403-night incandescent lamps of 10-candle power each, including carbons, trimming, cleaning, repairs, and maintenance; £20 per lamp per annum | £400 0 0  |
| 440 incandescent lamps of 20-candle power, including renewals, cleaning, repairs, and maintenance, at £2 12s. 6d each                                                                        | 1155 0 0  |
|                                                                                                                                                                                              | £1555 0 0 |

|                                                                      |          |
|----------------------------------------------------------------------|----------|
| As against an expenditure at present 502 lights at about £2 12s. 6d. | 1313 0 0 |
|----------------------------------------------------------------------|----------|

An increase of . . . £242 0 0

which is, of course, due to the cost of the arc lamps.

These 20 arc lamps would replace some 60 existing burners. The comparative costs would be therefore—

|             |      |
|-------------|------|
| 20 arcs     | £400 |
| 60 gas jets | 158  |

Increase . . . £242

But the candle power of these two services may be fairly stated thus—

|                                         |          |
|-----------------------------------------|----------|
|                                         | Candles. |
| 20 arcs of 1000-candle power            | 20,000   |
| As against 60 lights of 20-candle power | 1200     |

Or even supposing that the mantles were all new, 60 lights of 40-candle power = 2400—an increase of 17,600 candles; or 8½ times more light for 2½ times the cost; that is, light for light, the electric lamps would give more than three times as much light for the same cost.

The candle power of the two services for the whole city would be therefore—

|                                          |          |
|------------------------------------------|----------|
|                                          | Candles. |
| 20 arcs of 1000-candle power             | 20,000   |
| 440 incandescents of 20-candle power     | 8,800    |
|                                          | 28,800   |
| As against 502 lights of 20-candle power | 10,040   |
|                                          | 18,760   |

or nearly double the light.

The term of the contract to be for three or five years, subject to such fines as may be settled for bad or extinguished lights. The whole of the lamps, columns, and frames, &c., to receive a coat of paint each year.

In the foregoing tender, we have followed the lines laid down in the memorandum handed to us by the City Surveyor; but if we may vary this, we would offer an alternative proposal—that 350 of the 440 incandescent lamps proposed should be turned out at 11.30 p.m., and the remaining 90 left alight all night. If this plan were adopted, we could increase the candle power of all the incandescent lamps, and supply either one 32-candle power, or two 16-candle power lamps in place of each burner at present in use, at the same price as already quoted; thus increasing the light in the streets by 50 per cent. during the time a good light is required, and yet leaving sufficient light at all important points all night.

Trusting you will approve of our scheme, and that before winter the main streets may be lit in a manner suitable to the importance of the city, and thus add to its dignity and attractiveness, and increase its prosperity.

THE WINCHESTER ELECTRIC LIGHT AND POWER CO., LTD.,  
per J. C. WIGHAM, Engineer.

**A Large Water Scheme for Leicester.**—The Leicester Town Council last Thursday decided to promote a Bill in Parliament to empower them to obtain a water supply from the Upper Derwent—a distance of 66 miles. The co-operation of the Authorities of Derbyshire and Nottinghamshire is to be invited. The cost of the scheme is estimated at £3,000,000; and a daily supply of about 14 million gallons will be obtained.

**Great Wigston Gas Company.**—The consumption of gas in the district of this Company for the half year ending June 30, only shows a small increase, through the slackness of trade in the shoe factories. The cottage consumption, however, advances; 31 prepayment meters, 10 ordinary meters, and 36 cookers having been fixed. There are now 250 of the former meters in use, yielding £100 quarterly. There are 200 cottages being built at the present time, each of which is furnished complete with gas-fittings; provision being made in the size of the piping carried to the back kitchen to supply a gas-cooker. The Gas Company fix the service-pipe to the inlet and outlet of the meter free, and also supply grinders and boiling rings gratuitously. The dividends for the half year are 7 and 5 per cent. The quantity of coal carbonized was 1033 tons 11 cwt., the gas made being 11,526,800 cubic feet—an average of 11,150 cubic feet per ton of coal. The Directors recently received a deputation from the Urban District Council with a view to purchasing the works, which are under the management of Mr. John A. Harris. The price asked was £52,500. The offer was to stand good for one month; but up to the present no reply has been received from the Council.



## BIRMINGHAM CORPORATION GAS SUPPLY.

### The Extensions at the Saltley Works.

In the "JOURNAL" last week, brief reference was made to some extensive additions to the storage capacity of the Saltley Gas-Works of the Birmingham Corporation, which are now being carried out under the supervision of the Engineer, Mr. Henry Hack, M.Inst.C.E. As already mentioned, the works were recently visited by the members of the Gas Committee, including the Lord Mayor and the Chairman (Alderman Pollack), who received from Mr. Hack, with the assistance of plans conveniently arranged for the purpose, a lucid explanation of the extensions; and satisfaction was expressed at the progress that is being made. It may be remembered that two lifts are being added to the No. 5 gasholder; thereby increasing its capacity from 2 million to 4 million cubic feet. The guide-framing, however, will not be erected above the third lift—the fourth rising quite clear. The work is in the hands of Messrs. Westwood and Wrights, who have already completed three lifts. An interesting feature of this portion of the extensions, which was first inspected, was the use by the Resident Manager for the firm (Mr. Rickard) of his specially constructed shear-legs, which from below looked like huge three-legged compasses or an elongated tripod. The back leg, which is 150 feet long, is fixed at the top of the holder, and secured to a pivot on the centre pier; allowing it to fall round the circumference as required. This pivot works in a slide, so as to bring forward or push backward the two front legs. The visitors next turned to the work in connection with the four-lift holder to be erected by Messrs. C. & W. Walker adjacent to No. 5. It will be 264 feet in diameter and 42 feet deep, and will have a capacity of  $2\frac{1}{2}$  million cubic feet. Consequently, it will be one of the largest holders in the world. In this, as in the other case, the guide-framing will extend to only three of the lifts. The tank is being constructed by Messrs. John Aird and Sons. The bottom is formed partly of concrete and partly of lias lime—the lower portion being of portland cement. The walls are built upon a solid platform of portland cement concrete, and are of brick, with lias lime mortar, and bands of portland cement and mortar and hoop-iron bands at frequent intervals in the height. The timber framework to support the crown when the holder is at rest is held up by cast-iron columns braced together by wrought-iron ties. The tank is now ready for receiving the holder. The cost of the new holder, tank, valves, and connections will be about £72,000; and the addition of the two lifts to the adjoining holder will come to about £16,000.

## THE PROFITS OF THE TIPTON GAS UNDERTAKING.

The Tipton District Council had before them last Tuesday, the annual financial statement of the Gas Department. Its adoption was moved by Mr. D. Hipkins, who remarked that a satisfactory feature of the year's working was that the net profit had been £1390 or £182 more than for the preceding year, notwithstanding that during the year they had lost the sale of nearly 5 million cubic feet of gas by the withdrawal of the custom of two ironworks. The gross profit amounted to £5638, out of which they had paid £4248 in interest and repayment of loans. This excellent result was principally due to the favourable contract for coal, and to the high price obtained for residuals. Good management had also largely conduced to the satisfactory result; and he thought it would be to the advantage of the Council to advance the salary of their Manager (Mr. Vincent Hughes). The consumption of gas showed a slight increase on previous years, which was due to the provision of penny-in-the-slot meters. The sum of £2328 had been expended on the extension of the works, and had been transferred to capital account; and £1230 had been spent on works, but had not been so transferred—making in all £3558. Seeing the possibility of competition by the introduction of electric light and other illuminants, he suggested that, if they continued to make profits, they ought to establish a reserve fund sufficient to meet emergencies. The total liabilities, as shown in the balance-sheet, amounted to £71,701, while the assets represented nearly £90,582, or about £20,000 to the good. Mr. W. W. Doughty seconded the motion, which was carried. Some discussion took place respecting the recommendation of the Gas Committee to increase the salary of the Manager to £250 a year; and ultimately it was adopted.

## THE GOMERSAL DISTRICT COUNCIL AND THE WATER-WORKS.

### Arbitration Proceedings.

The proceedings in the arbitration with reference to the proposed purchase of the undertaking of the Gomersal Water Company by the District Council were opened at the Midland Hotel, Bradford, on the 22nd ult., before Mr. G. H. Crowther, of Huddersfield, the Umpire. The Arbitrators were Mr. J. Watson, the Water Engineer of the Bradford Corporation, for the District Council; Mr. W. H. Willstead, of Hull, for the Company. The Council were represented by Mr. W. J. Waugh; the Company, by Mr. T. R. D. Wright.

The arbitration had reference to the price to be paid for the water-works. The Company was formed as far back as 1863; the capital consisting of £5000 in shares of £5 each, no debenture or preference shares being issued. The object was to supply a district with water from the mains of the Bradford Corporation. From time to time various agreements were entered into with the Corporation; and the one now in force was entered into on May 15, 1895, for a period of twenty years. By it the Company covenanted to supply all the pipes in the district shown on a plan produced. Any injuries to meters were to be repaired by the Corporation as they thought fit. The powers of supply within the district rested on various clauses of different Acts of Parliament. The position of affairs above set forth was laid before the Umpire by Mr. Wright, who, in answer to questions, stated that the whole of the area was within the district of the Corporation, and that there was no over-

lapping. He went on to state that clause 5 of the agreement secured to the Company the right to have the benefit of any reduction which might be made in the charge for water. The Company had at various times supplied different areas; but since 1893 they had served the same area, and had had the same property as now. The number of houses in the present area of supply was 895; and there were in addition fourteen manufacturing establishments supplied by the Company. The estimated population now being served by the Company was 4355. The basis of charge for the water supplied was the rateable value, so far as cottages were concerned; meters being used in other cases. The average profits of the Company for the three years ended the 30th of June had been £603; and an examination of the balance-sheets of the Company would show that the profits, as well as the earnings had been continually increasing during that period, a condition of things which, given good management, should continue. He submitted that a fair valuation of the undertaking would be thirty years' purchase of these profits, which gave something over £18,000. The profits he had spoken of were net results, after providing for all expenses of maintenance, repair, and supervision. As a matter of strict law, the agreement was for a limited period of twenty years; and it might be argued that this fact ought to affect the Umpire's judgment in the case. Those who instructed him (Mr. Wright) looked upon the concession contained in the agreement as likely to endure so long as the existing conditions lasted in the Corporation district.

Mr. Wright then proceeded to call witnesses. Among these was Mr. Charles Gott, who admitted, in cross-examination by Mr. Waugh, that the agreement between the Corporation and the Company, while binding the latter to take the whole of their water from Bradford, did not preclude the former from competing with them by supplying water in the Gomersal district. Pursuing this point, Mr. Waugh stated that in certain contingencies Bradford might be compelled to take the course referred to; and accordingly the case for the Company would appear to be based on a supposed monopoly of which they were not in possession.

This was the case for the Company.

On behalf of the District Council, Mr. Waugh dealt at considerable length with the rights of the Corporation, the Company, and his clients. He contended that the Company, having no statutory powers, had no monopoly whatever to supply water in the district; and that, if the rate-payers of Gomersal had been so disposed, they could have demanded a supply of water direct from the Corporation many years ago, without the intervention of the Company, who were only pedlars in water, and had, in fact, been making their 10 per cent. dividends on sufferance. If he was wrong in his legal arguments, he contended that the price the Company were asking the Council to pay by way of compensation was absurd. It was ridiculous to contend that water-pipes  $2\frac{1}{2}$  inches in diameter were as good now as when they were put into the ground thirty years ago. If a new Company were to undertake the water supply of the district, it would, he maintained, be cheaper to put down new plant than to buy that now existing. It was not conceivable that, at the end of the fifteen years during which the Company's agreement with the Corporation had still to run, Parliament would allow the Corporation to renew it on the old terms, as in 1910 the plant would be practically valueless. The maximum value of the works at the present time, having regard to the length of time the pipes had been down, was, according to the expert evidence obtained, £1097. As for goodwill, it would be quite sufficient to take three years' profits. Taking the statement of the other side as to the profits earned, this would make a further sum of £1800, or £2897 altogether. This was practically the basis upon which the Company had sold part of their works to the adjoining district of Birkenshaw; and he maintained that it was the proper basis upon which to go in this instance.

Evidence in support of these contentions was given by Mr. J. Waugh and Mr. W. B. Woodhead, and the proceedings closed.

The award has not yet been given.

**The Ashburton District Council and the Gas-Works.**—The Gas-Works Purchase Committee of the Ashburton District Council have recommended the Council to acquire the property; the report of Mr. Willey, of Exeter, on the subject being of a sufficiently favourable character to justify this step. The report has been adopted; and the purchase of the works for £2500 has been unanimously agreed to, subject to the approval of the Local Government Board.

**Warrington Gas and Water Supply.**—The Borough Treasurer of Warrington (Mr. J. Fairhurst) has issued his annual statement of the accounts of the Corporation. It shows that on the gas undertaking there was a profit of £10,133 in the past financial year. A sum of £43,500 was received from consumers of gas, and £911 for meter-rents. The income of the water undertaking was £16,026, of which £15,714 was for water-rates; the profit being £11,372.

**A Question as to Directors Serving on Public Bodies.**—Just lately the Local Authorities of Stowmarket have been much disturbed by an assertion of (we believe) the Clerk of the District Council, Mr. H. E. Wilkes, that Mr. Hervey A. Oakes was disqualified from holding the position of Chairman of the Board of Guardians and District Council, by reason of his being a member of the banking firm of Messrs. Oakes, Bevan, Tollemache, and Co., and Chairman of the Stowmarket Gas Company. By his connection with these concerns, it was urged, he indirectly obtained profit from the Council—seeing that a clerk at the bank, Mr. A. B. Bevan, was Treasurer to the Council and banked with the firm, and that the Gas Company leased their works, and the Lessees supplied gas to the Council for public lighting. To determine Mr. Oakes's position, the matter was laid before Mr. Alexander Glen. His opinion is that the fact of the Treasurer of a Board of Guardians and a Council banking with a firm of which he is clerk, and of which the Chairman is a member, does not disqualify the latter from being a member or Chairman of the Council, provided the firm has no control over the employment of the Treasurer, which was a question of fact. He is also of opinion that the fact of the Lessees of the gas-works having a contract with the Council does not disqualify one of the owners of the gas-works from acting as a Councillor, if the owners have no voice in the dealings between Lessees and Council, and if their only interest arises from the fact that the Lessees might be less able to pay rent if they had not the contract for lighting. "I am, therefore, of opinion," concludes Mr. Glen, "that the facts stated are not sufficient to show that Mr. Oakes is disqualified as a Councillor or Guardian."



## METROPOLITAN WATER SUPPLY COMMISSION.

## Thirty-first Day—Monday, July 25.

(Viscount LLANDAFF, Chairman, Sir JOHN E. DORINGTON, Bart, M.P., Major-General A. DE COURCY SCOTT, R.E., Right Hon. J. W. MELLOR, Q.C., M.P., Mr. A. DE BOCK PORTER, C.B., Mr. H. W. CRIPPS, Q.C., and Mr. R. LEWIS.)

The Commission sat at the Guildhall, Westminster.

The following are the Counsel engaged: Mr. POPE, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., for the New River Company; Mr. LITTLER, Q.C., and Mr. LEWIS COWARD for the Kent Water Company; Mr. PEMBER, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. RICKARDS for the Chelsea Water Company; Lord ROBERT CECIL for the Hertfordshire County Council; Sir JOSEPH LÆSSE, Q.C., M.P., for the Kent County Council and Kent Local Authorities; Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN, Q.C., for the London County Council; Sir R. NICHOLSON for the Middlesex County Council; and Mr. GABRIEL P. GOLDNEY (Remembrancer) for the Corporation of the City of London. The Southwark and Vauxhall Water Company are represented by MESSRS. BIRCHAM and Co.

Mr. PEMBER said before Mr. Middleton was further examined he should like to make a remark which he would have made before he was examined at all, if he (Mr. Pember) had known the witness was to be called at the previous sitting. He felt beforehand that Mr. Middleton's evidence, coming as that of the first of a series of witnesses for the Companies, might, to some extent, confuse the Commission, because the witness had been obliged to take somewhat different figures—not merely as a basis for comparison with the statements given earlier, but also for the substantive purposes of his own calculations—from those given by Sir A. Binnie and other witnesses. Counsel had intended to ask the Chairman not to discuss the figures of the comparative statements of Mr. Middleton and Sir A. Binnie until witness had laid down the bases of his case, which was intended to strengthen that for the Companies, and not merely as a criticism of the County Council witnesses. If, therefore, the Chairman were to go to the portions of Mr. Middleton's evidence not already referred to, and to the tables afterwards, it might perhaps help the Commission. Though when they came to the tables they would see the amounts of supply differed to some extent from those of the County Council, this need not trouble the Commission much, because, though the calculations of amounts might be slightly inexact, they would still enable the Commission to judge whether or not the Companies were right in saying there would be a vast difference between the cost of going to Wales for the supply of London, over and above the 185½ million gallons already sanctioned from the Thames, and the cost of getting a further supply from the river. Counsel therefore suggested that witness should be allowed to say a word or two more about the increase of population, and on the point of the 300 million gallons daily being the maximum yield of the Thames, because, whatever Lord Balfour's Commission might have meant, the Companies could not help feeling they were entitled to give substantive evidence that more than 300 million gallons might be obtained with safety from the Thames. Sir A. Binnie threw doubt on the possibility of this quantity being obtainable; and, by parity of reasoning, the Companies felt they ought to be allowed to show that more was procurable. Lord Balfour's Commission only looked for 40 years ahead. The Companies thought it right to go as far as the present Commission felt inclined to go; and they rather gathered that the Commission would like to know what they thought ought to be done at the end of that period. It was because of this that the calculation extended to 400 million gallons as the possible take from the Thames—a figure also dealt with in the statements of Sir B. Baker and Mr. Deacon. The Companies intended to call chemists to speak as to the purity of the water; but it might be well to let Mr. Middleton put in some initiatory facts as to what, up to now, had been the effect on the river of the increase of population in the Thames Valley. The learned Counsel added, in reply to Mr. C. A. Cripps, that the estimates would show the cost of obtaining quantities up to 400 million gallons daily from the Thames; and, this evidence having been given, the Companies would assert that the scheme was far better and cheaper than the Welsh one.

The CHAIRMAN suggested that Mr. Pember should obtain from the witness evidence on the particular points referred to, as he (the Chairman) found the statement of the witness extremely difficult and complex.

Mr. PEMBER said he could hardly hope to succeed where the Chairman could not.

In the end, the Chairman undertook the examination of the witness.

Mr. R. E. MIDDLETON, whose examination-in-chief was commenced, but not concluded, at the last sitting, was now further examined by the CHAIRMAN. He said the population of 5,732,950 in 1891, quoted in the report of Lord Balfour's Commission, was not the population of "Water London," but of "Greater London," including outlying portions; and it exceeded the population supplied by the eight Metropolitan Water Companies at that date by 500,795. In all witness's calculations he had used the larger figure, because Lord Balfour's Commission considered the whole of London ought to be supplied from the same sources. The rate of increase in Water London had been 15·53 per cent.; but he assumed the corresponding figure for Greater London at 18·2 per cent., though he thought this was excessive. He therefore concluded that the population of Greater London in 1931 would be 11½ millions.

The CHAIRMAN: As to the quantity obtainable from the Thames, what is your view?

Witness: My view is that we do not know yet what is obtainable; but it certainly is something more than 400 million gallons a day.

Mr. MELLOR: Why do you say that?

Witness: Because I have examined beyond the 400 million gallons, and I find I can produce that by storage. Evidently Mr. Deacon and Sir B. Baker thought the same, because they put in an estimate for 400 million gallons. I have gone beyond that, but have not come to a limit.

Mr. PEMBER: But, at all events, you have satisfied yourself about the 400 millions?

Witness: Yes; and something more.

Major-General SCOTT: And is that without prejudice to the other inhabitants of the basin?

Witness: Yes. The increase of consumption by places above London was not likely to be great. They did not know what it was; and he had not taken it into consideration at all.

Mr. MELLOR: You heard what Mr. Littler said about Middlesex?

Witness: If Middlesex is part of London, it comes into London. Outside, I think he said they supplied themselves from wells. If they supply themselves from wells, they will not deplete the Thames.

Do you assume that taking any quantity from wells will not affect the river?—I have examined the question very carefully for some years past, and find it has not had any detectable effect on the river.

That is not true of the Lea as well, is it?—Yes.

Major-General SCOTT: Can you say off-hand what is the average amount taken from wells in the Lea Valley at the present time?

Witness: I am afraid not—about 20 million gallons, I think.

Hardly as much as that.—I am talking of supplies taken at Hertford, not by the East London and New River Companies only.

The CHAIRMAN: We have had it from more than one witness that the pumping in the Lea Valley has sensibly affected the amount of water.

Witness: I am afraid I must say I do not agree with that. I have examined the thing very carefully indeed, and have devoted a large amount of time to the question; and I am perfectly certain.

In further examination, witness said he had compared the flow of the Lea with the flow of the Thames for a number of years, and had examined the rain-gauges and the percolation, and he had come to the conclusion that, ignoring seasonal failures, the amount of the flow of the Lea did not diminish in comparison with that of the Thames. The average flow of the Lea was 119 million gallons, and it had varied only in comparison with the flow of the Thames.

Did you do that when deputed by Lord Balfour's Commission?—I did it at the time, and three years later.

What do you mean by saying the flow of the Lea, in comparison with that of the Thames, has not diminished?—The flow of the Thames is almost entirely untouched by wells.

You mean there would not have been more proportional decrease in the Lea than there had been in the Thames?—That is so. Wells were supplied from the body of the chalk, and the supply came in that way in cases where the river was running by at a higher level than the water in the chalk.

Sir J. DORINGTON: The lowering of the wells in Herts, of which we have heard so much, does not lower the water in the river?

Witness: No it does not; and I do not think there has been any lowering of the wells, except seasonal wells.

Mr. MELLOR: Then you think Herts has no ground for complaint?

Witness: That is so. The gauges on the Lea went back to 1854; but were, he admitted, imperfect. He should say gauging over a period of 30 or 34 years would be necessary to eliminate seasonal failures. He had made experiments with regard to wells at Amwell, which it was alleged had been pumped dry, but he held that they had only been pumped down. In the one case he admitted the water would go to the Lea; but that was the only instance of this kind.

The CHAIRMAN put several cases mentioned by Sir John Evans and others, of wells having been pumped dry.

Witness said that he had heard of these cases; but he had not been able to substantiate them. He could say, however, that the flow of tributaries of the Lea had not fallen off. The lowering of a well was usually temporary, and due to local causes.

Major-General SCOTT said witness in his proof referred to the amount of water which he considered available in the Upper Thames from wells sunk in the chalk. In connection with this, he directed witness's attention to a paragraph in the report of Lord Balfour's Commission which stated that no doubt a large quantity of water could be collected by sinking wells in the chalk above the intakes of the Companies, but that any such supply would be at the expense of the streams and springs feeding the Thames, and would proportionately diminish the flow of the main stream in dry weather.

Witness replied that he was aware of the paragraph; but he was sorry that he was obliged to differ from it. He believed the conditions were exactly the same in the Lea Valley as in the Thames Valley, and that the same effect would take place in both. If proper precautions were taken so that the wells were not sunk in the bare chalk, the action stated was simply impossible. He thought the chalk was rather closer in the Thames than in the Lea Valley; but the same held good in regard to both. The wells in the chalk drew water that was originally rain. If the wells did not exist, the water would, for the most part, find its way to the lower reaches of the Thames. A small proportion would enter the Upper Thames.

Mr. PEMBER quoted Sir F. Bramwell to the effect that the pumping from deep wells in the chalk drew supplies from subterranean waters which were travelling, either in defined underground channels such as fissures, or were permeating the mass of the chalk on the way from the place of absorption to the point of delivery.

Major-General SCOTT asked if Sir F. Bramwell assumed that there was a separation between the water which fed springs in the Lea Valley and water which ran away.

Mr. PEMBER said there was not a separation; but if the water in the chalk got up to a level where it could escape through a more superficial fissure, then it might issue into the open air and find its way into lower streams. If they struck the higher fissure they would tap water which would otherwise flow into the river.

In reply to the CHAIRMAN, witness said that with a sufficient amount of boring tackle and money he would undertake to fix the point at which the water of the Lea Valley found its way into the Thames or the sea. Many springs were supplied from mountains at a considerable distance. There were springs sometimes at the top of a hill or mountain, and these must be supplied from a higher level in some way or other.

Now I believe you desire to lay before us some figures as to the purity of the Thames water?—Yes. In the decade from 1868 to 1877 Sir Edward Frankland reports that the Thames water as supplied to consumers (that is, after filtration) contained 0·463 part of organic matter per 100,000; in the decade from 1878 to 1887, 0·345 part per 100,000; and in the last decade it was 0·331 part—showing a steady decrease in the pollution.

Major-General SCOTT: Do you infer from that, that the river is more pure than it was?—It is after filtration. I should say it is due to improvement in filtration and storage.



I understood the basis of your argument was that the increase in the population bordering the stream had not produced worse effects in the period you refer to, but rather the contrary?—That I go on to.

The CHAIRMAN: Have you grounds for believing that the organic purity of the Thames at the point where the Companies take it was decreased or increased?—I believe it was rather increased than decreased. The organic carbon and organic nitrogen according to samples (taken in May in each case) were 0.284 part in 1868, 0.257 part in 1895, 0.231 part in 1896, and 0.255 part in 1897, in each case per 100,000. The corresponding figures of samples taken in October of these years were respectively 0.320, 0.274, 0.469, 0.230, and 0.235.

Mr. MELLOR: Do you consider that this amount of impurity is bad?—Oh, no. He gave these figures simply as an opening to evidence which some chemist would lay before the Commission, to the effect that the exertions of the Thames Conservancy to clear the river of pollution were bearing good fruit.

Mr. PEMBER: At all events it shows that there is no evidence of deterioration in spite of the increase of population.

Witness: Yes.

The CHAIRMAN: To come back to the quantities of supply. We know that Lord Balfour's Commission contemplated getting 300 million gallons from the Thames, 52½ millions from the Lea, 40 millions from the wells in the Lea Valley, and 27½ millions from wells in the Kent Company's district?—That is so.

Which do you suggest should be altered. You have already told us you wish the 300 from the Thames to be 400?—I propose to add from additional wells in Kent another 123 million gallons. The figures for the quantities available from the wells in the Lea Valley as set out in Lord Balfour's report were, he pointed out, minimum figures. That Commission took the lowest of three dry years—viz., 47 million gallons, and then to be on the safe side put the figure at 40 million gallons.

On what do you base your figures of 123 million gallons for water from other wells in Kent?—On the report of Lord Balfour's Commission. He had not, however, made any investigations regarding the supply from Kent chalk since Lord Balfour's Commission. Another 2 million gallons a day would be available from the new well of the Southwark and Vauxhall Company.

All these figures give 645 million gallons a day obtainable from the London area?—That is so. To this quantity, however, should be added in his opinion for water from wells which could be sunk in the chalk basin of the Thames, at least 190 million gallons daily. This, he thought, showed that the available and procurable supply was sufficient to enable the Companies to go on for a very long period, and that there was no need to go to Wales.

The CHAIRMAN: You think further wells could be sunk in the chalk basin of the Thames?—Yes, to produce at least 190 million gallons; probably more.

Major-General SCOTT: On what is this evidence based?—Partly on many journeys I have taken up and down the Thames, and partly on the examination I made in the Hertfordshire area.

Of course you know it is in direct contradiction to the conclusion of Lord Balfour's Commission?—Yes.

The CHAIRMAN: What storage do you consider necessary to satisfy the provisions laid down by Lord Balfour's Commission in order to provide the present average supply of 130 million gallons a day?—A storage of 1802 million gallons.

Does that leave the flow of the river at Teddington at 200 million gallons a day?—Yes.

We have been told that only 866 million gallons of storage are at the present time provided?—That is so; but a large quantity is in course of provision.

But that was not yet entered into the capital account of the Companies?—Oh yes, a large amount must have been. He could not say what it was, however.

You suggest, I believe, that there should be a gauge station at some point on the Thames?—Yes, at Teddington.

To make sure that the 200 million gallons a day flows past Teddington?—Yes. There was not a gauging station now. One was going to be made at Penton Hook, which, however, would be above the point of intake of some of the Companies.

You have already intimated your opinion that 200 million gallons as the flow of the river is too high?—I have.

We have Lord Balfour's view about that?—He merely gives a *résumé* of the evidence, nothing more. He says it should be something more than at present; but I am ready to accept the 200 million gallons. All the reservoirs proposed to be constructed in the future were taken to be of one capacity—viz., 3600 million gallons each. He excluded from his calculations all existing reservoirs, and those in course of construction or authorized—a total capacity of 6176½ million gallons.

The CHAIRMAN: Whereas those actually constructed only afford storage really for 866 million gallons. That leaves a balance of 5310½ million gallons still to be made?—Partly constructed, some of which are very near completion, or authorized.

Mr. PEMBER: And that will bring up the supply to 185½ million gallons daily?

Witness: And beyond—it will leave a storage of nearly 1000 million gallons in excess.

Mr. PEMBER remarked that this was owing to the quantity derivable from the Staines reservoirs being limited to a smaller quantity than the capacity of the reservoirs would enable them to supply. The capacity of the reservoirs was not to be measured by the 35 million gallons authorized to be taken through them daily. As a matter of fact they could supply an average of 54 million gallons and, on a pinch, up to 62 million gallons for a limited period. The capacity of the conduit was 90 million gallons daily.

Witness, further examined by the CHAIRMAN, said he had prepared his estimates of the cost of works on the basis of the schedule of prices in the Staines contract, to which he had added 10 per cent. for contingencies. His charges for pumping were taken from Mr. Lass's tables, except in the case of pumping for store, in which he had rather exceeded them, because a large amount of the charge was due, not to actual pumping, but to the wages of the men who must be kept ready for pumping, but were idle for a great part of the year. Instead of assuming the total quantity to be provided was 300 million gallons, he had taken 309 million gallons, so

that the balance yet to be procured was 123 million gallons, not 114 millions as assumed by Sir A. Binnie.

Mr. PEMBER remarked that 123 million gallons was one of the Welsh instalments.

The CHAIRMAN: You have something to say, I think, about the Thames aqueducts between the intakes and the pumping stations of the Companies at or near Hampton?—Yes. As the maximum monthly supply exceeds the average by 21.11 per cent., and as the capacity of the conduits to supply an average of 35 plus 123½, or 158½ million gallons daily must be 192 million gallons, and for an average supply of 35 plus 215, or 250 million gallons per diem, 303 million gallons daily, while the capacity of the present aqueduct is 90 million gallons per diem, it is considered desirable to construct three others of the same dimension, as and when they are wanted.

You put in last time your estimate of the Welsh supply, and you calculated that to supply 123½ million gallons daily from Wales the cost would be £21,000,000?—Yes.

Whereas the Staines Reservoirs Scheme for a like quantity is a little over £5,500,000?—Yes. He wished, however, to add £500,000 for pipe lines from the aqueduct to the district of the Companies, to bring the cost into comparison with that of the Welsh scheme—the cost of the mains from the Elstree reservoirs.

You have provided the cost of storage for the delivery of 123½ million gallons daily from Wales to bring the present authorized supply of 185½ million gallons to 309 millions?—Yes. He estimated the cost of this storage and of 81 miles of pipe lines and conduit at an average of £91,611 per million gallons of daily supply, or £11,313,958, which he arrived at by averaging the similar figures in the Thirlmere, Vyrnwy, and Elan Valley schemes, which were the most nearly analogous to the case of London. Then he added a sum for an average of 81 miles of conduit to convey 215 million gallons daily, at a cost of £64,000 per mile. The conduit would not, he explained, have to be made for the whole distance between the Yrfon Reservoir and London. The pipe lines would be made to convey a smaller quantity than that which would eventually come from this source; but the conduit, where made in stone or brick or concrete would be made at first to take the full 215 million gallons, which would eventually come from this source. The figure of £11,313,000, not only included the cost of the pipes and conduits, but of the first reservoir at Yrfon and of purchasing moorland, which he put at £9 or £10 an acre, though some of it—being agricultural and farming land—would cost probably £150 an acre. Witness knew Sir A. Binnie calculated the cost of the Yrfon reservoir and head works at £1,850,000; but he dissented from this, considering that the land compensation, diversion of railways, &c., would cost very nearly that figure.

How much have you calculated in your figure of £11,000,000 for the Yrfon reservoir and head works?—£3,400,000.

The CHAIRMAN: Therefore you put on something like £1,600,000 for the Yrfon reservoir and head works.

Proceeding, witness said he added to his estimate Sir A. Binnie's figure of £1,314,750 for service reservoirs and filters at Elstree; also two other new items, one of which was £3,000,000 for mains between the service reservoirs at Elstree and the service reservoirs of the Companies. Sir A. Binnie had distinctly said the cost of these pipes was not included in his figures. This figure of £3,000,000 corresponded with the figure of £500,000 which he had added to the other estimate. Then he added an item of £279,549, the cost of pumping to supply during 20 years a quantity increasing from 21.7 to 29.8 million gallons at 30s. per million gallons pumped. He should, however, first have taken £98,280 in respect of pumping machinery to supply 30 million gallons daily to districts above gravitation level. It was suggested to the witness that this was an improper charge, seeing that these districts were already being supplied, and that the charge was included in the supply of 185 million gallons, which quantity he was ignoring in his estimates. He held, however, that it would be very expensive to continue in this way.

The CHAIRMAN: No expense would be added by going on with the present supply?—I charge pumping over all this against my other amount. Therefore it is fair to charge this at a small rate against the Welsh scheme.

You assume that instead of sending the Welsh water where it can go by gravitation, it is to displace water that is now being pumped to these higher districts?—It would be the cheaper way of doing it certainly.

Mr. MELLOR: You would displace the whole of the water?—Not the whole—the 125 million gallons. As far as you are displacing you are replacing the 185 million gallons. The figure of £45 per horse power for pumping was Sir A. Binnie's figure, which was taken from Messrs. Hunter and Fraser's report.

You put the cost of pumping to supply during 20 years a quantity increasing from 21.7 to 29.8 million gallons—how do you get that extreme accuracy of decimals?—You cannot get it with such extreme accuracy; but it is the nearest thing you can get. These quantities represented the quantities which would be in the reservoirs which would not be supplied by gravitation. The last item on the table with regard to the Yrfon reservoir, was an addition of £13,916,861 for accumulated interest. That was the interest on the capital expenditure for each year during the course of construction, and after the works were constructed—from 1906, when the work would begin, to 1936. Asked to explain an item of £7,296,098 for work in progress, he said the reservoir in question (the Yrfon) would begin to be constructed in 1906, it would be completed in 1916, and its capacity fully used up by 1936; so that more storage must be provided by 1935. Ten years was required for the construction of the reservoir; therefore ten years before 1935 another must be commenced, costing the seven millions odd. Witness claimed to justify some of his estimates by comparison with the cost of the Thirlmere and the existing Welsh scheme of the Birmingham Corporation. He had visited the sites of the proposed Welsh reservoirs; but they were not so favourable as they were described to be. The rock was covered in some places with large masses of drift; and the sides of the valley did not offer thoroughly reliable foundations for the dams. The rock in the bed of the Yrfon river appeared to be solid; but the sides of the valley, where the proposed dam would cross it, were covered with drift, and, where exposed in a railway cutting about 20 feet deep, the shale was exceedingly friable. No solid rock was visible.

You would ask us to infer that no reliable estimate can be formed of the cost of the dam?—Yes.



How many acres would have to be taken for the Yrfon?—Some 102,000 acres for the Yrfon and Towy.

Sir A. BINNIE said the County Council proposed to buy the land necessary for the reservoirs and works—3300 acres for the reservoir; and it was not proposed to go much beyond that.

The CHAIRMAN: Then what is the meaning of this 102,000 acres?

Witness said that was the drainage area, which he had always been led to believe the County Council proposed to purchase, as in the case of Birmingham, which city had purchased the whole of the area drained.

Sir A. BINNIE further pointed out that the whole drainage area was only 65,000 acres, even if the County Council were to purchase the whole.

The CHAIRMAN: What are the Yrfon and Towy together?

Mr. PEMBER: He gives it himself as 102,600 acres.

Sir A. BINNIE: 86,000 acres, I think.

Witness went on to state that, if these two reservoirs were constructed according to the plans of the County Council, six miles of railway, involving some heavy work, would have to be diverted; 13 miles of road replaced; seven churches, chapels, and schools, and 31 farms and villages, involving 108 houses, destroyed. The compensation to be paid must consequently be very heavy.

The CHAIRMAN: We had better now go back to your Thames estimate. You allow these, to supply 123½ million gallons a day, a storage capacity of 18,000 million gallons?—Yes. The witness handed in an estimate of the cost of supplying 114½ million gallons daily from the Thames, so as to correspond with the estimate of Sir A. Binnie for a like supply.

You bring out a total cost of the Staines scheme to supply 114½ million gallons a day at £5,477,280?—Yes.

Mr. PORTER: But you do not put in this table anything for accumulated interest for the years it would take to carry it out?

Witness replied that the figure in the other table would be so much like it that this might be taken as the amount.

The CHAIRMAN: You have allowed a storage of only 16,000 million gallons, as against Sir Alexander Binnie's 20,000 million gallons?—Yes. Sir Alexander Binnie adds a certain percentage for reservoirs out of use, which I say is unnecessary, and a certain amount for bottom water, which I say is quite excessive. I think an addition of 10 per cent. is sufficient for all purposes—bottom water, cleaning, and evaporation. The proper storage capacity required was 14,987 million gallons, which, plus the 10 per cent., gave the figure of 16,486 million gallons. To supply 130 million gallons daily, storage for 1638 million gallons or plus the 10 per cent. as above, 1802 million gallons was required. This figure, and others for the supply of larger quantities, were arrived at by working out day by day the amount of deficiency there would be in a particular day and adding them together. It was an average deficiency over a period of absolute deficiency. He had taken it at what the deficiency would have been in 1893—a very dry year—with a supply of 130 million gallons.

Does that mean that if you added 1638 million gallons to the present storage you would have been able to supply an additional 130 millions in the driest year?—Not an additional 130 millions; 130 millions, and provide 200 million gallons a day flowing in the river at Teddington.

The CHAIRMAN: Well, but the Companies are now supplying more than that.

Mr. PEMBER: But then they draw the river down too far.

Witness said he put the cost of the reservoir at £218 per million gallons—a figure based on the actual cost of the Staines works as they were being carried out.

The CHAIRMAN: I understood Sir A. Binnie's figure of £380 was got at by dividing the total capacity by the total expenditure.

Sir A. BINNIE said that was so.

Witness said there were reasons for the difference which he thought he could explain. The first reservoirs would cost more than his (witness's) figure; they would cost £300. Sir A. Binnie did not know that the aqueduct was a great deal larger than was required at present. Witness had taken the proportional cost of the aqueduct. Then there was an expensive cross-dam in the first reservoir which would not be constructed in the later ones.

The witness's examination-in-chief had not concluded when the Commission adjourned till November.

**The Explosion at the Plymouth Gas-Works.**—One of the men injured by the explosion at the Plymouth Gas-Works (*ante*, p. 217) died on Wednesday last. He was named Aaron Parkes, was a native of Hollinwood, Lancashire, and was in the employ of Messrs. Samuel Cutler and Sons as a fitter. The inquest was opened on Thursday, and was adjourned until Sept. 2. The Coroner said the doctor had informed him that the other injured men would not be able to attend and give evidence for some time. The Inspector of Explosives had been communicated with. Mr. Pearce, solicitor, appeared for Messrs. Cutler, and said his clients desired every particular to be laid before the jury.

**Electric Lighting Orders and Licences.**—According to a Parliamentary Paper just issued, in the course of last session, 55 Provisional Orders under the Electric Lighting Acts were applied for, and 50 Orders were made by the Board of Trade and confirmed by Parliament. One Licence was also applied for and duly granted. Taking the total number of Orders and Licences granted by the Board of Trade since the passing of the Acts, and prior to the present session, it appears that of 560 Orders applied for 390 were made by the Board, of which number 387 were confirmed by Parliament. Of 46 applications for Licences, 30 were granted by the Board of Trade, and of these 27 have since been revoked or repealed, or have expired.

**Newhaven and Seaford Water-Works Purchase Question.**—The Newhaven District Council have secured the insertion of a clause in the Bill which the local Water Company have in Parliament by which it is provided that, in the event of the undertaking being purchased by the Council, in conjunction with the Seaford District Council, on terms to be settled by arbitration, the powers conferred on the Company by the Bill shall not be deemed by the arbitrator to enhance the value of the concern, except so far as capital shall have been expended in executing the works authorized. Last Wednesday the Newhaven Council decided to proceed in the matter of purchase by applying to Parliament for the necessary power; and they also gave instructions for a letter to be written to the Water Company, asking them if they were willing to enter into a provisional agreement for the sale of their property.

## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The North British Association of Gas Managers, though the undoubted leaders of thought on gas supply subjects north of the Tweed, have this week, in a sense, followed the suit of the two meetings which have preceded theirs this year. There is a manifestly revived quickening of interest in Scotland, in relation to those matters affecting gas management which are public in so far as they are mutual. There is no evidence that the North British Association would not have been the first to lead the way in this movement, which, it is to be hoped, will be a continuing one; in fact the presumption is that they would but for the circumstance that their annual meeting fell, in point of time, behind the others. The first manifestation of the new solidarity was at the Informal Meeting in Glasgow in April, and the next was at the Waverley Meeting in Edinburgh, immediately following. On those two occasions, the principal bond of fellowship was the subject of the standardizing of meter-unions. But it is a singular trait of human nature that, when once friendship has been established upon one question, the net of cordiality has a tendency to sweep in all others—*vide* the improved relations between this country and the United States of America, arising from a common understanding with reference to the attitude of the latter towards Spain. In writing thus it is not to be assumed that there ever was any spirit of hostility within the ranks of the gas brotherhood; for that was not the case. But for some years after the Murdoch centenary burst of enthusiasm, which culminated at the Stirling meeting in 1892, there was a lackadaisical interest in Gas Association work, the only quickening influence which remained being the debated subject of oil gas. That subject is not now so prominent as it was. The reason for this is that for large works carburetted water gas has come in like a flood, and for works which are considered to be not large enough for adopting this method of gas manufacture, the price of cannel has fallen so low that the use of oil is no longer so profitable as it was. This would not, however, account for the general movement which I am taking notice of; it is only one of the indices by which the force of the movement may be gauged. The real reason, I apprehend, is that for gas managers the horizon has sensibly widened during the past decade. Since money became cheap, there has been an immense advance in material prosperity, which leads, on the one hand, to more luxurious living, including a greater demand for light. This has led to increased capital accounts; and one of the problems which the gas manager now has to face is how to pay the customary dividend of 5 or 10 per cent., upon the enlarged capital. This brings forward the other side of the question, which is that, with cheap money, there has arisen very fierce competition, and the gas industry has not escaped its effects. The market for residual products is an example of how competition has led to diminished profits. In the lighting department, too, prices have fallen. Money can no longer be made "like slate stones;" and I am not sure but that managers may not have begun to feel pressure from their directors or commissioners, who, proceeding from the actuarial side of the question of gas supply, have concluded that something must be done, if profits are now less, to save at the other end. Otherwise, managers themselves, being, in many instances, the real custodians of the finance policy of the undertaking—the treasurer being often little more than a figure-head—many of them have foreseen that they must adopt a new line themselves. It cannot be gainsaid that, from whatever reason, there is now a universal desire to make all that can be made of the materials handled. This is accomplished both by extracting more out of them, and by putting more of them through. The first four papers on the programme of this year's meeting sufficiently illustrate the trend of public feeling among gas managers. Mr. Ewing's and Mr. Little's papers were devoted to showing how more may be made out of coal; and Mr. Alex. Wilson's, and Mr. Carmichael Peebles's papers were both on subjects relating to the increased output of gas. I daresay this happened without arrangement—and if it did it bears out my view all the more—but I could not conceive of a better balanced programme. I attribute, therefore, the present improvement in the politics of gas manufacture and supply to the general widening of the field of operations, and to the general desire to make the most of the new ground which has to be occupied. The situation is one of great hope. The industry is flourishing, probably as it never flourished before, and managers are equipping themselves to meet the new situation. The effect is, while it throws more work and more responsibility upon the gas manager, to raise his status; and in this respect he will be the wise manager who welcomes what has come to him, and he the unwise one who may seek to evade it. These remarks will serve as a commentary upon this year's meeting. It cannot be said to have been a brilliant meeting, in the sense that nothing sensational was disclosed at it, or anything particularly new. It was a work-a-day meeting; and that, after all, is the most profitable. A spirit of cordiality, a readiness to impart experiences, and a general hand-shaking species of discussion, characterized the whole proceedings. The arrangements made by Mr. Carlow for the conduct of the proceedings were perfect; and, above all, the presidency of Mr. Thomas Wilson, of Coatbridge, was a signal success. There were misgivings as to the length of the programme, to the effect that it might lead to part of the technical portion not being overtaken, or to some of it being left over; but Mr. Wilson kept the business so well in hand that, although every subject was sufficiently reasoned upon, the whole was got through with nearly half-an-hour to spare. This year Scotland stands well, occupying satisfactorily the niche which providence, or fortune, has assigned to her. Of this year's meeting there can be nothing but happy memories; and, if it has served its purpose, these will be accompanied by high resolves as to the future.

The accounts of the Glasgow Corporation Gas Department, for the year ending May 31, have been made up. I have only seen a summary as yet; and must leave over giving a full account till another week. From what I have seen, however, it appears that the year has worked out well. The revenue from gas, although the price remained unchanged—2s. 2d. per 1000 cubic feet—amounted to £510,543, an increase of £17,971 upon what it was in the preceding year. This is quite a satisfactory result; but still more remarkable is the increase in the return from residuals—from £110,777 to £115,819. This is not in accordance with general experience; and it is a result which must depend upon circumstances specially applicable to Glasgow. Coal cost £272,763, or £18,395 less



than in the preceding year. The whole of the charges for the manufacture of gas amounted to £437,028, an increase of £22,748, of which over £4000 was due to a rise in wages to workmen. The distribution of gas cost £54,486, showing a decrease of £1306. Rents, rates, and taxes amounted to £24,198, an increase of £1174. Management cost £10,061, an increase of £487. The amount written off for depreciation is £35,716, an increase of £2074 over the sum written off a year ago. The capital account stands at £1,275,529, an increase during the year of £22,094. The Corporation have been working under borrowing powers to the amount of one million sterling. These powers are now practically exhausted; and it is intended to take powers in the next Corporation Bill, to borrow another million. During the year £15,000 was expended upon new piping and relaying, and £15,908 upon meters; but, of course, a great part of this expenditure was out of revenue. The principal capital expenditures have been at the Temple and Dawsholm stations, where a new gasholder is being erected; and the purifying, as well as the carbonizing, plant is being extended. The sinking fund amounts to £348,531, an increase of £23,408. The accounts come up for consideration next month.

The revenue of the Electricity Department of the Glasgow Corporation for the past year is reported to have been £36,360, against £30,474 last year, an increase of £5886. This result has been obtained notwithstanding the reduction that was made a year ago in the price of electricity. After meeting the cost of production, the balance is carried to depreciation and sinking funds.

The Edinburgh and Leith Gas Commissioners held a useful meeting on Monday, at which they disposed of their accounts for the financial year ending May 15. These accounts have already been given in the "JOURNAL" of June 28, and need no further detail. Indeed, if I were to attempt it, I should be obliged to fall back upon documents for information, for the Commissioners vouchsafed no explanation of them, except as regarded the capital account. This is quite an interesting department of the Commissioners' undertaking; but what is of more value to the critical eye of the public is the result of the working—the revenue and expenditure for the year. If there were any reason for withholding it, I could understand silence; but there is not. I put it down to two causes, first, that the prosperity of the undertaking is usually commented upon, in some detail, at what is called the annual meeting in March, and second, that the Convener of the Finance Committee, though a good business man, is not an orator. It is a pity that the Commissioners, in their Act of this year, did not have the so-called annual meeting altered to the end of July. In March it serves no good purpose, as the year is ten months run by that time, and if anything is to be said at it, as to the varying position of the undertaking from year to year, it is either too late to be of much interest or value, or it is spoilt by being mixed up with problematic anticipations for the future. Bailie Manclark's explanation, regarding the position of the capital account, was given as a sort of reply to private, and, so far as the public are concerned, anonymous critics of the finances of the Commissioners. It was as if he said that Mrs. 'Arris had been writing to them about their capital account, and he gave what the Commissioners said to her. It was a one-sided entertainment, because we did not get the criticisms; and we do not know

whether he slew his antagonist or not. Had there been no intimation of a questioner, the statement would have read just as well, and the added information was entirely superfluous. On the merits of the communication, there can be no feeling except that of satisfaction. The Commissioners have, in ten years, without starving the works, but, on the contrary, while improving them, been able to accumulate and apply their surplus funds in such a way that they may, if all goes well, be able to reduce the period of redemption from 54 years to 38½ years. That is to say that, while, under their Act of Parliament of 1888 they were allowed till 1942, they may be clear of the capital account of the present undertakings by 1927. Of course they will have remaining the new capital account for the works at Granton, about to be erected. This account, I expect, will be kept strictly separate from the existing accounts; and it will, naturally, be a long time before it can be liquidated, if it be ever thought desirable to wipe it out, or should it be possible, for it will necessarily be a growing quantity. But there is this to be said, that when the present works, or the sites of them, in Edinburgh, Leith, and Portobello, come to be sold, the proceeds of the sales will at once be applicable for the reduction of the Granton capital account, into manageable proportions. This opens up a prospect for the Commissioners which many bodies would be happy to possess. Bailie Kinloch Anderson followed up Bailie Manclark with one of those practical disquisitions which he is so capable of giving, and of which we have had many, and which, on this occasion, helped to make the excellent position of the Commissioners more clear than the statistics of Bailie Manclark had left it. In the circumstances disclosed, the Commissioners were certainly right in giving an increased contribution to the sinking fund for redemption of annuities. The only alternative to this would have been a reduction in the price of gas. But the Commissioners are averse to the price of gas going up and down; and in view of the prospective outlay at Granton, the probability is that, in order to keep matters square, they would not be able, until the new works are in operation, to work at less than the present price—3s. per 1000 cubic feet. On the proposed accident fund, I think it will not be disputed that delay is commendable. As Bailie Kinloch Anderson said, wherever the money is to come from, if claims are made, the Commissioners are liable; and as they have money in reserve, they may as well keep it there till they have a year's experience. Then they will have some idea of the basis to found such a fund upon.

The docket added to the report of the Auditor is of consequence only in view of the fact of its laying it open to anyone who may object to the donations by the Commissioners to the local hospitals to challenge their legality. He would be a sorry person who would. The donations were given as Diamond Jubilee contributions to the funds which were being raised locally to celebrate the event. They have hitherto been questioned by only one man. If I were at liberty to disclose his name, which I do not feel myself to be, there would be widespread amazement. The stated ground of his opposition is that he himself was a contributor to the fund. That is not a very strong ground; but, according to the Auditor, the law is on his side. The objector is himself a prominent philanthropist, and it would be a sorry spectacle to see him suing the Commissioners for repayment, out of their own pockets, to the funds of the

## GAS AND WATER COMPANIES STOCK AND SHARE LIST.

Referred to on p. 249.

| Issue.    | Share. | When ex- Dividend. | Dividend or Dividend & Bonus. | NAME.                       | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue.    | Share. | When ex- Dividend. | Dividend or Dividend & Bonus. | NAME.                              | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|-----------|--------|--------------------|-------------------------------|-----------------------------|-----------------|---------------------|------------------------|-----------|--------|--------------------|-------------------------------|------------------------------------|-----------------|---------------------|------------------------|
| £         |        |                    | p. c.                         |                             |                 |                     | £ s. d.                | £         |        |                    | p. c.                         |                                    |                 |                     | £ s. d.                |
| 530,000   | 10     | Apl. 15            | 10½                           | Alliance & Dublin 10 p. c.  | 23½-24½         | ..                  | 4 5 9                  | 75,000    | 5      | June 29            | 6                             | Malta & Medn., Ltd.                | 43-52           | ..                  | 5 14 3                 |
| 100,000   | 10     | " 7                | 7½                            | Do. 7 p. c.                 | 16-17           | ..                  | 4 8 3                  | 541,920   | 20     | June 10            | 5                             | Monte Video, Ltd.                  | 14-15           | ..                  | 6 13 4                 |
| 800,000   | 100    | July 1             | 5                             | Australian 5 p. c. Db.      | 105-107         | ..                  | 4 13 6                 | 617,946   | Stk.   | Feb. 24            | 9½                            | Newcastle & Gateshead Con.         | 235-240         | ..                  | 4 1 3                  |
| 200,000   | 5      | May 26             | 6                             | Bombay, Ltd.                | 6½-6¾           | ..                  | 4 8 11                 | 252,355   | Stk.   | Jan. 3             | 3½                            | Do. 3½ p. c. Db. Stk.              | 115-120         | ..                  | 2 18 4                 |
| 40,000    | 5      | " 5                | 5                             | Do. New, £4 paid.           | 4½-5            | ..                  | 4 16 0                 | 150,000   | 5      | May 26             | 8                             | Oriental, Ltd.                     | 7½-7¾           | ..                  | 5 8 3                  |
| 880,000   | Stk.   | Feb. 24            | 12                            | Brentford Consolidated      | 280-285         | ..                  | 4 4 3                  | 135,000   | 5      | " 8                | 8                             | Do. New, £4 10s. pd.               | 6-6½            | ..                  | 5 10 9                 |
| 240,000   | "      | " 9                | 9                             | Do. New                     | 215-220         | ..                  | 4 1 10                 | 15,000    | 5      | " 5                | 5                             | Do. do. 1879, £1 pd.               | 1½-1½           | ..                  | 4 11 5                 |
| 50,000    | "      | " 5                | 5                             | Do. 5 p. c. Prf.            | 140-145         | ..                  | 3 9 0                  | 60,000    | 5      | Mar. 11            | 7                             | Ottoman, Ltd.                      | 5-5½            | ..                  | 6 6 2                  |
| 159,375   | "      | June 10            | 4                             | Do. 4 p. c. Db. Stk.        | 130-135         | ..                  | 2 19 3                 | 500,000   | 100    | June 1             | 6                             | People's Gas 2nd M. of Chicago Bd. | 103-108         | ..                  | 5 11 1                 |
| 220,000   | Stk.   | Mar. 30            | 11½                           | Brighton & Hove Orig.       | 268-273         | ..                  | 4 4 3                  | 848,070   | 10     | May 26             | 6                             | River Plate Ord.                   | 9-9½            | ..                  | 6 6 4                  |
| 218,820   | "      | " 8                | 8½                            | Do. A. Ord. Stk.            | 195-200         | ..                  | 4 5 0                  | 250,000   | Stk.   | June 29            | 4                             | Do. 4 p. c. Db. Stk.               | 97-99           | ..                  | 4 0 19                 |
| 933,500   | Stk.   | Feb. 24            | 5                             | Bristol, 5 p. c. max.       | 127-132         | ..                  | 3 15 9                 | 250,000   | 10     | Apl. 29            | 10                            | San Paulo, Ltd.                    | 153-163         | ..                  | 6 1 3                  |
| 420,000   | 20     | Mar. 30            | 11½                           | British                     | 63-65           | ..                  | 4 1 9                  | 250,000   | Stk.   | Mar. 30            | 10                            | Sheffield A.                       | 245-248         | ..                  | 4 0 8                  |
| 50,000    | 10     | Mar. 11            | 11½                           | Bromley, Ord. 10 p. c.      | 25-27           | ..                  | 4 5 2                  | 135,000   | "      | " 10               | 10                            | Do. B.                             | 245-248         | ..                  | 4 0 8                  |
| 75,000    | 10     | " 8                | 8½                            | Do. 7 p. c.                 | 20-22           | ..                  | 3 17 3                 | 209,053   | "      | " 10               | 10                            | Do. C.                             | 245-248         | ..                  | 4 0 8                  |
| 500,000   | 10     | Apl. 29            | 6                             | Buenos Ayres (New) Ltd      | 9-9½            | ..                  | 6 6 4                  | 447,427   | "      | " 10               | 10                            | Do. D.                             | 245-248         | ..                  | 4 0 8                  |
| 98,122    | Stk.   | June 29            | 4                             | Do. 4 p. c. Db. Stk.        | 98-100          | ..                  | 4 0 0                  | 5,531,250 | Stk.   | Feb. 24            | 5½                            | South Metrop. 4 p. c. Ord.         | 142-145         | ..                  | 3 12 5                 |
| 150,000   | 20     | July 14            | 8½                            | Cagliari, Ltd.              | 30-31           | ..                  | 5 6 5                  | 1,460,000 | "      | July 14            | 3                             | Do. 3 p. c. Db. Stk.               | 100-103         | ..                  | 2 18 3                 |
| 100,000   | 10     | June 10            | 7                             | Cape Town & Dis., Ltd.      | 15-16           | ..                  | 4 7 6                  | 60,000    | Stk.   | Mar. 11            | 12                            | Tottenham & J. A.                  | 285-295         | ..                  | 4 1 4                  |
| 50,000    | 50     | May 3              | 6                             | Do. 6 p. c. 1st Mort.       | 58-60           | ..                  | 5 0 0                  | 60,000    | "      | " 9                | 9                             | Edmonton J. B.                     | 205-215         | ..                  | 4 3 9                  |
| 550,000   | Stk.   | Apl. 15            | 13½                           | Commercial Old Stock        | 315-325         | ..                  | 4 3 1                  | 162,380   | 10     | June 10            | 7                             | Tuscan, Ltd.                       | 124-134         | ..                  | 5 3 8                  |
| 200,750   | "      | " 10½              | 10½                           | Do. New do.                 | 252-257         | ..                  | 4 1 3                  | 149,900   | 10     | July 1             | 5                             | Do. 5 p. c. Dbs. Red.              | 100-103         | ..                  | 4 17 1                 |
| 200,750   | "      | June 10            | 4½                            | Do. 4½ p. c. Db. do.        | 148-153         | ..                  | 2 18 10                |           |        |                    |                               |                                    |                 |                     |                        |
| 800,000   | Stk.   | June 10            | 12                            | Continental Union, Ltd.     | 207-212         | ..                  | 5 13 2                 |           |        |                    |                               |                                    |                 |                     |                        |
| 200,000   | "      | " 9                | 9                             | Do. 7 p. c. Prf.            | 195-200         | ..                  | 4 10 0                 |           |        |                    |                               |                                    |                 |                     |                        |
| 51,600    | Stk.   | Feb. 24            | 14                            | Croydon A 10 p. c.          | 310-315         | ..                  | 4 8 11                 | 746,164   | Stk.   | June 29            | 10½                           | Chelsea, Ord.                      | 313-318         | ..                  | 3 6 0                  |
| 168,400   | "      | " 11               | 11                            | Do. B 7 p. c.               | 255-265         | ..                  | 4 8 0                  | 150,000   | "      | " 5                | 5                             | Do. 5 p. c. Prf.                   | 170-175         | ..                  | 2 17 2                 |
| 555,000   | Stk.   | Feb. 24            | 5½                            | Crystal Palace Ord. 5 p. c. | 127-132         | +2                  | 3 19 7                 | 160,000   | "      | " 4½               | 4½                            | Do. 4½ p. c. Prf. Stk. 1875        | 148-152         | ..                  | 2 19 3                 |
| 60,000    | "      | " 5                | 5                             | Do. 5 p. c. Prf.            | 142-145         | ..                  | 3 9 0                  | 175,785   | "      | Mar. 30            | 4½                            | Do. 4½ p. c. Db. Stk.              | 157-162         | ..                  | 2 15 7                 |
| 486,030   | 10     | July 28            | 11                            | European, Ltd.              | 123-124         | ..                  | 4 11 8                 | 1,720,500 | Stk.   | Apl. 15            | 8                             | East London, Ord.                  | 227-232         | ..                  | 3 9 0                  |
| 854,060   | 10     | " 11               | 11                            | Do. £7 10s. paid.           | 163-173         | ..                  | 4 14 4                 | 654,740   | "      | June 29            | 4½                            | Do. 4½ p. c. Db. Stk.              | 157-160         | ..                  | 2 16 8                 |
| 5,922,230 | Stk.   | Feb. 10            | 12½                           | Gaslight & Coke, A. Ord.    | 297-302         | ..                  | 4 1 1                  | 380,000   | "      | " 3                | 3                             | Do. 3 p. c. Db. Stk.               | 103-105         | ..                  | 2 17 2                 |
| 100,000   | "      | " 4                | 4                             | Do. B, 4 p. c. max.         | 120-125         | ..                  | 3 4 0                  | 700,000   | Stk.   | June 29            | 7½                            | G'd Junction, 10 p. c. Db. Stk.    | 115-118         | ..                  | 3 3 7                  |
| 665,000   | "      | " 10               | 10                            | Do. C, D, E, 10 p. c. Prf.  | 309-313         | ..                  | 3 3 11                 | 810,000   | Stk.   | Mar. 30            | 4                             | Do. 4 p. c. Db. Stk.               | 140-145         | ..                  | 2 15 2                 |
| 30,000    | "      | " 5                | 5                             | Do. F, 5 p. c. Prf.         | 220-240         | ..                  | 3 3 3                  | 700,000   | Stk.   | Feb. 10            | 13                            | Kent                               | 360-365         | ..                  | 3 11 2                 |
| 60,000    | "      | " 7½               | 7½                            | Do. G, 7½ p. c. do.         | 195-200         | ..                  | 3 2 6                  | 1,043,800 | "      | " 10               | 10                            | Do. New, 7 p. c. max.              | 213-218         | ..                  | 3 4 8                  |
| 1,300,000 | "      | " 7                | 7                             | Do. H, 7 p. c. max.         | 308-313         | ..                  | 3 10 0                 | 460,200   | 100    | June 29            | 10                            | Lambeth, 10 p. c. max.             | 293-308         | ..                  | 3 6 0                  |
| 463,000   | "      | " 10               | 10                            | Do. J, 10 p. c. Prf.        | 184-188         | ..                  | 3 3 11                 | 350,000   | Stk.   | Mar. 30            | 7½                            | Do. 7½ p. c. max.                  | 227-232         | ..                  | 3 4 8                  |
| 476,000   | "      | " 6                | 6                             | Do. K, 6 p. c. Prf.         | 131-133         | ..                  | 3 0 2                  | 500,000   | Stk.   | Feb. 10            | 13                            | Do. 4 p. c. Db. Stk.               | 140-145         | ..                  | 2 15 2                 |
| 1,061,150 | "      | June 10            | 4                             | Do. 4 p. c. Db. Stk.        | 148-153         | ..                  | 2 18 10                | 1,000,000 | Stk.   | July 28            | 4                             | New River, New Shares              | 432-437         | ..                  | 2 19 6                 |
| 294,850   | "      | " 4                | 4                             | Do. 4½ p. c. do.            | 198-203         | ..                  | 2 19 1                 | 902,300   | Stk.   | June 29            | 6                             | Do. 4 p. c. Db. Stk.               | 140-145         | +1                  | 2 15 2                 |
| 958,000   | "      | " 8                | 8                             | Do. 8 p. c. do.             | 134-144         | ..                  | 5 10 4                 | 126,500   | "      | " 6                | 6                             | Southwark & V. Hall, Ord.          | 169-168         | ..                  | 3 11 5                 |
| 70,000    | 10     | May 12             | 8                             | Hongkong & China, Ltd.      | 210-212         | ..                  | 4 13 0                 | 489,200   | 100    | " 5                | 5                             | Do. do. 7½ p. c. max.              | 155-160         | ..                  | 3 15 0                 |
| 8,500,000 | Stk.   | " 1                | 1                             | Imperial Continental        | 98-101          | ..                  | 3 19 8                 | 1,019,585 | "      | Apl. 15            | 4                             | Do. do. 5 p. c. Prf.               | 168-172         | ..                  | 2 18 2                 |
| 376,400   | 100    | Feb. 1             | 4                             | Do. 4 p. c. Dbs. Red.       | 103-106         | ..                  | 3 6 0                  | 1,155,066 | Stk.   | June 10            | 10                            | Do. 4 p. c. A. Db. Stk.            | 141-144         | ..                  | 2 15 7                 |
| 473,600   | Stk.   | Feb. 10            | 3½                            | Do. 3½ p. c. Db. Stk.       | 110-112         | ..                  | 4 9 3                  | 200,000   | "      | Mar. 11            | 5                             | West Middlesex                     | 297-302         | ..                  | 3 6 3                  |
| 560,000   | 100    | Apl. 1             | 5                             | Met. of Mel- 5 p. c. Db.    | 107-109         | ..                  | 4 2 7                  |           |        |                    |                               |                                    |                 |                     |                        |
| 250,000   | 100    | " 4½               | 4½                            | Bourne J 4½ p. c. Db.       | 107-109         | ..                  | 4 2 7                  |           |        |                    |                               |                                    |                 |                     |                        |

† Next dividend will be at this rate.



Commission of the 300 guineas which they voted, on so auspicious an occasion, to the funds of the leading charities in his neighbourhood. One thing I am almost certain of, which is that if ever the question should come to be discussed in Court, it will not be in the name of the real instigator of the opposition, but in that of another—an assignee or such like. He could not afford to throw away his reputation for benevolence by challenging such a benevolent action.

The only other matter of note before the Commissioners was the resolution to have the first sod of the new works cut by Mrs. Mitchell Thomson, the wife of the Lord Provost of Edinburgh, some time in October.

At the half-yearly general meeting of the Coatbridge Gas Company next Tuesday, the Directors will report that, notwithstanding the low rate charged for gas, and the fact that nearly all the larger iron-works in the district have introduced electrical installations, the satisfactory aspect of the Company's affairs, financial and otherwise, is still maintained. The sales of gas for the six months ending June 30 amount in the aggregate to 39,615,400 cubic feet, which is an increase of 251,623 cubic feet over the corresponding period of last year. The total revenue is £6439; the profit being £1988. From this the sum of £203 is chargeable for interest; and the remainder, added to the balance of £785 brought forward, makes the sum of £2570 applicable to dividends. The number of consumers increased by 507. The works and plant, under the supervision of Mr. T. Wilson, the Secretary and Engineer, have been carefully kept up, and are at present in a thoroughly good state of working efficiency. The unaccounted-for gas has been at the rate of 11.01 per cent.; and the average illuminating power of the gas supplied has been 23.30 standard candles. The Directors will recommend the payment of dividends at the rates of 10 and 7 per cent. per annum on the old stock and new shares respectively.

A Sub-Committee of the Glasgow Corporation Water-Works Department met on Monday, for the purpose of receiving a report regarding tenders for the supply of 1000 tons of piping. It was stated that six tenders had been received—four from local firms and two from firms in Philadelphia. The American offers were the lowest, amounting to £4282 and £4965 respectively. The local estimates were £5461, £5734, £5910, and £5960. In respect, however, that the American firms tendered for 12-foot lengths, instead of 9 feet, as specified, it was agreed to re-advertise for fresh offers of 9 and 12 feet lengths, alternatively.

### CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, July 30.

**Sulphate of Ammonia.**—A further improvement in values has to be recorded for the week. During the first few days, dealers continued anxious to fill their engagements; and parcels in Scotland were eagerly sought—the best makes eventually realizing £9 12s. 6d. f.o.b. Leith for prompt and August delivery. At Hull and Liverpool, by reason of the small supplies, a limited business only has passed; but, in sympathy with the Scotch market, values have advanced—being about £9 10s. to

£9 12s. 6d. per ton f.o.b. As was to be expected, the demand has fallen away somewhat during the closing days of the month; dealers' pressing requirements being filled, and consumers mostly continuing to hold aloof. Supplies having been cleared, the position, however, remains firm. For forward delivery no further business is reported; but quotations remain unchanged.

**Nitrate of Soda** is firmer—7s. 7½d. per cwt. now being asked for fine quality on the spot.

LONDON, July 30.

**Tar Products.**—A holiday feeling has taken possession of this market. Makers are indisposed to sell forward at to-day's quoted prices. Production being at its minimum, and stocks in all cases being low, there is no pressure nor reason for selling. Values are generally only nominal, as practically no business is being done.

The average prices obtaining during the week are: Tar, 12s. to 15s. Pitch, east coast, 23s. 6d.; west coast, 19s. Benzols, 90's and 50's, nominal, 10d. Toluol, 1s. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 1d.; crude, 30 per cent., naphtha, 4½d. Creosote, 2½d. to 2¾d. Heavy oils, 42s. 6d. Carbolic acid, 60's, 2s. Naphthalene, 52s. 6d.; salts, 30s. Anthracene, nominal, "A," 4½d.; "B," 3½d.

**Sulphate of Ammonia** is firmer; and higher prices are being asked all round. There appears to be a scarcity of sulphate for prompt shipment. There are buyers both for the last three months of this year, as well as for the first three months of next, at good prices. Sales during the week have averaged £9 7s. 6d. to £9 10s., less 3½ per cent.

### COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—The only change of any moment to notice in the coal trade of this district, is that in house fire descriptions. There has been a decided slackening off, and the better qualities of round coal are accumulating at the collieries in increasing quantities. Short time is becoming more general—many of the pits not working more than four days per week. The position generally, however, continues much more satisfactory than is usual at this time of the year; stocks have not yet accumulated to anything like the extent that is customary at the commencement of August, and the surplus output, for the most part, will be necessary to meet prospective winter requirements. Prices are also being very steadily maintained; and it is only in exceptional cases where collieries have surplus lots which they are anxious to clear off promptly, that there is any giving way upon the current list rates. With regard to forward contracts for house fire coal, the position would seem to be that in most cases these have been booked on the basis of full list rates, which represent advances of something like 6d. per ton over the prices at which contracts were taken last year, and that generally, in addition, there is a clause for regulating prices in accordance with any advance in wages that may come into effect. At the pit mouth, the current prices are firm at 10s. to 10s. 6d. for the better qualities of

# CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ltd.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.

American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETET, LONDON."

## CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

|                                                              | Cubic Feet Daily. |                                                 | Cubic Feet Daily. |
|--------------------------------------------------------------|-------------------|-------------------------------------------------|-------------------|
| BLACKBURN . . . . .                                          | 1,250,000         | TORONTO (Second Contract; Remodelled) . . . . . | 2,000,000         |
| WINDSOR STREET WORKS, BIRMINGHAM . . . . .                   | 2,000,000         | MONTREAL . . . . .                              | 500,000           |
| SALTLEY WORKS, BIRMINGHAM . . . . .                          | 2,000,000         | BELLEVILLE . . . . .                            | 250,000           |
| COLCHESTER . . . . .                                         | 300,000           | OTTAWA (Second Contract) . . . . .              | 250,000           |
| BIRKENHEAD . . . . .                                         | 2,250,000         | BRANTFORD (Remodelled) . . . . .                | 200,000           |
| SWINDON (New Swindon Gas Co.). . . . .                       | 120,000           | ST. CATHERINES (Remodelled) . . . . .           | 250,000           |
| SALTLEY WORKS, BIRMINGHAM (Second Contract) . . . . .        | 2,000,000         | KINGSTON, PA. . . . .                           | 125,000           |
| WINDSOR STREET WORKS, BIRMINGHAM (Second Contract) . . . . . | 2,000,000         | PETERBOROUGH, ONT. . . . .                      | 250,000           |
| HALIFAX . . . . .                                            | 1,000,000         | WILKESBARRE, PA. . . . .                        | 750,000           |
| TORONTO . . . . .                                            | 250,000           | ST. CATHERINES (Second Contract) . . . . .      | 250,000           |
| OTTAWA . . . . .                                             | 250,000           | BUFFALO, N.Y. . . . .                           | 2,000,000         |
| LINDSAY (Remodelled) . . . . .                               | 125,000           | WINNIPEG, MAN. . . . .                          | 500,000           |
| ROCHESTER . . . . .                                          | 500,000           | COLCHESTER (Second Contract) . . . . .          | 300,000           |
|                                                              |                   | YORK . . . . .                                  | 750,000           |

500,000 Cubic Feet.



Arley; 8s. 6d. to 9s. for Pemberton four feet and seconds Arley; and 7s. 6d. for common house fire coal. In gas-making coal there is no further move of any moment. Some important contracts are not yet settled; but prices remain practically the same as those quoted last week. All descriptions of fuel for manufacturing purposes continue in active request, with prices firm at full rates for steam and forge coals, and a tendency to harden on engine classes of fuel, advances of 3d. per ton being quoted in some instances although scarcely being got generally. At the pit mouth, steam and forge coal averages 7s. up to 7s. 6d. for some special sorts; engine fuel, 3s. 6d. for common, 4s. to 4s. 3d. for medium, and 4s. 6d. to 5s. for best qualities. For shipment a brisk inquiry still comes forward, owing to the continuance of the South Wales dispute, and 8s. 6d. to 8s. 9d. is got for ordinary steam coals, with here and there 9s. realized for some of the more special qualities, delivered at the ports on the Mersey.

**Northern Coal Trade.**—The coal trade in the north-east is very brisk; and under the stimulus of a fuller demand, the range of prices is rather higher. The production is also being restricted by the local and other holidays. Best Northumbrian steam coals are firm at from 13s. 6d. to 13s. 9d. per ton f.o.b.; second qualities are about 12s. 6d. per ton; and steam smalls are scarce at from 6s. to 6s. 6d. per ton. The bunker-coal trade has been very brisk, and prices have been firm; but the supplies are now rather fuller, and unscreened qualities may be had at about 9s. 9d. to 10s. 3d. per ton. In the gas-coal trade, there has been great interest felt in the decision as to the supplies of coal for the Sunderland Gas Company. It is believed that the contracts have been given chiefly to the Londonderry and Lambton and other collieries comparatively near to the works; the quantity being about 8000 tons monthly on the average. The price has not yet transpired; but it is believed to be about 1s. per ton above that of the past year, on the average, for best Durham gas coals. For occasional cargoes of gas coals, high prices are now asked (about 10s. per ton being a current quotation), while the pressure of demand for gas coals is unusually heavy for this time of the year. Household coals are very dull; and there is no alteration in the price of manufacturing coals. Coke is very firm. Gas coke is steady, and prices are maintained, the stocks of gas coke being low, except at one or two of the inland centres of manufacture.

**Scotch Coal Trade.**—Work has been resumed at the collieries; but on account of the very fine weather, and the miners having plenty of money, it has been somewhat intermittent, and supplies have not been large. There being now an expectation that the Welsh trouble may not be settled for some time, buyers are showing an increasing inclination to book forward; and, for the same reason, sellers are holding out for prices at least as good as those which are current. There is a great demand for ell; and the supply is being got with difficulty. The prices quoted per ton f.o.b. Glasgow are: Main, 9s.; ell, 9s. 6d. to 10s.; and splint, 9s. 6d. The shipments for the week amounted to 160,084 tons—a decrease upon the preceding week of 67,856 tons; but an increase on the corresponding week of last year of 30,152 tons. For the year to date, the total shipments have been 5,277,385 tons—an increase upon the corresponding period of last year of 1,047,795 tons.

**Bright's Light and Power, Limited**, is the title of a Company formed with a capital of £200,000, in £1 shares, to adopt and carry into effect an agreement expressed to be made between Charles Bright and the Company, to act as undertakers for the supply of electricity and gas for lighting and other purposes within the Argentine Republic or elsewhere, as electricians, gas and mechanical engineers, dealers in mineral oils, motive power, traction, heat, and light, and as contractors for lighting streets and other places and public and private buildings by gas or otherwise, and to construct and maintain reservoirs, water-works, &c.

**Electric Lighting Extensions at Salford.**—Lieut.-Col. A. C. Smith, representing the Local Government Board, held an inquiry at Salford last Thursday into an application by the Corporation for power to borrow £33,000 for electric lighting. From the opening statement of the Town Clerk (Mr. Sam. Brown) and the evidence of witnesses, it appeared that £57,770 has been borrowed for the purposes of the electricity works, and that of the £33,000 now sought to be borrowed £10,000 is required for land for a large new generating station at Pendleton, £10,700 for electrical mains, and £11,300 for three battery sub-stations in the different districts of the borough. In illustration of the urgent necessity for the provision of land for a new station, figures were given showing the great increase in the demand for current. The Committee, it was stated, expected to have in the coming winter new customers for 20,000 8-candle power lamps; applications had been received for motive power equal to about 2000-horse power; and motive power to the extent of 6000-horse power would be required to drive the tramcars. At the close of the evidence, the Inspector visited the sites of the proposed works.

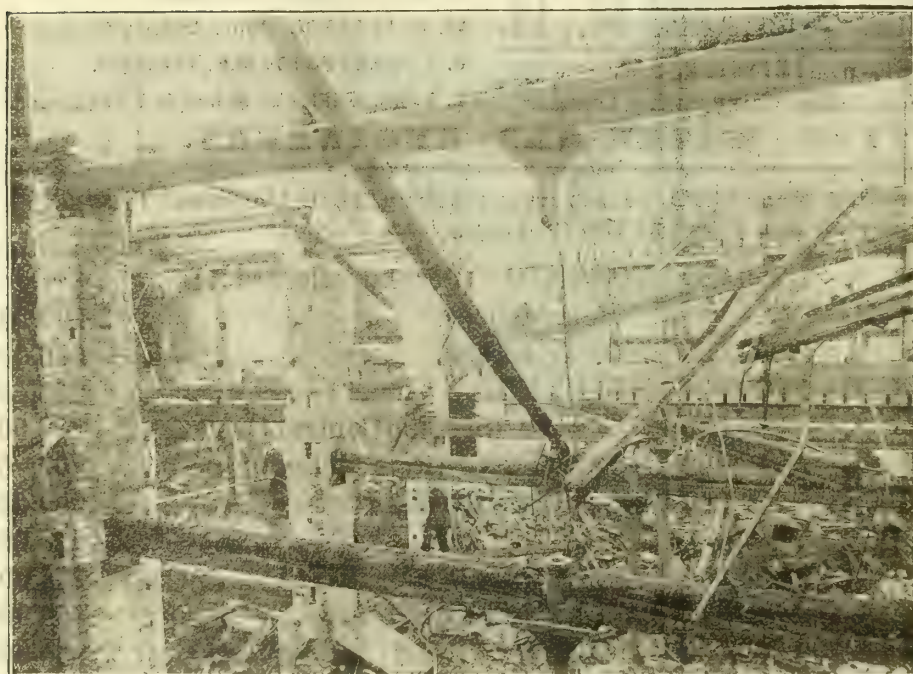
**Horsforth Water Supply.**—At Horsforth, the question of the water supply has for some time past been of paramount importance. On the part of the consumers there has been much grumbling regarding the quality of the water; and at the same time the District Council have been in correspondence with the Company with reference to the transfer of their works. But the latter are unwilling sellers, and will not entertain any proposal which does not give them the full amount to which they are entitled. In a letter addressed to the Council by the Company's Solicitors, and which came before the former yesterday week, it was stated that the Company would only part with their property on the terms sanctioned by Parliament; and, furthermore, they did not believe in the exclusion of 10 per cent. compensation for compulsory purchase. Seeing the determined attitude of the Company, the Council reluctantly passed a motion that the works should be purchased on the terms named; but it is expected that there will be strong opposition from the ratepayers. Three actions, bearing upon the question of the quality of the water, came before the Leeds West Riding Court last Tuesday. On the application of the Company, summonses had been issued against the representatives of the Horsforth Conservative Club, the Liberal Club, and the Recreation Club, for the recovery of water-rates. During the hearing, it was admitted by the Manager of the Company that, owing to the scarcity of water this season, compensation water had been supplied for domestic use, and that a little of the washings of the roads had found their way into the water. The Magistrates dismissed the cases, and allowed the defendants costs.

## THE HOTTEST FIRE

Richmond's  
Works have  
yet produced.

For Particulars see  
"JOURNAL" for July 19,  
Page 169.

**Richmond & Co**  
LIMITED,  
LONDON, WARRINGTON, and  
STRATFORD.





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## TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

## EDITORIAL NOTES.

## The Chartered Meeting.

THE meeting of the proprietors of The Gaslight and Coke Company on Friday last will be found reported in another column; and as, from motives of economy and others, the Directors of the Company do not see their way to follow the South Metropolitan practice of sending out with the dividend warrants an authenticated transcript of the proceedings at these meetings, we are sorry to say that those proprietors who do not happen to see the "JOURNAL" will not be able to form a clear idea of how matters are going with this vast undertaking. It is a strange commentary upon the oft-repeated declaration of the Governor that the Administration of the Company have nothing to conceal, and court the fullest investigation of their proceedings, that the Directors should deliberately deny those proprietors who do not make the half-yearly pilgrimage into the purlieus of old Westminster the means of informing themselves as to what goes on at the general meetings. It is not that the majority of the proprietors would ever take an intelligent interest in the conduct of the business from which they derive their dividends, by reason of their having a report of the proceedings of the meeting placed in their hands. It is one of the evils of the joint-stock company principle of trading that shareholders usually have to rest content with opening their mouths for their dividends, and shutting their eyes to the means whereby the profits are earned. Really competent critics of a Gas Company, or of any other great statutory concern, must always be few; but it is not the part of a self-respecting directorate to shirk the painful duty of making their nominal constituents acquainted sometimes with the worst as well as with the best that can be said of them in their official capacity.

And, if one may credit Colonel Makins, the Directors of The Gaslight and Coke Company are a real mirror of rectitude and boldness in doing what they esteem to be their duty, in scorn of such considerations as opportuneness or what the world thinks. Their nerve, when it comes to selling the dearest gas in the kingdom for the quantity, or of clinching a bargain for a year's supply of coal at top market rates, is like that of the Duke of Plaza Toro. Why should they be afraid? Parliament will not go back upon the sliding-scale bargain; and as to what further restrictions may be placed upon future capital issues, the holders of the existing capital need not trouble themselves. It is no concern of theirs. Moreover, there is nothing in the bogey of purchase by a public authority. "The London County Council have to reckon with the Water Companies first!" Let us put up the price of gas to cover our red-taped commercial methods. We are a *quasi* Department of State, and whoever heard of Government business being done upon ordinary trade principles? It is a little annoying, but utterly useless, for pestilent agitators like Mr. George Livesey to attend these meetings and convict the present Administration of squandering capital, crippling the business, and being incapable either of buying or selling to advantage. The proprietors do not care for any of these things; or if some of them do, they are but an insignificant handful.

Such are some of the reflections suggested by Friday's proceedings. The Governor, flippantly, as is his manner, remarked that there is so much groaning at the Administration from without, that indulgence in just a little optimism within the Horseferry Road circle is pardonable. But what insensate, not to say blind, optimism pervades every communication from the Chartered chair! Everything is "satisfactory," according to the official view. If the price of gas is raised, it is in the interest of the consumers as much as on any other account. When the management succeeds in doing as well as other Gas Companies in any particular, it is "satisfactory." When a transaction is found to be very much worse than a similar one carried through by other hands, it is still more "satisfactory." Does Parliament manifest a desire to know how the Company stand with the public? How gratifying! Perhaps the silent dispersal of the proprietors on Friday without passing the customary vote of thanks to the Board who have presented them with a reduced dividend, and stirred up more discontent against the undertaking than has been shown during the past quarter of a century, is far more "satisfactory" than anything mentioned in the glozing sentences of the Governor.



It is impossible to leave this subject without mention of the personal element in the Horseferry Road problem. Hitherto the contest over the huge body of the undertaking has been between Mr. Livesey on the one side and the Governor and General Manager on the other. On Friday last it was enlarged to include Mr. Corbet Woodall, whom Mr. Livesey, by implication, claimed to be upon his side. Much sympathy will be felt for Mr. Woodall in the awkward position thus created for him. On Friday he had to sit silent while his name was being bandied between the powerful critic in the body of the meeting, and the mouth-piece of the Board in the chair. Mr. Livesey accused the Board—that is, the Governor—of taking advantage of the lamented death of the Hon. Henry Noel to neutralize the expert in the person of Mr. Woodall by rushing in a typical professional Director in the person of Mr. John Miles. In making this serious charge, Mr. Livesey used the phrase “indecent haste” to stigmatize the fashion of the appointment, and ignored the appeal of the Governor to withdraw the epithet. But inasmuch as there was a little disagreement between the Governor and Mr. Livesey upon the fact of the period of time that was allowed to elapse between the occurrence of the vacancy and its being filled, the question of the fitting phraseology for describing the proceeding remained open.

Altogether, it must be concluded that if the whole of the Directors of The Gaslight and Coke Company parted on Friday upon good terms with themselves, they must be easily pleased. There is a pungent political saying, with which the Governor, as a “quasi-statesman,” must be familiar. It is that “anybody can govern with a state of “siege.” For “state of siege” read “power to increase “the selling price and diminish the dividend;” and here is the secret of the “satisfactory” administration of The Gaslight and Coke Company by its present chiefs.

#### Gasholders and the Law of Nuisance.

JUDGMENT has at last been delivered in the action of *Jordeson v. The Sutton, Southcoates, and Drypool Gas Company*, reported in the “JOURNAL” in February last, when it was heard by Mr. Justice North, sitting without a jury. Some issues of fact were decided at the time, as will be found recorded in our issue for Feb. 22 (p. 410). One of these was as to the effect of the erection of a holder 105 feet high upon the light previously enjoyed by the plaintiff's cottages in the vicinity; and another was as to whether the construction of the tank for the holder had been carried out without negligence, in the legal sense of the term. The points reserved for consideration had respect to the difficult legal question of the liability of the undertakers for the consequences of acts done by them in the exercise of their statutory powers. His Lordship has now completed his judgment; and it is against the Company on all the issues. Having decided that the erection of a gasholder to the proposed height of 105 feet would interfere with the access of light to the neighbouring cottages, the Judge finds that this would be an unjustifiable nuisance. An injunction accordingly issues; but it is not to prevent the Company from raising their holder to the height of 68 feet from the ground-level. The work of constructing the tank was not negligently done; but still, in his Lordship's opinion, a considerable amount of injury was inflicted thereby upon the plaintiff's property, for which he ought to be compensated. Accordingly he gets £340 for damages; the amount being assessed by the Judge himself, by request. The main line of the Company's defence was that their Acts of Parliament conferred upon them an absolute right and duty to do what was complained of upon this very site. But the proposition has failed. It is of the greatest importance that the reasons for the failure should be studied. The statutory obligation to supply gas carries with it certain rights; but the rights are not such as would warrant the particular acts brought into question. This is the gist of the whole judgment. It is an instance of judicial arguing from the general sanction to the particular application. A Gas Company must erect holders. True; but they need not erect them in utter disregard of the rights of other people to light for their houses and support for their land. It is therefore held that the case in point is governed by the class of decisions of which *The Metropolitan Asylums Board v. Hill* is an example; and not by the class of cases to which *The London, Brighton, and South Coast Railway Company v. Truman* belongs. That is to say, the right of the Company in this connection is

permissive, not obligatory. The former of these leading cases is discussed, in agreement with Mr. Justice North's reading, in “Michael and Will” (4th ed., p. 193); but the other case is merely mentioned as a contrast. Hence we must understand for the future that section 29 of the Gas-Works Clauses Act, 1847, is fraught with weighty significance, reinforced as it is by section 9 of the Act of 1871, which says that “nothing in this or the Special Act shall “exonerate the undertakers from any indictment, action, “or other proceeding for nuisance, in the event of any “nuisance being caused by them.” The only grain of comfort to be gathered from Mr. Justice North's decision is that there must be specific damage done to give cause of action. The moral of the case is that gas undertakers should agree with their neighbours wherever possible, and be careful not to rely too confidently upon their statutory privileges.

#### The Evil of “Cadging” in the Gas Trade.

In a recent issue of the “Ironmonger,” the editorial notes (which, by the way, are as usual particularly well written) are devoted to the “Ethics of Cadging.” The motive of this disquisition is the seasonable recurrence of “that “peculiar institution known as the beanfeast or wayz-“goose.” It is, of course, possible to discuss this feature of the life of the British workman from various points of view. As a rule, our contemporary admits that the institution is an evidence both of the determination of the British workman to enjoy himself on occasion in his own manner, and also of his readiness to pay for his enjoyment like a man. If the day's pleasure is provided at the expense of the employer, which is often the case, it is again a subject for pleasant reflections, as exhibiting the kindly relationship that prevails, generally speaking, between the work-giver and the worker of this country. But there is another aspect of the “beanfeast,” which is not so pleasant to contemplate. There exists in some quarters, and in particular trades, a bad custom of begging from business customers, agents of wholesale firms, and others, for subscriptions towards the cost of these jollifications. As our contemporary says, the moving agent in this degrading performance is some foreman or clerk; and not infrequently the firm's business letter-paper is used for conducting this “cadging foray.” Specimens of several of these begging letters are given; but one glaring example will suffice. It is “a lengthy letter, written in a nice clerkly hand on “business paper, and signed by a foreman.” The writer begins by regretting that two previous appeals for subscriptions had remained unheeded. He goes on to apologize for the smallness of the business connection which is made the excuse for the appeal, and “expresses the hope “that he will shortly be able to send more orders.” The last sentence exposes the true inwardness of the trick.

The topic that arouses the “Ironmonger's” scorn is mentioned here because we have only too good reason to believe that it is a kind of trade canker which is to be found in a very bad form in certain departments of the gas industry. The lower staff of the distributing branch of a gas undertaking have always been a source of anxiety to their official superiors. The “gas men” who are brought into contact with publicans, managers of places of public entertainment, and so forth, are peculiarly exposed to temptations which need not be particularized. Nowadays the distributing staff have dealings with many more people, and with representatives of more various interests, than ever. Here, again, it is unnecessary to particularize; but it is certain that many a manufacturer's agent could tell some rather strange tales of invitations to join “gas men” in their outings, and of the consequences as regards his pocket. The evil will go on so long as the mutual jealousies of rival traders induce them to submit to this kind of blackmail, for fear of offending a class of small officials who are much more influential than their superiors always realize. It is nevertheless a scandal which these superiors should deal with, for their own credit's sake. If the next trader to be victimized in this way were to send evidence of the fact to the Directors of the Gas Company concerned, which might be done without unnecessarily exposing the source of the information, some remedial action might be taken. The old revolutionary principle applies here: “Who would be free, themselves must strike “the blow!” for it is hopeless to expect gas directors or even high officers to know to what practices the subordinate staff are addicted in secret.



**Smokeless Fuel Wanted.**

A MAGNIFICENT example of journalists' wisdom, which often exceeds that of the average Coroner's jury, may be found in some recent utterances of the "Daily News" in regard to the fining of a London Water Company for emitting black smoke from the chimneys of their pumping-station. The Welsh colliers' strike has produced many curious consequential results; and among the most troublesome of these is the demonstration that the comparative absence of black smoke from London factory chimneys has been mainly due to the nature of the fuel consumed, and not to the character of the means employed for burning it. Smoke abatement has been a "cause" in London for many years; and the smokelessness of most Metropolitan industrial chimneys has been taken as a proof that the laws against smoke emission are much better administered in the capital than in such neglected places as Manchester. It has been roundly asserted that where the Local Authorities of the northern towns have failed to prevent the emission of dense smoke from factory chimneys, the true reason has been the presence of the offending manufacturers in such authorities and upon the local Bench. London has supplied an answer to this reproach. The experience of the past few months has proved that London factory owners simply avoided producing smoke by burning smokeless Welsh coal so long as they could get it. It was the same with the Railway Companies and others. When the supply of smokeless coal failed, there was nothing for it but burning something else; and then the police and the magistrates began to be busy, while the atmosphere of some parts of the Metropolis assumed an appearance and consistency reminiscent of Stockport. Lastly, the Water Companies fell just like the others. Their boiler furnaces were only adapted to deal smokelessly with a particular kind of fuel; and when this could no longer be had, the law of smoke prevention was broken under the stress of the greater law that the pumping of water for the proper supply of the town must go on. Nevertheless, the offenders were fined; and the newspaper comment was that "the probable effect of the Welsh strike, if it lasts long enough, will be to deprive Wales of its monopoly by stimulating invention for the production of smokeless coal." How would one set about inventing a particular kind of "coal"? It is not very creditable, perhaps, to the mechanical engineering of the age that the failure of the Welsh smokeless coal supply to London and the South of England should have exposed the backwardness of the practice of smoke prevention in respect of steam-boiler furnaces; but the fact is worth noticing for all that it implies.

**Artificial Albumen.**

It will not be wise to attach too much importance to the report, which went "the round of the papers" last week, to the effect that Dr. Lilienfeld, of Vienna, has succeeded in producing artificial albumen, the basis of animal food, from certain coal-tar derivatives. The demonstration seems to have been conclusive as to the fact; for Dr. Lilienfeld is reported to have performed it before a congress of chemists. The process is described vaguely as consisting in "the condensation of phenol and amydo-acetic acid with phosphoro-chloric oxide," which produces "pepton;" and this hitherto exclusively animal product somehow comes out at last as albumen, not to be distinguished by any test from the natural article. There is nothing impossible about this. Other products ordinarily resulting from vegetable and animal life-processes have been artificially made from coal-tar derivatives; and why not albumen? It is probably only a question of degree. All the same, we are as yet far from realizing the newspaper prognostication that we are all to "have on the breakfast-table a cruet containing phosphoro-chloric oxide, with which we shall make our own eggs." The suggestion that "eggs for political purposes will be manufactured with a deliberate deficiency of chloric oxide," is only an indication of how soon man's natural depravity affects the products of his intellectual forces. We shall have to wait some time for these fruits of chemical industry.

**Gas Traction for Tramways.**—The Neath and District Tramways have been acquired by the Corporation of Neath, and extended  $4\frac{1}{2}$  miles; and at a recent Local Government Board inquiry in regard to an application for sanction to borrow £15,000 for gas-works purposes, it was stated that the lines would henceforth be worked by gas traction.

**ESSAYS, COMMENTARIES, AND REVIEWS.****GAS AND WATER COMPANIES IN THE STOCK MARKET.**

(For Stock and Share List, see p. 330.)

LAST week was a rather disappointing one on the Stock Exchange. Upon the re-opening on Tuesday, although the attendance was small and business was quiet, the general tendency was firm. Aided by the improving prospects of an early pacification in the western world, things took quite a cheerful turn, when suddenly a disturbing factor arose in the East, and the intelligence received from China threw things completely back again. Consols were sensitive, and had a smart drop. In special lines, Rails were depressed by low dividend announcements; but Americans, of course, were buoyant. The Money Market is as easy as possible; short money being overabundant, and discount rates having slipped down appreciably. Business in the Gas Market was decidedly quiet; and it looks as if the usual autumnal torpor has fairly set in. Movements in price were few in number and slight in degree; and they were irregular too—there being about as many in the one direction as in the other. The general tendency, however, appears to be fairly firm. In Gaslights, the "A" was put down a couple of points on the opening day by way of marking the fall in the dividend. But this level was steadily maintained through the week; and transactions were made daily at 29 $\frac{3}{4}$ . The secured issues were firm and quiet. In South Metropolitan, business was decidedly limited. But the stock was strong, aided by the favourable report and accounts issued; and it rose a point. The rate of dividend will be raised from £5 5s. to £5 6s. 8d. per cent.; the latter being a more conveniently calculable figure. Some business was done in Commercials, at rather better prices; but the quotations did not move. The Suburban and Provincial Companies were all very quiet and steady. The accounts recently to hand continue to show that, as a class, they have done well in the half year. The Continental Companies were just as quiet as the rest, and ruled firm generally; while Union had a further slight advance. None of the minor undertakings presented any feature calling for notice. Business in the Water Companies was remarkable for being almost entirely confined to secured issues. The tendency was good; and a few advances in quotation were scored. The Kent Company meet to-morrow, and will declare a higher dividend.

The daily operations were: Business in Gas was quiet enough on the opening day, Tuesday; but it fell calmer still later on. Gaslight "A" receded 2. Wednesday was very slack indeed; but prices were good for the most part. South Metropolitan gained 1. Thursday was even quieter; and no changes in Gas prices were effected. But in Water, Southwark ordinary rose 3; ditto "D," 2; and Grand Junction debenture, 2. Friday brought a little more activity into the market; and prices were good. Continental Union preference rose 2; but Newcastle debenture fell  $2\frac{1}{2}$ . Saturday was quite devoid of feature; and quotations closed unchanged.

**ELECTRIC LIGHTING MEMORANDA.**

**New Electrical Schemes and the Financial Press—A Primary Battery Scheme—Nature of the Cell—Criticisms.**

RECENT revelations of some of the tricks of company promoting are having a noticeable, though it may be transient, effect upon the conduct of the financial Press with regard to new ventures. There may or may not be honest and independent daily financial newspapers. We are not called upon to decide so nice a question; but it is amusing just now to observe the gingerly way in which these publications handle projected schemes, electrical and otherwise. Their conductors are well aware that what are put forward in their editorial columns as opinions of the soundness of new company issues are thoroughly "suspect." It does not matter whether these opinions are good, bad, or indifferent, the suspicion of venality clings to them still. If favourable, the supposition is that they are bought by the promoters; if bad, that the paper has not been "squared." Mere indifference signifies nothing either way. The difficulty with this section of the Press is that it cannot afford to be indifferent to the character of the speculations that are offered to the public day by day, any more than a political journal can live outside politics, or a technical periodical be consistently ignorant of its chosen technic. Regular operators may buy the paper for the sake of the market news; but this is not a sufficient reason for the existence of a fully-equipped journal. Consequently, one notices, notwithstanding the circumstance of the financial Press being actually under a blacker cloud than ordinary, that it ventures to put forth a timid opinion or two respecting the character of new companies.

One such expression of opinion, respecting a "Syndicate" formed to introduce a primary battery for the generation of electricity for lighting and small power purposes, lately attracted our attention by reason of the modesty of its phraseology. Nothing could be meekier than the way in which the merits of this battery were descanted upon. Not so very long ago, any financial newspaper engaged in the puffing of an electric lighting



project would have gone against gas with a lurid display of abusive adjectives, and declared that anybody who ventured to doubt the transcendent merits of the new speciality would deserve to be consigned to an asylum for idiots. Now it is merely suggested that, if the reports of the expert gentlemen who have tested the new battery are to be relied upon, there may be something in it. True, electricity thus generated must always be dearer than that obtainable from a steam or gas-driven dynamo; but cost is not everything, when requirements are small. It has always been recognized that the primary battery is a handy source of electrical energy, up to a point; and it is at least conceivable that invention might succeed in enlarging the scope of this class of electrical apparatus. Wherefore, why not give a second thought to the proposals of the New Electricity Supply Syndicate, formed to exploit a system of supplying electricity without machinery.

It is hardly surprising that this old familiar strain should be heard once more. It is some time since a new primary battery was placed upon the market; and history was due to repeat itself. The promised "Revolution in Electricity" attaches itself to what is styled the "Rowbotham Primary Generator;" and our contemporary the "Electrical Review" promptly condemns the whole thing to "the fate of every other enterprise of the kind—namely, complete failure." As we may have inquiries on the subject, it will save time and trouble to give a general description of the "generator," which consists of a series of galvanic cells mounted on an inclined plane, in order that the electrolyte may flow from one to the other by gravity. The elements of the cell are carbon and iron; the former not being consumable, while the latter is used up in proportion to the energy drawn from the system. There is no novelty here, either of arrangement or of material. "The use of iron as the positive element is pretty ancient history. Blanch Brain, and especially the notorious D'Humy, and others, tried iron; but we hear nothing of their batteries now." Similarly, the system of circulating the electrolyte has been tried over and over again; and every conceivable blend of fluid has been used for this purpose. Yet the use of galvanic batteries for electric lighting has never been a success, for the reasons that the plan is extravagantly costly, and that the efficiency of such generators rapidly falls in use.

Professor S. P. Thompson and Mr. Haydn T. Harrison have vouched for the fact that, having regard to the cost of the raw materials consumed, the Rowbotham battery will supply electricity for about 5d. per unit. Our contemporary asks pertinently, for how long? And what is included in this estimate of cost, for comparison with a steam or gas-driven dynamo plant? Seriously, it is asked how experts can, in the present year of grace, issue such reports as that in question. It is but fair to record the curious fact that the other leading English electrical journal, the "Electrician," does not think the case of primary batteries so hopeless, nor this particular example so bad. Indeed, it professes to see in the Rowbotham cell "in many respects the essential elements of commercial success." Yet it is far from conceding that this generator is everything that could be desired. We are disposed to agree with this authority that the success of the "new" battery will not depend upon whether it can generate electricity for 6d. or 1s. 6d. per unit; but wholly upon "whether it can be installed and used continually without inconvenience from frequent need of repairs, or the annoyance due to bad smells and a voltage that asymptotically [good word!] approaches zero. Not the brief tests of experts; but the test of time and actual practical use will settle such points as these." But should they not have been settled before the cell was put upon the market?

## THE ACETYLENE EXHIBITS AT THE IMPERIAL INSTITUTE.

(Continued from p. 252.)

THE Sunlight Gas Company, Limited, are the owners of Mr. R. Goodwin's patent, No. 17,644, of 1896, for the "Production of Acetylene and Carbonic Acid Gas Combined." The apparatus made by the Company resembles, in essential points, that illustrated and described in the abstract of Goodwin's specification in our "Register of Patents," Vol. LXIX., p. 655. Briefly Goodwin's system as carried out by the Sunlight Gas Company, Limited, consists in decomposing a mixture of calcium carbide and calcium carbonate in suitable proportions by means of water acidulated with sulphuric acid. The gas evolved is purified by means of copper sulphate. The calcium carbonate is added to the carbide in order that the gas may consist of a mixture of acetylene and carbonic acid in place of acetylene alone. What advantages does such a mixture possess over simple acetylene, and are its advantages discounted by any serious disadvantages?

It is comparatively ancient knowledge that a luminous gas flame may be disilluminated by the addition to the gas of a certain amount of carbonic acid. Professor Vivian B. Lewes has shown that 1·26 volumes of carbonic acid are required to disilluminate the flame from one volume of 16·3-candle coal-gas; while 2·29 and 3·12 volumes of carbonic acid are required per volume of 24-candle and 43-candle oil gas respectively. With these rich gases, the carbonic acid is a far more potent disilluminating

agent than is air; for the volumes of air required to render the gas flames non-luminous are more than double those of carbonic acid. Carbonic acid is, indeed, the most potent disilluminant of all the common inert gases, probably in virtue of its high specific heat. The temperature of a gas-flame disilluminated by carbonic acid is lower than that of the luminous flame or one disilluminated by air. The presence of an inert gas in coal gas also retards the separation of carbon in the flame; and the temperature required for the decomposition of acetylene is directly raised by the presence of a gas such as carbonic acid. From observations such as those which Professor Lewes placed on record in 1892,\* we may infer that carbonic acid has a disilluminating action on the flames of hydrocarbon gases, not because it aids the combustion of the gas, but because it lowers the temperature of the flame. Reduction of flame temperature implies waste of energy, and therefore the addition of carbonic acid to an illuminating gas is attended with a falling away from its maximum illuminating duty. The store of energy in the gas is partially frittered away in low-degree heat, instead of being as far as possible given out in luminous radiation.

A report on Mr. Goodwin's system for the production and use of a mixture of carbonic acid and acetylene by Professor J. Emerson Reynolds, D.Sc., F.R.S., states that the best effects are obtained when the proportion of carbonic acid is from 5·8 to 8·5 volumes per cent. This proportion suffices to produce a mixture which gives a white and smokeless flame under conditions under which acetylene would smoke freely. The mixture therefore has a great practical advantage over acetylene; but at what cost is the advantage gained? On this point Professor Emerson Reynolds gives no precise information. He says that the photometric value of the plain acetylene flame is 15 to 16 times that afforded by the same volume of Dublin coal gas; but he does not say or show that this photometric value is preserved when the acetylene is mixed with carbonic acid. In the absence of direct evidence to the contrary, we are prepared to maintain that the illuminating value of acetylene is lowered by an admixture of carbonic acid; and that the smokelessness of the flame from the mixture is secured by taking some steps in the direction of disillumination of the flame. The percentage of carbonic acid, though small, must lower the temperature of the flame below that of plain acetylene, and hence must reduce the capacity of the flame to emit luminous radiations. The waste may be small, but undoubtedly there is waste of a part of the illuminating value of the acetylene. As a makeshift until we have learnt to burn acetylene to full advantage, Goodwin's process for mixing carbonic acid with the gas may prove useful; but it must not be forgotten that the principle of the process is scientifically faulty.

We have not ventured to challenge Professor Emerson Reynolds's views without giving the subject due consideration. But his report is strangely free from actual data, and we cannot accept mere opinions—even though they be those of acknowledged authorities—when they run counter to the results of numerous observations in analogous cases, unless the opinions are backed by a sufficiency of experimental evidence. Such evidence is lacking in the report of Professor Reynolds. We know that carbonic acid acts as a more powerful disilluminating agent than nitrogen on the flames of coal gas, oil gas, and ethylene; and M. Hubou† has used nitrogen as a diluent of acetylene and found that he sacrificed much of the illuminating value of the gas by the dilution. Are the relative disilluminating capacities of nitrogen and carbonic acid towards other illuminating gases not preserved when acetylene is the illuminating gas to which they are added? We shall be surprised to see proofs that these diluents behave differently towards acetylene than towards other rich gases.

Professor Emerson Reynolds, indeed, in one sentence of his report, offers what may perhaps pass as an explanation of the supposed beneficial action of the carbonic acid on the acetylene flame. He says: "The well-known oxydizing effect of carbonic acid gas on carbon and hydrocarbons at high temperatures sufficiently explains this specific, though necessarily limited, action of carbonic acid in facilitating the chemical changes in progress within the flame of a gas so rich in carbon as acetylene; otherwise its action would be that of a mere diluent like nitrogen." But if carbonic acid oxidizes it suffers reduction; and the heat necessary to reduce it must be taken from the flame. The heat is no doubt restored again when the carbonic acid is re-formed; but there is no gain of energy by the changes. A transference of heat from one part of the flame to another may occur through the reduction and subsequent oxidation of the carbonic acid; but we know no facts which prove the occurrence of the phenomenon. Moreover, in the case of other illuminating gases, carbonic acid *does act as a mere diluent like nitrogen*; and we know no reason why Professor Emerson Reynolds should imply that it acts differently in the case of acetylene.

The apparatus in which the Sunlight Gas Company, Limited, generate the mixture of acetylene and carbonic acid is a simple non-automatic generator provided with a gasholder capable of receiving double the volume of the gas which is evolved from a single charge. If the apparatus were used for the generation of plain acetylene gas from carbide and water, it would strike the critic as a serviceable machine free from those devices of the too-

\* "Journal of the Chemical Society," Vol. LXI., p. 337.

† "Le Génie Civil," March 7, 1897; p. 156.



ingenious inventor which fail because they attempt too much. The use of acidulated water is necessary for the production of carbonic acid from the carbonate; but on the other hand, acidulated water is apt to liberate the highly objectionable impurity siliciuretted hydrogen if the carbide to which it is added is not of an exceptionally high degree of purity. On the other hand, the use of acidulated water ensures the gas produced being free from ammonia. There is no doubt, however, that it is better to employ simple water for the generation of acetylene unless some very substantial advantage is secured by the use of a specially prepared solution or liquid.

Readers of the "JOURNAL" are already familiar with the acetylene generators made by Messrs. Read Holliday and Sons, Limited, through the descriptions given by Mr. T. Glover in the paper on "Acetylene Gas" which he read before this year's meeting of the Midland Association of Gas Managers.\* To those descriptions we have little to add. It need scarcely be said that a firm having the command of ample resources and employing many expert chemists have succeeded in making sound and simple apparatus which answers its purpose well, even though it may not satisfy the aspirations of idealists. A glance at Mr. Glover's paper will show that the carbide is in excess in the generator, a plan which theoretically is less commendable than the converse arrangement. But very few generators in which the water is in excess are shown at the Exhibition; and the difficulties in the way of making automatic appliances of this class seem well nigh insuperable. It is not surprising, therefore, to find that Messrs. Read Holliday and Sons have here adopted the commoner plan of keeping the carbide in excess at the point of action. The firm make both automatic and non-automatic generators, and also a number of accessories for the use of photographers, cyclists, plumbers, and others wishing to use acetylene in the pursuit of their work or recreation.

A pamphlet of 48 pages issued by Messrs. Read Holliday and Sons is a brilliant exception to the prevalent low-grade trade circulars which are offered to the public by many exhibitors. If it occasionally seems to us to take too favourable a view of the qualities and uses of acetylene, we must admit that there is no instance in it of that gross exaggeration and even misrepresentation which we have lamented in other cases. The general account of calcium carbide and acetylene is evidently written by one of the many capable chemists employed by the firm, for the statements are those of a man trained to observe and to report his observations truthfully. In this they differ from the random outpourings of the professional pamphleteer, who ranks effect higher than truth, and has a profound conviction that abuse of a rival is a sure means of ousting it from public favour. Messrs. Read Holliday and Sons' exhibit is well worthy of them in every way. Two pendants in the Intermediate Gallery of the Institute are supplied with acetylene from one of their generators, which nominally is intended to feed a hundred burners.

(To be continued.)

### ANOTHER VIEW OF LIGHTS AND LIGHTING.

AFTER what has so often been advanced in the "JOURNAL" respecting the hopelessly inartistic way in which electricians are in the habit of treating their lamps when used for the lighting of interiors, and after all our complaints of the indifference of architects to the decorative side of domestic lighting, it is refreshing to discover that during the present year this subject has been brought before the members of the Architectural Association and discussed by them. Mr. Tom Ekin undertook, as an engineer, to state the problem of the application of electric lighting to architecture; and he did it very well, from his own standpoint. We should not have thought it necessary to consider his paper at length, but for the fact that much of what he had to say concerning the placing of lights and so forth applies as much to gas as to electric lamps. Besides, in putting in his plea for electric lighting, Mr. Ekin had things to say about gas lighting which should not be allowed to pass unchallenged.

Naturally, as an electrical engineer, Mr. Ekin assumed the position that in this year of grace it is altogether unnecessary for anybody to dwell upon "the manifold and very apparent advantage of electric lighting over every other known form of illuminant, whether it be considered from a hygienic, artistic, decorative, or even commercial point of view." He went on to declare that "there are very few individuals—excepting, of course, those interested in gas or oil companies—who will not honestly endorse this statement." Mr. Ekin is justly entitled to raise the chant of there being "nothing like leather;" and this is, in point of fact, all that the praise of electric lighting to-day by an electrical engineer really means. When will gentlemen of this persuasion learn that to impute motives of trade interest to their opponents only evokes the obvious retort? It appears to be yet more vain to inquire when they will take serious note of the fact that it is the public who consume gas and lamp oil in ever-increasing quantities, not the vendors of these necessities of life. It would be impossible for gas engineers and lamp makers to live, if the public really agreed with the electricians with regard to the supremacy of the means of lighting provided by the latter. We interpose this observation here in order to justify the remark

which Mr. Ekin's enthusiasm evokes, that both electricians and architects may make up their minds to endure the rivalry of gas and oil for an indefinite time to come.

To pass on, however, to the paper. Mr. Ekin deals first of all with the distribution of lights, and leads off with a statement of the incontestable principle that every "room or space which it is intended to light should be considered and examined from at least three different points of view—viz.: (1) The purpose for which it is to be used; (2) the decorations, furniture, and general surroundings; and (3) the cost of the proposed lighting." Which of these three points is the most important is granted to be a matter of opinion; but the author thinks it may be safely assumed that the third, or question of cost, is not the least consideration. This admission does not lead him to the further confession that the point of expense is the weakest in the whole argument for electric lighting, but merely to the observation that "the skill of the architect or engineer in arranging a system of lighting is in no case more marked or apparent than in getting the maximum lighting effect at minimum cost." Mr. Ekin observes that it is possible to treat the practical problems of electric lighting with a freer hand, and to better effect, in the case of a new building than in that of houses where gas is already installed, because one is so very apt to take the positions at present held or assigned to gas as those most suitable for electric lamps—quite forgetting the fact that gas is so non-adaptable and lends itself with such ill-grace to artistic effect that there are only certain positions in any room in which it can safely be placed." This is a loud-sounding generality which, while not without a certain amount of justification, is not to be trusted too far.

We get the electric lamp ranged alongside the gas-burner again in the admission of the author that shaded lights are the most perfect form of illuminant. It has taken the electricians a long time to bring themselves to endure this sacrifice of the illuminating power which costs so dear. But Mr. Ekin admits the necessity of screening lamps from the eye, though "double or even treble the amount of energy has to be used." How thoroughly does this sensible admission upset all the familiar comparisons of illuminating effect based on the nominal rating of lamps in candle power!

Mr. Ekin is no half-and-half temporizer with this important consideration. He gives up the arc light as not being, and never to be, suitable in any way for the internal lighting of buildings. Even apart from the arc lamp, however, he agrees that electric lights are apt to "glare;" and he contends that this is not one of the inherent faults of the system, but is a fault of the "brain of the stupid person who put it there." The reflection is not quite clear; but the author proceeds to explain that what he means is that every lamp should be used to diffuse light without itself being seen. He is fully aware that "the cost of complying with this requirement is in many cases too heavy to allow of its being adopted." But still he thinks that every electric lamp should be shaded in some way or another. Coming to the amount of light to be provided in particular cases, Mr. Ekin throws over the scientific method of solving such problems according to rule, declaring that a good deal of practical experience and judgment is required for the determination of the proper amount of light required, and also the position in which the lamps should be placed. No photometry for him! He admits the existence of rules for lighting in "pocket-books and similar literature," but is bold enough to avow that he never found these to be of the slightest value. The rules to him have been, if anything, "rather misleading." He denies that it is of the smallest use for anyone to know that a 16-candle power lamp will light a certain number of square feet of floor when raised a given height above it, for the reason that it is quite impossible to take into calculation, or make due allowance for, the surrounding colouring of walls or furniture. One has only to bear in mind the difference of lighting effect producible (say) in a clothier's warehouse compared with a white-tiled dairy, by one and the same light, to feel the force of this criticism.

Mr. Ekin again falls into line with the despised gas lighting practitioners when he condemns the artless electricians' device of lighting an interior by dropping a number of pendant lamps from the ceiling. Nothing is easier to do; and if the lighting points are kept a certain distance from the floor, in this way it is possible to procure a maximum amount of light with a minimum number of lamps and cost. But the effect is thoroughly and incurably bad and depressing. The photometry may be excellent; but the decoration is simply non-existent. Wherefore Mr. Ekin concludes "that the most pleasant, and at the same time most artistic method of lighting ordinary living-rooms is by means of wall brackets, standard lamps, and table lamps—the lamp in each case being shaded so as not to come in direct contact with the eye." But is not this precisely how those older schemes of interior lighting are ordered, which the author had previously condemned as not necessarily prefiguring the means of properly employing electric light? What can electric lamps do in this way that is not already done by gas and oil?

In the discussion that followed the reading of the paper, Mr. G. H. Fellowes-Pryne remarked that in the lighting of public halls it is well, but not all-sufficient, to keep the lights above the heads of the audience. "In that room they had an illustration of placing the lights above their heads, with the most glaring and unsatisfactory result. The lights looked like red-hot hair-pins; and they fixed themselves on the retina of the eye." The

\* See "JOURNAL," Vol. LXXI., p. 464.



speaker did not like brackets and shaded lamps. "If they could hide the lights in the ceiling, or at some given points, he thought that the most satisfactory results could be obtained." Patchy lighting was to be avoided, as it distorted the architectural appearance of a room. Other speakers condemned the lighting of the room in which the meeting was held, which is sufficient testimony that the evil of bad lighting effect is not to be overcome by the simple expedient of adopting electric lamps. The popular electricians' view of the subject seems to be that there is no bad electric lighting; but that some electric lighting is better than others, while every other light is objectionable.

It is possible to agree with the aspiration of the Chairman of this meeting of architects—that some architect of experience would handle the whole subject from the professional standpoint. It should be clearly understood, however, that there is no special science or art of electric lighting, as distinguished from other systems of artificial lighting. The nature of the work to be done, and of the effect to be secured, is one and the same, whatever the means employed. This truth hardly needs proof; but if corroboration is desirable, it may be found in the neighbouring field of artificial illumination for decorative purposes pure and simple. Illumination, in this special sense of the word, is not lighting. But it is worth while to trace the history of the kind of illumination in which what are known as "Vauxhall" lamps are used. Originally, these were little cups of variously coloured glass, containing some oil in which a lighted wick floated. At the period of the latest South Kensington Exhibitions, these lamps were superseded by incandescent electric lamps, worked at an enormous expense. So far from this application of electricity having increased and developed, it has of late years been wholly abandoned; and the "Vauxhall" illuminations of the Earl's Court Exhibitions, which are commercial speculations, are now gas lights. The "moral" of this story is that oil, electricity, or gas are all one when it comes to be a question of effect; while the determining cause of the selection of one in preference to another must be sought in something besides the nature of the illuminant. "Grounds Illuminated by Electricity" would be no attraction nowadays, irrespective of the quality of the illumination. So in this, as in other uses of artificial lights, we get down to the bottom facts, which are the considerations of convenience, efficiency, and cost; and by these must all systems be finally judged. There is no need to fear for gas when the comparison is made between it and electric lighting in any of its forms.

#### OBITUARY.

The death is announced, by drowning in the Clyde, near Renfrew, of Mr. EDWARD BROOKE, who formerly owned extensive pottery and fire-clay works at Fieldhouse, which some years ago were amalgamated with other similar businesses into the Leeds Fire-Clay Company, Limited, of which deceased was a Director. Mr. Brooke was a man of considerable wealth.

The death last Wednesday, at the age of 73, of M. CHARLES GARNIER, the architect of the Opera House in Paris, calls for notice here from the fact that the lighting arrangements in connection with this magnificent building were described and illustrated in the "JOURNAL" in April, 1875. M. Garnier's design was selected out of 170 sent in in competition for the prize; and the work occupied fifteen years of his life. According to "The Times," he "installed himself in a kind of shed, and there, during the erection of the building, covered 30,000 foolscap sheets with his plans."

A remarkable man passed away at Halifax last Wednesday morning. We refer to Mr. EDMUND MINSON WAVELL, who was the oldest practising solicitor in England, having arrived within a few weeks of the completion of his 91st year. From 1847 to 1864, he filled the office of Town Clerk of Halifax; and during that period he took a very prominent part in the negotiations and agitation which resulted in the local gas-works passing into the possession of the Corporation. It was in 1855 that the Municipality made overtures to the Gas Company with a view to acquiring their undertaking; but the Company asked a price that was regarded by the Council as prohibitive. The Town Clerk thereupon promoted a rival Company, called the Gas Consumers' Company; most of the shares being taken up by members of the Town Council and other leading men in the town. The popularity and determination of the leaders of this movement were such that the proprietors of the existing gas-works took alarm, and promptly offered their concern to the Corporation at a much lower price than they originally required. The offer was accepted; and the business acquired formed the nucleus of the present extensive and profitable gas-works.

#### PERSONAL.

Mr. HENRY PEEKS, who has managed the Thorne Gas-Works for 45 years, has lately retired. In consideration of his faithful services, the Company have voted him a pension.

A meeting of the Lincoln City Council in Committee last Friday decided to recommend the appointment of Mr. J. H. TEAGUE to the Water-Works Engineership, which post was held by his late father. There were several candidates.

Mr. H. MONCKTON, the Town Clerk of Maidstone, has resigned his seat on the Board of the local Water Company. The proposal of the Corporation to purchase the water-works rendered the two offices incompatible and the retention of both undesirable. At the same time, the knowledge which Mr. Monckton has gained as a Director of the Company will be of material assistance to him in directing the Council in the work which they have before them.

Mr. JOHN RICHMOND, of Dunbar, has been appointed Resident Manager of the Kilkenny Gas-Works, in succession to the late Mr. Catlin, deceased. Mr. Richmond was trained under his father in the works of the Whitburn Gas Company, West Lothian; and before he was seventeen years of age he was appointed Manager of the works—a position which he held for seven years. He was appointed Manager of the Dunbar Gas-Works in January, 1895, and during the 3½ years he has held office there the financial position of the undertaking was greatly improved, and the price of gas reduced 1s. 3d. per 1000 cubic feet in two years. The Gas Commissioners of Dunbar, being anxious to retain Mr. Richmond's services, offered to increase his salary by £20 per annum; and this offer being refused, they have voted him an honorarium of £10.

**The Metropolitan Gas Inquiry.**—The Select Committee appointed by the House of Commons to investigate the question of the charges of the Metropolitan Gas Companies held their first sitting last Thursday, "to choose a Chairman and consider the course of proceeding." The constitution of the Committee has already been notified (*ante*, p. 248). Sir John Dorington (Tewkesbury) was chosen Chairman; but it is understood the Committee will not do anything this session beyond recommending their re-appointment, with a view to the prosecution of the inquiry next year.

**The Centenary Edition of "Newbigging's Handbook."**—The sixth (and centenary) edition of Mr. Newbigging's "Handbook for Gas Engineers and Managers," which has been for some time in preparation, will be ready for delivery this week. In order to keep the work abreast of the constant advances that are being made in the gas industry, much of the text has been rewritten, and it is illustrated by about fifty additional diagrams. A steel-plate portrait of William Murdoch forms a suitable frontispiece to the volume, which will be issued in two styles of binding. A synopsis of the contents of the "Handbook" will be found in the advertisement which appears elsewhere.

**Water Gas in Spain.**—According to the "Revista Minera," there is a good prospect for water gas in Spain. Owing to the abundance and cheapness of anthracite, it is said to be possible to manufacture water gas by the Strache process at a cost of 1½c. per cubic metre (about 4d. per 1000 cubic feet), or even less. The expense of distribution is reckoned at something under 3c. per cubic metre; so that if it were sold at 8c. it would yield a good profit on the capital employed. Used with the incandescent gas system, it would, at this figure, give a light of 16 candles for five hours at a cost of 4c. For motive power, 28 cubic feet of water gas, used in improved gas-engines, will give 1-horse power. It is estimated that works could be built in Madrid for 250,000 pesetas (£10,000).

**Salt Water for Street Sprinkling.**—This subject has lately been investigated by the Merchants' Association of San Francisco, which had a portion of a street sprinkled with sea water and the remainder with fresh water. The following conclusions were reached, according to the "City Record" of Boston: "It binds the dirt together between the paving-stones, so that when dry there is no loose dust to be raised by the wind. It does not dry so quickly as fresh water; and it is claimed in those cities which use salt water that one load of it is equal to three loads of fresh water. The salt water which is deposited on the street absorbs moisture from the air during the night, so that in the early morning the street is thoroughly moist, and has the appearance of having been freshly sprinkled. This effectually prevents dust being raised by the wind or street sweepers before the regular sprinkling-carts can get over the ground during the morning, and thus overcomes one of the great nuisances."

**The Reproductive Undertakings of Municipal Corporations.**—The return on the above subject moved for by Sir H. Fowler, to which reference was made last week, has been ordered. It will furnish the following particulars: Capital.—(1) Name of undertaking, and date when corporation commenced working. (2) Total capital, inclusive of borrowed capital, provided by corporation. (3) Amount of capital borrowed. (4) Amount of capital borrowed which has been paid off. (5) Balance of capital borrowed which was outstanding at March 31, 1898. (6) Amount in sinking fund or loans fund at March 31, 1898, in respect of capital borrowed. Income.—(7) Average annual income for the five years ended March 31, 1898; or, if the undertaking commenced during that period, from date of commencement. (8) Average annual working expenses for the period mentioned in column 7. (9) Average annual net profit for the same period. (10) Average annual amount paid during the same period in respect of principal and interest on capital borrowed. (11) Average annual amount set apart for depreciation. (12) Mode in which average annual net profit has been applied.



## NOTES.

**The Substitution of Exhaust Fans for Chimneys.**

It is only to be expected that manufacturers of specialities in engineering plant should endeavour to exploit them for all they are worth. Accordingly, it is not surprising that information should be circulated respecting the success which has rewarded the efforts of the B. F. Sturtevant Company, of Boston, in the direction of superseding chimney draught by one of their large fans. It is reported in the "Engineering Record" that the Sturtevant Company had occasion to change the situation of the boiler plant at their works, and took the opportunity of discarding the chimney which had previously furnished the necessary draught. The bricks from the old chimney were utilized in the erection of the new boiler-house, which has no chimney-shaft properly so called. The waste gases from the 300-horse power boilers are exhausted by a fan having a 54-inch wheel, and are discharged by means of a short delivery stack which is hardly noticeable from the outside. The fan is driven by a direct connected upright engine, so regulated that the speed increases as the steam pressure falls; thus maintaining a practically constant pressure in the boilers. As the result, a mixture of coal and yard screenings is burnt smokelessly, without carbonic oxide in the waste gases, tested by the Orsat apparatus. The boiler efficiency was 11.05 lbs. of water evaporated into dry steam per pound of fuel, burnt at the rate of 16.45 lbs. per square foot of grate. This performance is held to show that the chimney is superseded as a draught producer for boiler furnaces by the fan, and only remains serviceable as a means of discharging the products of combustion into the atmosphere at a convenient and harmless height.

**The Balancing of Machinery.**

In a paper read before the Manchester Association of Engineers, on the "Balancing of Engines," Mr. James Whitcher discussed the question of vibrations set up by moving machinery. Mr. James Swinburne read a paper before the British Association last year, in which he answered affirmatively the question whether reciprocating machinery should be mounted on springs. This conclusion was opposed by Mr. Whitcher, on practical and theoretical grounds. He now contends that his practical objections were just; but he admits that his theory was wrong, and requires correction. This brings up the case where a resilient sub-basis for engine foundations is indicated. The most promising procedure for isolating the vibrations of unbalanced engines from surrounding property, according to this author, is to make the foundations as heavy and solid as possible, and see that they are carried on a deep sub-bed of faggots or the like. Then if the sub-bed is well drained, the trouble ought to be prevented; but if the foundations become water-logged, the very means taken to prevent the transmission of vibration may conduce to this effect. The perplexing circumstance of these vibration nuisances sometimes is that, in the aggregate, an immense mass of material is being appreciably vibrated by an originating cause apparently small. The explanation is that the transmission is by wave motion. A complete system of waves is a balanced mechanism in itself, since the sum of the moments having regard to the direction is *nil*. For this reason, where the circumstances favour wave transmission, vibration may become very troublesome indeed. To effectively balance a reciprocating engine is no easy matter. A common, but futile, device is to put a rotating counterweight on the fly-wheel opposite the crank; but a rotating weight cannot balance a linear reciprocation. The subject is eminently one for further study; and young engineers having access to a model reciprocating motor could hardly employ themselves better than in working out the phenomenon of vibration.

**The Rusting of Iron.**

The reasons for the rusting of iron and steel are intelligently stated and discussed in a recent issue of the "Ironmonger." It is explained that, chemically speaking, rust is a hydrated oxide of iron containing a small proportion of free metal which causes it to be attracted by the magnet. In other words, it is a compound of iron, oxygen, and water, mixed with some free iron as aforesaid. It is not formed by the direct union of iron with the oxygen of the atmosphere, since in perfectly dry air at ordinary temperatures iron and steel do not rust. The primary cause of the rusting of iron is the presence of carbonic acid in the atmosphere, which acid is carried down by rain or moisture, and deposited on any exposed metallic surface. The first result of this contact is the production of the unstable compound ferrous carbonate, which quickly absorbs more oxygen, and becomes hydrated oxide of iron. This oxide, in its turn, is very hygroscopic; so that when once formed it always holds enough water to carry on the oxidation of the metal beneath. The only ingredient of which a continual supply is afterwards necessary is the oxygen of the atmosphere. Hence, therefore, though three separate reagents are requisite to start the rusting of iron, only one is needed to carry it on; and this is the one which, of all others, is the most difficult to keep at a distance. This explains the remarkable way in which perfectly bright burnished iron and steel surfaces retain their brilliancy for a comparatively long time; and also the equally remarkable speed with which they become covered all over with rust when once it has obtained the smallest lodgment upon them. But

chemistry explains more than this. It explains the necessity for the thorough removal or the total absence from iron or steel of rust, before it is painted, if the coating is to be a satisfactory preservative. When applied to a clean surface, paint will be efficient if it succeeds in holding at bay any one of three substances, whose rates of diffusion through the porous paint skin are widely different. On a partly rusted surface, paint must be competent to withstand the entry of oxygen, which is practically impossible. By the law of chemical equivalents, when damp carbonic acid attacks iron, the volume of hydrogen given off is many times greater than that of the metal dissolved; so that if the action goes on under a tough layer of paint, the latter will be raised in large blisters. If the film of paint is so porous as not to be thus blown off the surface of the metal, it must evidently be far too porous to be of any good at all.

## COMMUNICATED ARTICLES.

**THE PURIFYING OF COAL GAS.**

By STEPHEN CARPENTER, of East Ham.

From what has been said about hydrate of lime, it is obvious that lime is indispensable for removing carbonic acid and bisulphide of carbon from the gas. The pernicious effects of these impurities are well known. The carbonic acid deteriorates the illuminating power, and the bisulphide of carbon is not merely useless, but is absolutely noxious, as its presence in the gas gives rise during combustion to sulphurous acid. Bisulphide of carbon is a sulphur acid corresponding to carbonic acid, but containing two elements of sulphur instead of oxygen, and combining with alkaline-sulphide to form a species of salts called sulpho-carbonates.

If the conditions under which lime acts efficiently upon the sulphur impurity in the forms other than sulphuretted hydrogen were adequately known, the purifying power of the material might be increased by excluding the atmospheric air from the lime purifier, and the quantity of lime as a purifying agent might be reduced by slaking it properly. I may remark that lime which is to be used in gas purification should be slaked three or four days before it is required. It should be properly slaked and well mixed before being used. If this is not properly done, there will be small nodules left which will make the lime worthless. It has been said that lime which is to be employed in gas purification ought not to be slaked until just before it is placed in the purifiers, for slaked lime absorbs carbonic acid from the air, whereby its purifying action is impaired. This I must deny. If the lime is slaked only just before it is put into the purifier, it is not a practical way of using the material, for the reason that part of it will not be properly slaked. There will be small nodules in the lime which has received but very little water—perhaps none at all; and when the material is put into the purifier these will slake, and cause weak places in the layer. The lime ought to stand three or four days after it has been well slaked and mixed before it is put in the purifier; and then it will be in a fit state for removing the bisulphide of carbon from the gas. The object of using lime is to effect the absorption of the bisulphide of carbon, which is acid in its nature, by the alkaline sulphide of calcium. The bisulphide is capable of being absorbed to a very small extent by clean lime, but more readily by the union of lime with sulphuretted hydrogen—what the writer calls hydrogenated sulphide of calcium.

The combination of bisulphide of carbon with sulphide of calcium is slower and more gradual than that of the other impurities in crude gas with the several agents used to absorb them; so that to effect a corresponding degree of purification, the gas requires to be kept in contact with the purifying material for a longer time. It is of great advantage to have lime purifiers of larger area than those for oxide of iron; and to have four layers of material, about 4 inches thick. There will then be four surfaces of lime in each purifier. As the lime takes so many impurities out of the gas, by having four thin layers, these impurities will be more divided. As it is indispensable that the whole of the carbonic acid should be removed before the gas enters the lime purifier containing the sulphide of calcium, by having four layers of lime we shall get this. As carbonic acid has a greater affinity for lime than sulphuretted hydrogen has, it would be confidently expected that the first tray of clean lime will take out carbonic acid in greater proportion than it takes out sulphuretted hydrogen. So that the first tray of lime will be so busy with removing the carbonic acid that a part of the sulphuretted hydrogen will escape to the other layers of lime, and convert them into sulphide of calcium. By inserting a test-cock in the middle of the purifier just above the second tray of lime, and there testing the gas for carbonic acid and bisulphide of carbon, and testing at the outlet of the purifier for these impurities, the manager will be kept well informed as to the state of the lime in the middle and at the outlet of the purifier. It will show how much of the impurities has been taken out of the gas by the first lime purifier. After the material in the first tray has become in a state of carbonate of lime, the second tray will take out the carbonic acid and then the third tray. By this time the lime will be foul enough for the purifier to be shut off. The



manager should then bring the second lime purifier first, and put on a clean lime purifier to be the second.

The employment of lime purifiers in the manner here described, whereby the gas can be purified from bisulphide of carbon and all the carbonic acid, was devised by the writer in 1866 and 1867. He found out the best way of using lime for eliminating the carbonic acid and part of the bisulphide of carbon from the gas, and especially of testing the gas for carbonic acid, and confining this to the first lime purifier, so as to decarbonate the gas before it passed into the second purifier, where part of the bisulphide of carbon would be taken from the gas. Later on he revived the foul lime before taking it out of the purifier; thus abating the nuisance of the foul lime, and at the same time preparing it for use again for the purification of gas. At one time lime was the only material used for taking out sulphuretted hydrogen and carbonic acid. Nothing was then known about the bisulphide of carbon in the gas. It may be said that, where lime is used, the bisulphide of carbon is sure to be taken out. The writer does not assent to this. He used three lime purifiers in a gas-works in London as long ago as the year 1847, but did not work them in the same way that he did at the Bow works. The tests then were only for sulphuretted hydrogen and carbonic acid. The test for the latter impurity was taken at the outlet of the last purifier; but now the gas has to be tested for it at the first purifier.

It was in the years above named—1866 and 1867—that the writer first saw the importance of, and practically carried into effect, the principle of working two lime purifiers—one for taking out the carbonic acid and a portion of the bisulphide of carbon, and the second for removing two-thirds of the latter impurity. He was well aware that carbonate of lime such as is found in purifiers has little affinity for bisulphide of carbon. It is not so much the carbonic acid in the gas as the atmospheric air that interferes with the chemical action of the lime. The process was tried at the Bow Gas-Works for many years. The writer did not follow the practice of keeping one purifier for taking out the carbonic acid before it entered the second purifier. His method may be termed the "rotation" system—that is to say, when the lime in the first purifier is sufficiently foul, that purifier should be shut off, and the second one put first; a clean one being put on for the second purifier. It is a very great advantage to work two purifiers in the way described, for the reason that the purifier can be ventilated and the lime revived at the same time. Moreover, nuisance is abated, and the lime can be used a second time. If lime purifiers are worked in such a way (of which the writer does not approve) that the carbonic acid in the gas is eliminated by the lime in the first purifier, and the second one is kept wholly for what is called sulphide of calcium, when the lime in that purifier has become highly saturated with sulphur, it has to be changed.

In this purifier, which is termed the sulphide of calcium purifier, the lime is so heavily charged with sulphur that it will be risky to ventilate it, as there is danger of raising the temperature of the foul lime to such a height as to ignite the grids—a serious consequence. By working two lime purifiers in the manner described, this process of purification will be found not only more convenient, but also more economical than any other in which lime is employed, as a great saving is effected by using the revived material a second time.

There is no better, cheaper, or cleaner system, if the lime is used in the manner here described, for the removal of all the carbonic acid and part of the bisulphide of carbon from the gas. The writer worked lime purifiers in this way from 1866 to 1896, and obtained good results; and he has placed the results of his experience at the service of students and young gas managers. His advice to them once more is this: Look well after the lime purifiers, and test them twice in 24 hours. There is a chemical action going on between the lime in the purifier and the crude gas which has not been explained; and the writer thinks it never will be. He has tried his utmost to solve the problem, but has not been able to do so farther than he has stated.

Gas as it issues from the retorts contains several impurities—viz., tar, watery vapour, ammonia, carbonic acid, sulphuretted hydrogen, and bisulphide of carbon. Part of the tar and watery vapour is deposited in the hydraulic main; the other impurities being carried forward with the gas as it passes from the outlet of the condenser into the scrubbers. At the inlet of the latter it should be tested with the eudiometer for carbonic acid and sulphuretted hydrogen. The process is as follows: Take a portion of the gas in the eudiometer, add a solution of acetate of lead, and well shake it up. Put the tube in water, and let it remain for two minutes; then read off the absorption, which will give the percentage of sulphuretted hydrogen in the gas. Add a few drops of a strong solution of caustic potash to the gas in the eudiometer, well shake it up with the gas in the tube, and let it rest for two minutes, then read off the absorption, which will give the percentage of carbonic acid in the gas. Test the gas for these impurities in the same way at the outlet of the scrubbers; and the result will show what impurities have been taken out by these appliances. Next test the gas at the same place with red litmus paper, to see if it contains ammonia. If there is any, it will turn the paper blue. The test for carbonic acid is lime water. When testing the foul gas for the impurity named, pass it through a small hand purifier charged with oxide of iron to take out the sulphuretted hydrogen. Take a portion of the lime water, and let the gas bubble through it for three

minutes. If the water remains transparent, there is no carbonic acid in the gas; but if it becomes milky, it contains some. To test for sulphuretted hydrogen, use slips of paper moistened with sugar of lead. If there is any sulphuretted hydrogen in the gas, the paper will become a very dark brown.

To make the lime water used for testing gas, take a gallon of water, and drop into it about 4 oz. of quicklime. After this has dissolved, decant the clear fluid, filter it, and put it into a glass bottle, and then it will be ready for use when wanted. To prepare the test-paper for sulphuretted hydrogen, dissolve one part of sugar of lead in eight parts of water, and moisten some sheets of bibulous paper with the solution. Let them dry, cut them into small strips, and put them in a glass bottle. Litmus paper is made by taking a blue solution of litmus, adding a few drops of a very dilute solution of sulphuric acid, and then saturating the paper with the solution to such an extent as will leave it slightly red when dry. Cut into small strips, and put them into a dark glass bottle, and they will be fit for use. If the gas is tested several times a day with these agents, it will keep the manager well informed as to the impurities in his gas. The testing of gas for bisulphide of carbon is fully explained in the writer's pamphlet on "The Purification of Coal Gas." To ensure the purity of gas, it should be tested at the various purifiers at intervals. By this means it is ascertained when it will be necessary to change—or, more properly speaking, to replace—the purifier having the foulest lime for another containing fresh lime.

#### THE LOCAL GOVERNMENT BOARD AND THE PROTECTION OF WATER SUPPLIES FROM POLLUTION.

By PERCY GRIFFITH, Assoc. M. Inst. C.E., F.G.S., M. Inst. M.E.

All those who are interested in water-works will be aware that the Local Government Board recently endeavoured to introduce a series of clauses bearing upon this matter into several Private Bills which were before the Houses of Parliament this session. These clauses are given in full in the Appendix; and I propose to deal with them seriatim, afterwards summing up the actual position of affairs at the present time, and suggesting the lines upon which any further investigation of this important question should in my opinion be carried on. I would, however, suggest here that as the difficulties attending the alteration of the law of water supply are very serious, a Royal Commission should be appointed to investigate the matter in all its bearings, and report upon the most satisfactory basis upon which amendments to the existing law might be carried out. The following suggestions are advanced with the view of pointing out several of the principal considerations which must be borne in mind in dealing with the subject, and also with the object of opening a discussion which cannot fail to assist in the solution of the difficulties.

##### *Penalty for Failure to Supply Pure and Wholesome Water.*

The question of the position of a company or local authority convicted of supplying impure water to their consumers is one of vital interest at the present moment, seeing that during the past twelve months serious outbreaks of typhoid fever have broken out in two provincial towns (Maidstone and King's Lynn) with the most lamentable results, traceable in both cases directly to the contamination of the public water supply. The question which at once suggests itself is: What penalty can be inflicted on the purveyors of a necessity of life, such as water, when they are convicted of causing, not only an outbreak of disease, but a serious loss of life? In the case of any other comestible offered to the public for sale, the law provides very definite means of punishing any person or persons found guilty of causing injury to the health of the consumers thereof; but with regard to water, which is an element of public consumption far more essential than any other, it appears that no definite means exist of inflicting any penalty on the offenders whether they be corporations, companies, or private individuals.

It must be granted at the outset that, in the interest of the public health, this state of affairs should not be allowed to continue; but the most practical method of effecting the end in view is not by any means so clear. In my opinion, the clauses which the Local Government Board have attempted to impose upon several private water-works companies during the present session of Parliament are very far from meeting the case, and for several reasons; the following being the most obvious.

Firstly, it is grossly unfair that the imposition of any serious restrictions should take effect only on such companies as may happen from time to time to be before Parliament. As the House of Commons has intimated very clearly, any amendment of the law should be made by means of a Public Bill applying equally to all water companies at one and the same time, and not piecemeal (as was proposed), which would mean the lapse of many years before the restrictions were applied universally.

In the next place, it cannot be fair that penalties for supplying impure water should be inflicted on one class of undertakings, and not on another. Seeing that the works at King's Lynn are in the hands of the Corporation, it is obvious that municipal water-works are quite as liable to pollution as companies' undertakings; and it must be obvious to everyone that no effective protection can be secured to the public at large unless



municipal water-works are subject to the same safeguards as those in the hands of companies.

Another important oversight which is apparent in the clauses proposed by the Local Government Board, is that no definition is given of what "pure and wholesome" water really is. Experts are even now totally at variance as to what is the proper standard of purity in water used for domestic purposes. One contends that the presence of nitrates in any appreciable quantity (being an indication of "previous contamination") must be considered as sufficient to condemn any water, however satisfactory in other respects; others pin their faith wholly to bacteriological examination; while others again refuse to judge without having all possible information as to source and method of collection and delivery, and then combining both chemical and bacteriological examinations to give them a basis for their report. But even if the examination and analysis be of the fullest possible nature, it is probable that hardly any of the experts would agree as to the actual purity of any given sample examined. It is therefore obvious that, whatever penalties Parliament may make water companies liable to, there is not the slightest chance of their ever being inflicted unless, and until, some standard definition is adopted as to what constitutes a "pure and wholesome" water, and what characteristics are required to exclude any given sample from this category.

Following upon this difficulty, comes another hardly less serious, and that is detection of pollution when (as is most often the case) it exists at the source for a very short period, perhaps only for a few hours, and may therefore reach the consumers entirely undetected in spite of the most regular and frequent analysis. And, again, there is the probability that examination, even at short intervals, would not reveal the existence of pollution in time to prevent the delivery of the impure water into the mains or reservoir supplying the district. Judging from the history of the outbreak of typhoid fever at Maidstone (as given in a paper read before the Society of Public Analysts by Mr. Adam, the Medical Officer of Health), it appears that even had the Corporation not discontinued the regular analyses of the water—as they unfortunately had done just previous to the outbreak—it is extremely probable that the mischief would have been done before anything unusual had been observed in the character of the water.

It is also to be remembered that the question whether pollution has arisen through accident or neglect must always be settled before a penalty could be enforced, as it would be contrary to all ideas of justice to punish a water-works company for allowing pollution which had been caused through unavoidable accident, or some means utterly beyond their knowledge or control. The settlement of a difficult question of this nature is sufficient alone to make such clauses as have been proposed entirely inoperative, or at any rate provocative of almost endless litigation.

With all these points before us, it will, I believe, be generally accepted as a very doubtful means of accomplishing the end in view to resort to any system of penalizing water-works companies convicted of supplying polluted water. Before dealing with the question of punishment for default, some effort should be made to secure in a practical manner the protection of water supplies from any pollution at their source, which, if satisfactorily accomplished, would altogether dispense with the necessity of punitive measures of any kind.

#### *Power to Take Samples.*

The further powers proposed to be conferred on local authorities and their officers under this head—and not only on them, but on consumers generally—are, of course, on the lines laid down for preventing adulteration of ordinary products, such as butter, milk, &c., and appear to me to be in some respects far too stringent, and in others not by any means strong enough. In the first place, as they now stand they suggest the possibility of some zealous consumer with nothing else to do busying himself in collecting samples from every available source both on the works and at the consumers' services, analyzing them himself, and forwarding duplicate samples to the water company at all times and seasons—a risk which is utterly ridiculous, besides being useless in the extreme; and, on the other hand, there is the probability that after the present agitation has subsided local authorities will, as they have done in the past, allow the matter to fall in abeyance (professedly in the interests of economy), an issue which is equally unsatisfactory. It is, I think, sufficiently obvious that for the proper protection of water consumers, periodical analyses and examinations of the water on some practical basis (which ought to be clearly defined) should be made compulsory on all local authorities alike, whether the water-works are in their own hands or in those of a company; and, further, that for the reasonable protection of companies and water-works officials generally, the power to invade the works and inflict duplicate samples and reports upon the company's officials should be strictly confined to some recognized sanitary officer—preferably one appointed for the purpose—and should be also limited as regards frequency and time of day. As I have already said, it is very doubtful if any system of analyses, however religiously followed, would secure absolute immunity from occasional and accidental pollution of water supplies; but there is no doubt that the Local Government Board would be well justified in prescribing some such rules

as I have indicated for the guidance of local authorities, and if necessary for Parliament to deal with the matter by a General Act, amending the Water-Works Clauses Acts and the Public Health Acts as might be required.

#### *Pollution of Source of Supply.*

The two clauses under this heading are a great advance upon the preceding ones, and suggest a means of checking pollution which is likely to be far more effectual than anything previously specified. The examination by a properly qualified official of the works and land constituting the source of the water supply should, at any rate, give an indication both of risk and actual pollution in time for steps to be taken to prevent polluted water being supplied to the inhabitants. But here I must emphasize the fact shown by past experience, that it is utterly useless to confer optional powers on local authorities. To be effectual, these powers must be made compulsory, and must be very clearly defined; and, in my opinion, they might be considerably enlarged beyond what is indicated in the clauses in question.

#### *Power to Enter Lands, &c.*

The powers (or rather penalties for obstruction) of authorized entry on water-works, &c., detailed by these clauses are, of course, fair and reasonable enough. But it is worth while to examine the powers which local authorities possess in this respect under existing Acts of Parliament, before attempting to create new powers of this far-reaching character. This point will be enlarged upon in a subsequent paragraph.

Having thus briefly criticized the proposed clauses, and indicated the points to which further attention might profitably be devoted, I will now endeavour to further enlarge upon the latter in the hope of suggesting some practical *modus operandi*, by which such provisions may be made as will render the recurrence of serious epidemics such as have recently excited general alarm and severe local distress as near as may be impossible. In attempting this task, I am quite alive to the fact that while it is very easy to find fault with any proposals advanced with a view to solving a knotty problem such as this undoubtedly is, it is by no means so easy to suggest a practical and practicable method of getting over the difficulties which must be inevitably met with. Having, however, recently made a careful study of the parliamentary powers and obligations of water-works authorities, both municipal and commercial, and also having had some experience in the design and construction of water-works, I am hopeful that my remarks may at any rate prove useful, even if they do no more than suggest the lines upon which further investigations should be conducted.

#### APPENDIX.

For the convenience of my readers, I append copies of the clauses that were proposed to be inserted in the Higham and Hundred of Hoo, Mid-Kent, and other Water Companies' Bills by the Local Government Board.

#### CLAUSES PROPOSED BY THE LOCAL GOVERNMENT BOARD, JUNE, 1898.

*Penalty for Failure to Supply Pure and Wholesome Water (10 Vic., cap. 17).*

1.—If the company fail to provide and keep such a supply of pure and wholesome water as is required by section 35 of the Water-Works Clauses Act, 1847, they shall, unless prevented by frost, unusual drought, or other unavoidable cause or accident, be liable for the first offence to a penalty not exceeding £20, and to a penalty not exceeding £5 for every day on which the offence is continued after conviction; and such penalties may be recovered summarily before a Petty Sessional Court.

2.—Any offence under this section may be prosecuted by any local authority acting in the execution of the Public Health Acts in any part of whose district the company supply water for domestic purposes, or by any person supplied by the company with water for domestic purposes.

3.—All penalties recovered under this section shall be applied in such manner as the Court may direct.

#### *Power to Take Samples of Water.*

1.—For the better enforcement of the provisions of section 35 of the Water-Works Clauses Act, 1847, any Medical Officer of Health or other person authorized by any local authority acting in the execution of the Public Health Acts for any district in any part of which water is supplied by the company for domestic purposes (producing, if required, a certificate of his personal authority signed by the clerk to the local authority) shall be entitled at any time, on giving not less than six hours' notice to the company, to take and carry away samples of water from any land, reservoir, work, building, filter-bed, main, pipe, stand-pipe, or stopcock of the company, from, through, or by which a supply of water is given, and may for that purpose enter upon any lands or premises of the company. Any person who obstructs or molests such Medical Officer of Health or other person authorized as aforesaid shall be liable to a penalty not exceeding £20 for each such offence; and such penalty may be recovered summarily before a Petty Sessional Court.

2.—Any water consumer may at any time, on giving such notice as aforesaid, take and carry away samples of water from any land, reservoir, work, building, filter-bed, main, pipe, stand-pipe, or stopcock of the company, from, through, or by which a supply of water is given, and may for that purpose enter upon any lands or premises of the company.

3.—Any samples shall be taken in triplicate, and shall forthwith be respectively sealed up and marked by the person taking the same, who shall leave one of such samples with the company or an officer or other agent of the company, and may submit another for examination if he thinks fit, and shall retain the third for future comparison if required.

4.—The company shall be entitled to be represented by an officer or other agent when the samples are taken, sealed up, and marked.

5.—For the purposes of this section, "water consumer" means any



person who is supplied by the company with water for domestic purposes, or who pays, or is liable to pay, any rate for such a supply.

#### *Pollution of Sources of Supply.*

1.—For the better discovery of any causes of pollution of the water obtained or supplied by the company, any officer of the company authorized in that behalf by the company and any Medical Officer of Health for any district whereof any part is supplied by the company with water for domestic purposes authorized in that behalf by the local authority for such district, may at any time between the hours of nine in the forenoon and four in the afternoon, on producing, if required to do so, a certificate of his personal authority signed by the secretary of the company in the case of an officer of the company or by the clerk to the local authority in the case of the Medical Officer of Health, enter on any land or premises from which water is obtained or supplied, whether immediately or otherwise, by the company, and may take and carry away samples of any water or of any matter, substance, or liquid which may appear likely to cause pollution to the water of the company, or to the sources of supply of the company, or whereby such water may be fouled.

2.—Any samples shall be taken in triplicate, and shall forthwith be respectively sealed up and marked by the person taking the same, who shall leave one of such samples with the person having the custody of the premises, and may submit another for examination if he thinks fit, and shall retain the third for future comparison if required.

#### *Power to Enter Lands and Premises for the Purpose of Taking Samples and Discovering Causes of Pollution.*

1.—If any water consumer authorized by section 2, or any person authorized by or under section 3, to take and carry away samples or to enter on any lands or premises is refused permission so to do, any Justice having jurisdiction in the place where the land or premises is or are situate, on complaint thereof on oath by such person (made after reasonable notice in writing of the intention to make the same has been given to the person having custody of the premises), may, on reasonable cause being shown, by order require such person to admit the person authorized as aforesaid upon the premises during the hours mentioned in the order, and to permit and to give all facilities to him to take and carry away such samples as aforesaid.

2.—Any order made under this section shall continue in force until the purposes for which such order was made are completed; and any person who refuses to obey an order so made shall be liable to a penalty not exceeding £10, and any person who obstructs or molests any person authorized to take samples shall be liable to a penalty not exceeding £5 for each such offence—such penalties to be recovered summarily before a Petty Sessional Court.

(To be continued.)

## TECHNICAL RECORD.

### NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

#### *The Papers and Discussions at the Annual Meeting.*

In the "JOURNAL" last week we published a general report of the proceedings at the annual meeting of the above-named Association, held in Glasgow, under the presidency of Mr. T. WILSON, of Coatbridge. We now begin the papers and discussions.

#### RETORT-SETTINGS, AND PRACTICAL RESULTS OBTAINED.

By W. EWING, of Hamilton.

Our President having selected the title of "Retort-Settings, and Practical Results Obtained," as a subject suitable for consideration at this meeting, and one calculated to create a profitable discussion and helpful exchange of ideas, I consented, after some hesitation, to do what I could in preparing a paper on the lines indicated. I purpose giving you a short description of the condition in which I found the gas-works of the Hamilton Corporation on taking over the duties of Manager there, in the autumn of 1892, and the means I adopted to overcome the difficulties which immediately presented themselves.

Soon after being installed at Hamilton, I found that the condition of the works had been reported upon by an expert prior to my installation. This report stated that the plant was then at its utmost limit of production, and that the plant and buildings generally were rather antiquated, and in need of repairs and extension. The retort-benches then contained in all 57 retorts. These were all on the direct-firing principle; and great difficulty had been experienced, during the winter previous to my taking up office, in supplying the growing demand for gas during the maximum consumption. This, however, was ultimately successfully overcome by building settings of retorts on a simple generator principle in room of the old settings removed, without extra cost. The maximum storage capacity was, at that time, 255,000 cubic feet, though at times the available capacity was as low as 200,000 cubic feet, on account of the water leaking from the gasholder tanks through cracks caused by underground workings. From the same cause, notwithstanding constant repairs, the main pipes and services were in a very bad state—leaking all over the town, and causing the leakage or unaccounted-for gas to assume the enormous figure of 22½ per cent. of the annual production.

In works so much congested as ours, difficulties were the order of the day, and were, of course, peculiar to the works and the locality of the situation of the plant in which they had their existence. The Convener and members of the Gas Committee offered me every support in combating these difficulties, with the result that during the winter of 1892-3 we found ourselves in,

comparatively speaking, still water, and this without any capital expenditure, which had been strongly advocated at the time, but at the cost of much physical energy. A large scheme of extensions was under consideration at the end of 1891; but when my Committee found how I had tided over the following winter and met the increased demand for gas, having regard to the favourable results obtained by the substitution of a simple generator setting of retorts, they decided to delay, for a time at least, any further consideration of extensions.

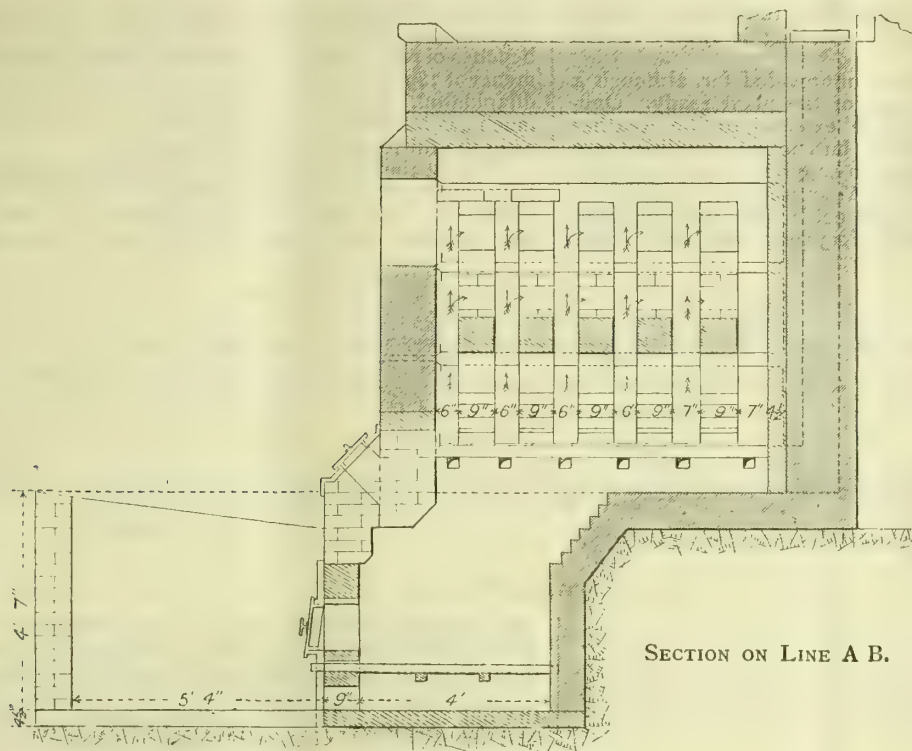
The simple generator setting of retorts which I have referred to, and which was designed to meet special circumstances, is shown by the drawings. They were introduced into each oven (excepting two settings of twos) as the old settings required renewing; and the cost for material and labour being practically the same as that required for the older systems, no extra expenditure for the same number of retorts was entailed—the work being done by our own employees. Into each oven that formerly held only three and four retorts I introduced five and six. This was accomplished by reducing the floor to the level shown on the drawings. The retorts were of the same sectional area as those formerly used, but were 6 inches longer. The dimensions of the old retorts were 8 feet long by 24 in. by 14 in., and of those introduced 8 ft. 6 in. long by 24 in. by 14 in. This additional 6 inches in the length of the retorts necessitated their projecting beyond the front walls of the settings; but this had the double advantage of giving one a larger carbonizing area, and consequently greater yield of gas per retort, as well as practical immunity from choked ascension-pipes, which pleasing circumstance it has always been my lot to enjoy. In my experience, I have found that if the ascension-pipes are of ample bore, and fixed so that they are a few inches off the perpendicular, the condensable tarry matter runs down one side of the pipe, instead of spreading round its whole area, and thereby prevents choking when high heats are in use.

When all the old direct-fired settings had been replaced by those of the newer design on the generator principle, we found that we had, in the same space, added an additional 25 retorts; thus having 82 available retorts, as against 57 hitherto. The productive capacity was raised by this means from 330,000 to 750,000 cubic feet; and this for the trifling cost of £150 for additional retorts. My object in introducing this system of retort-setting was, at the outset, to be able to maintain higher heats, increase the yield per ton, and save fuel; but I also found that with the increased number of retorts in the same ovens I could produce 100 per cent. more gas. The working results came as a pleasant surprise to my Committee, who were deeply interested in the arrangements, and who awaited with much interest the result of the first year's working.

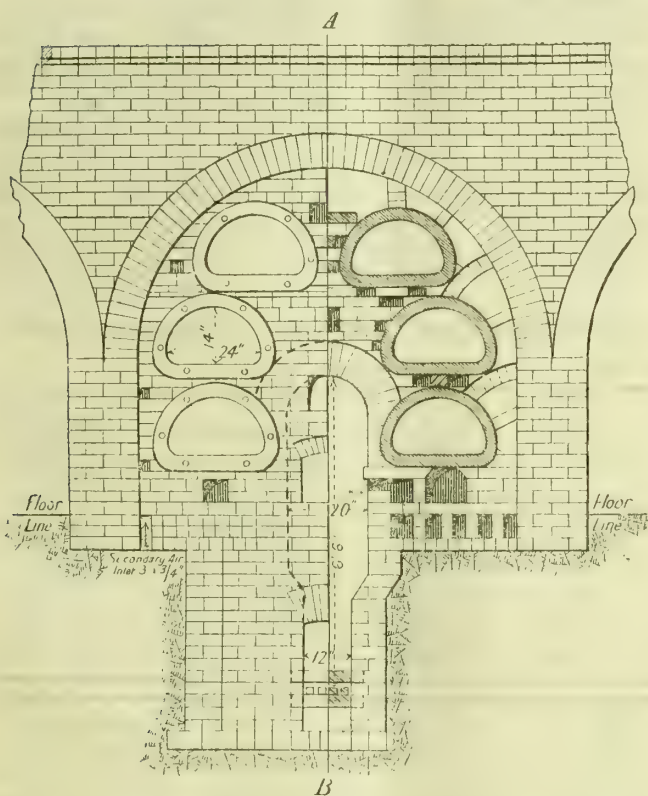
For manipulating these settings of retorts, the usual care is required in regulating the dampers, secondary air, and steam. The regulation is done gradually, and the openings increased till the required amount of each is obtained. The setting then requires no further attention, excepting the clinking process, which is occasioned once in every eight or ten days, and the feeding of the producer with hot coke direct from the retort. I have found that the best results are obtainable with a depth of from 3 to 4 feet of coke in the producer. The furnace bars have a hole at the end and project 3 inches in front of the furnace door in the producer pit. They are shaken up every eight hours, after which the top door of the producer is opened, and the remaining clinker and coke are pushed down on to the bars and allowed to settle, so that no space is left between the bottom of the coke in the producer and the furnace bars. The steam-jet underneath the producer bars makes the clinker very friable; and the greater part of it is reduced to powder by the action of shaking the bars. The secondary air is admitted at the front of the retort-bench, immediately underneath the bottom retorts, through a slot in the brickwork communicating with five graduated secondary air flues to the producer, where it meets the producer gases in the combustion chamber, and at once combines with them. The products of combustion are first led upwards through the setting, then down both side flues simultaneously; making their final exit along the flue underneath the bottom retort, and thence up a vertical flue in the wall behind the setting to the main flue situated on the top of the bench. I have always found this setting to give equal heats throughout the oven; any local heating being overcome by an arrangement of dampers and slip bricks inside the setting, which are either opened or partly closed to obtain the desired result. The slot in the brickwork, through which the secondary air passes, is regulated by means of a brick; and I find that for a setting of five or six, with a draught on the chimney equal to 1 inch of water, an opening 3 inches by ¾ inch is suitable.

It was not till 1894-5 that we derived the full benefit of these settings; but during that year they did good work, giving us practical proof of their utility and amply justifying their adoption. The make of gas per mouthpiece averaged from 8500 to over 10,000 cubic feet; and the fuel account was from 16 to 20 per cent. of the total coke made—assuming the yield of coke from local canals to be 11 cwt. per ton of coal carbonized. The yield of gas per ton of coal carbonized was, for some, about 11,000 cubic feet from local third-class canals, and which the printed form of analysis showed as giving 10,860 cubic feet per ton. To ascertain the actual yield of these canal coals with high heats, I made three different tests on a working scale, with a resulting average yield of 12,300 cubic feet per ton, the coals



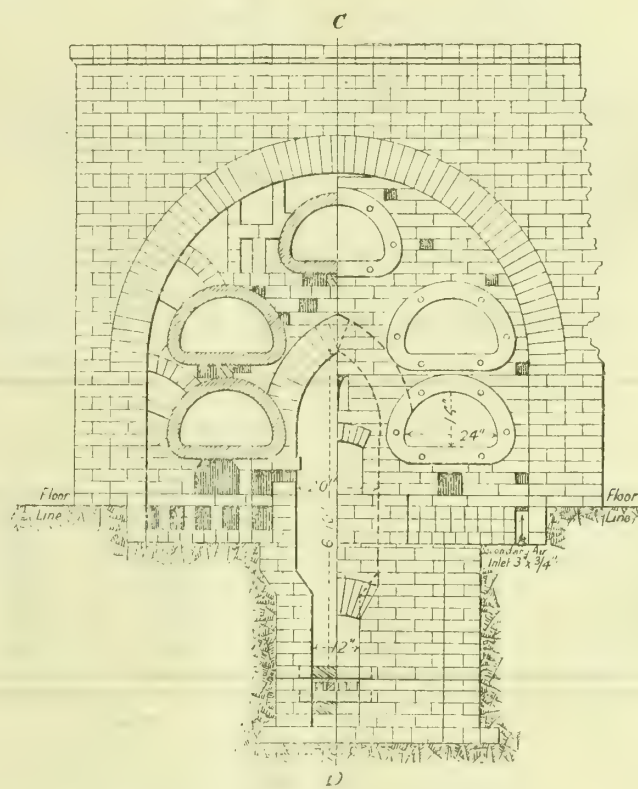


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being carefully weighed. After a few months' trial with very high heats, we found a great difficulty in getting the tar to flow freely from the foul main, owing to the hydraulic main being so near the top of the bench—there being only 12 inches space between them. The tar contained in the hydraulic main began to distil, and so caused no end of trouble in necessitating the drawing of the thick tar from the drip-box by hand, and then putting it into open barrels. This caused us to exercise great care to prevent the complete solidification of the contents of the hydraulic and foul mains. This was a most hazardous and disagreeable task; and to prevent it, and a probable stoppage of the works, we found it safer to make about 10,000 cubic feet per ton.

The table of working results shows an improvement in the returns from 1893; but the greatest improvement in results is from 1894 to 1898, for during these years I had practically the full use of the new settings. I must also include the year 1891-2, as during the whole of this year direct-fired settings were in use. Only one half of the following year (1892-3) was under my management. It will be noticed from this comparison that the make of gas increased from 61,750,000 cubic feet in 1892 to 102,000,000 cubic feet in 1898; and I am much pleased to say that during the current year we shall be paid for 100 per cent. more gas than in 1892. This, in a sense, is largely due to the

great reduction in the leakage account, which, after several years of downright hard work, has been reduced from the unenviable figure of 22.5 per cent. in 1892 to about 10 per cent. for the current year. At present our output of gas is 25 per cent. more than it was this time last year; and I calculate that our make of gas this year should be anything between 110 and 120 million cubic feet. The returns for tar and liquor have been variable—ranging during the past four years from 55.65 to 70.95 gallons per ton of coal used. The fuel account, too, has been variable; but the average, after allowing for shale and the firing of boilers, is 21 per cent. of the total coke made.

Early in 1895, I reported to my Committee that I could not take the risk of carrying on the works another year without certain extensions, including a new gasholder, to be completed ere we entered into another winter—the maximum output of gas having reached 2½ times the available storage capacity of the holders. I was instructed to report and give a plan and probable cost of the proposed extensions. These proposals were passed in Committee, and fought bravely for in Council, but were ultimately sent back for further consideration. However, during the following summer, after a delay of several months, the scheme of extensions, as originally sketched out by me, was finally passed, and the work proceeded with, but too late to be of service for the ensuing winter; and, in consequence,

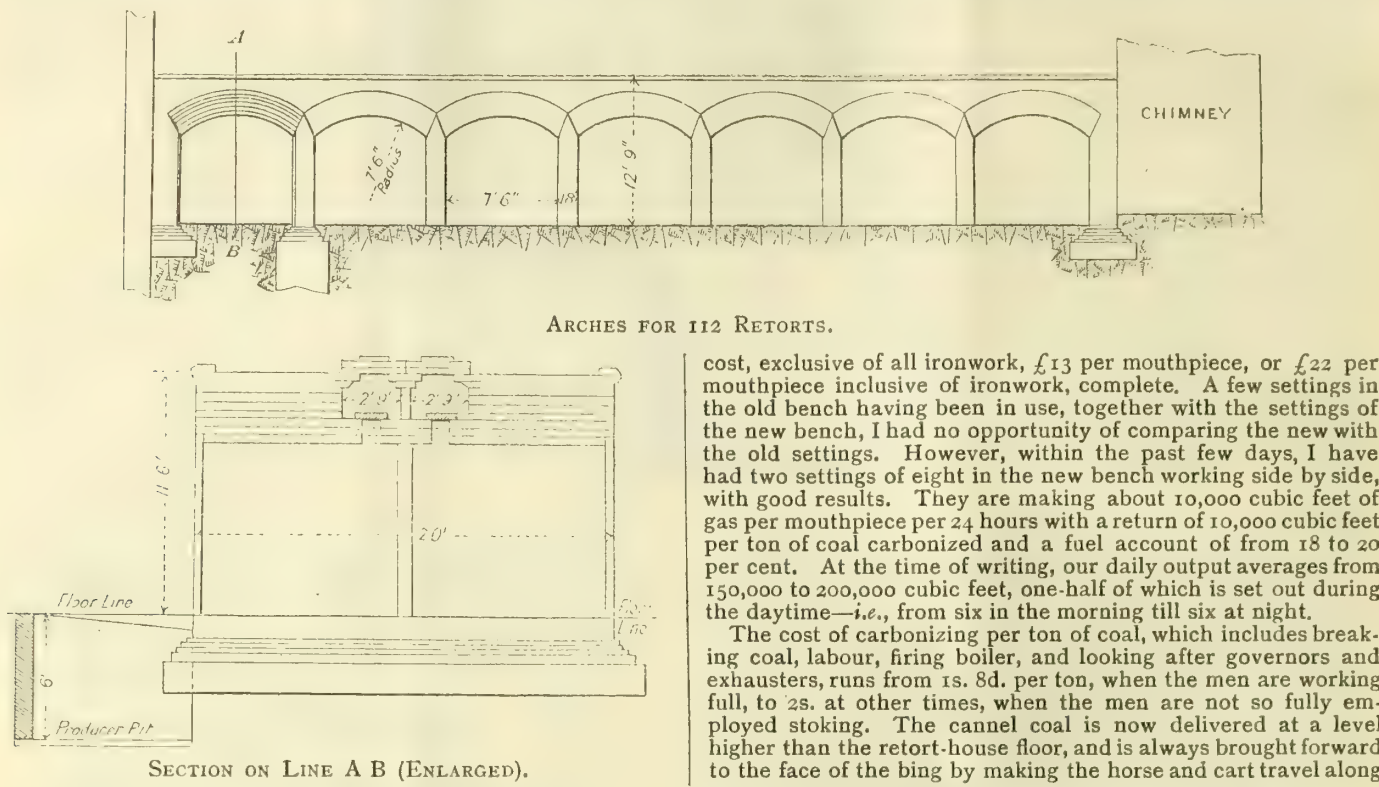


the loss all round was pretty heavy, and the working results considerably reduced. The result of this long delay may be seen in the table.

The winter of 1895-6 came thus unprovided for, although a strong effort was made to get part of the plant ready. One-third of the available retorts were exposed to the weather without any roof covering whatever; but, notwithstanding these inconveniences, we were successful in supplying the demand for gas during the Christmas and New Year weeks—including the record maximum output of 703,000 cubic feet—and this with only an available storage capacity of 230,000 cubic feet. This

was an anxious time, as you may suppose; but it was overcome without any inconvenience to the public. Seeing that these old benches of retorts were condemned as inadequate for the requirements of 1891, it was but natural to expect them to be somewhat dilapidated, and unprofitable to work in 1896-7, although as much gas has been made in these latter years in the same ovens as in the thirteen years previous to 1891.

To meet the requirements of a rapidly-growing consumption, I designed a double bench to contain 112 retorts—14 settings of eights—on the same generator principle as those already in use. A rough outline sketch of this bench is shown here, which



cost, exclusive of all ironwork, £13 per mouthpiece, or £22 per mouthpiece inclusive of ironwork, complete. A few settings in the old bench having been in use, together with the settings of the new bench, I had no opportunity of comparing the new with the old settings. However, within the past few days, I have had two settings of eight in the new bench working side by side, with good results. They are making about 10,000 cubic feet of gas per mouthpiece per 24 hours with a return of 10,000 cubic feet per ton of coal carbonized and a fuel account of from 18 to 20 per cent. At the time of writing, our daily output averages from 150,000 to 200,000 cubic feet, one-half of which is set out during the daytime—i.e., from six in the morning till six at night.

The cost of carbonizing per ton of coal, which includes breaking coal, labour, firing boiler, and looking after governors and exhausters, runs from 1s. 8d. per ton, when the men are working full, to 2s. at other times, when the men are not so fully employed stoking. The canal coal is now delivered at a level higher than the retort-house floor, and is always brought forward to the face of the bing by making the horse and cart travel along

COMPARISON OF WORKING RESULTS AT THE HAMILTON CORPORATION GAS-WORKS FROM 1891-2 TO 1897-8.

| Year.            | Coal Used.<br>Splint, Cannel,<br>and Shale. | Cost of<br>Coals. | Cost per Ton<br>Used. | Gas Made.   | Total Received<br>for<br>Residual<br>Products. | Total Received<br>for Residual<br>Products per<br>Ton of Coal<br>Used. |
|------------------|---------------------------------------------|-------------------|-----------------------|-------------|------------------------------------------------|------------------------------------------------------------------------|
|                  | Tons.                                       | £                 | s. d.                 | Cubic Feet. | £ s. d.                                        | s. d.                                                                  |
| 1891-2 . . . . . | 7,515                                       | 5099              | 13 7                  | 61,738,900  | 2319 8 2                                       | 6 2'06                                                                 |
| 1892-3 . . . . . | 7,449                                       | 5315              | 14 3                  | 70,058,500  | 1418 14 6½                                     | 3 9'72                                                                 |
| 1893-4 . . . . . | 7,296                                       | 3087              | 8 5                   | 71,876,000  | 1578 11 2                                      | 4 3'90                                                                 |
| 1894-5 . . . . . | 7,772                                       | 3252              | 8 4                   | 80,623,100  | 2607 8 2½                                      | 6 8'64                                                                 |
| 1895-6 . . . . . | 10,032                                      | 4323              | 8 7                   | 95,637,800  | 2361 7 1½                                      | 4 8'49                                                                 |
| 1896-7 . . . . . | 10,803                                      | 4150              | 7 8                   | 105,000,000 | 2424 18 11                                     | 4 6'13                                                                 |
| 1897-8 . . . . . | 10,606                                      | 4375              | 8 3                   | 102,018,900 | 2181 9 0½                                      | 4 1'60                                                                 |

| Year.            | COKE.                                                                                                            |                                                                       |       |       |                     | TAR AND LIQUOR.             |                             |                     |                                              | SPENT LIME. |       |                     |
|------------------|------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|-------|-------|---------------------|-----------------------------|-----------------------------|---------------------|----------------------------------------------|-------------|-------|---------------------|
|                  | For Sale<br>but not<br>including<br>that Used<br>in Boiler.                                                      | Saleable<br>per Ton<br>of Coking<br>Coal.                             | Sold. | Rate. | Amount<br>Received. | Due to<br>Year and<br>Sold. | Rate<br>per 100<br>Gallons. | Amount<br>Received. | Quan-<br>tity per<br>Ton of<br>Coal<br>Used. | Sold.       | Rate. | Amount<br>Received. |
|                  | The<br>average<br>amount of fuel<br>used from 1894 to<br>1898 was 21 per<br>cent. total pro-<br>duction of coke. | Cwt.<br><br>Does not in-<br>clude coke<br>used for firing<br>boilers. | Tons. | s. d. | £ s. d.             | Gallons.                    | s. d.                       | £ s. d.             | Gals.                                        | Tons.       | s. d. | £ s. d.             |
| 1891-2 . . . . . |                                                                                                                  |                                                                       | 1353  | 5 10  | 396 8 11½           | 372,965                     | { 9 9<br>10 1               | 1893 12 3           | 49'63                                        | 518         | 1 1   | 2) 7 11½            |
| 1892-3 . . . . . |                                                                                                                  |                                                                       | 1146  | 5 7   | 318 19 9½           | 385,657                     | { 10 1<br>3 7               | 1059 3 5            | 51'77                                        | 668         | 1 3   | 40 11 4             |
| 1893-4 . . . . . |                                                                                                                  |                                                                       | 2021  | 5 3   | 533 5 0½            | 433,228                     | { 3 7<br>4 9                | 1009 19 0½          | 59'37                                        | 615         | 1 2   | 35 7 1              |
| 1894-5 . . . . . | 3312                                                                                                             | 8'10                                                                  | 3067  | 5 9   | 883 4 10½           | 546,458                     | { 4 9<br>6 3                | 1644 19 0           | 70'30                                        | 1035        | 1 6   | 79 4 4              |
| 1895-6 . . . . . | 3441                                                                                                             | 7'54                                                                  | 3140  | 5 1   | 799 9 1½            | 558,313                     | { 6 3<br>5 0                | 1491 3 4            | 55'65                                        | 943         | 1 6   | 70 14 8             |
| 1896-7 . . . . . | 3636                                                                                                             | 7'34                                                                  | 3086  | 4 9   | 738 13 9            | 665,947                     | { 5 0<br>4 9                | 1626 4 1½           | 61'64                                        | 802         | 1 6   | 60 1 0½             |
| 1897-8 . . . . . | 3935                                                                                                             | 8'27                                                                  | 4380  | 4 2   | 910 17 7            | 752,581                     | { 4 9<br>3 0                | 1225 3 2            | 70'95                                        | 617         | 1 6   | 45 8 3½             |

the top of the coal, when it is tipped over the face towards the floor. I have found that the coal can be broken ready for the retorts at something like 1½d. per ton against the handling and breaking of coal, which was the case formerly, at a cost of from 4d. to 6d. per ton.

This year's price for residuals is the lowest on record; but, notwithstanding this, and considering the extra facilities given by the new plant, and that corporations are supposed to sell gas at cost price after paying interest on loans, and allowing a reasonable sum for depreciation, I am very confident when I say that we are in a position to sell gas at 1s. 9d. per 1000 cubic feet, and meet all the necessary obligations. This would then put us in the position of selling gas of 23 standard candles at 0'9d. per candle.

It is not to be inferred from these increased results that the duties of the workmen have also been increased; and although the number of employees is less than formerly, their work is now much less fatiguing, their working hours are reduced, and their



pay is increased. Good working results can only be obtained by careful and judicious management, and by strict personal supervision and skilled assistance in every department of the works, without which all the combined energy of the very best form of generator or regenerator settings and apparatus would be of no avail, and could not be expected to give results that were entertained, but neither attempted nor catered for. Good results, gentlemen, are within the province of every one of us, and should be diligently and thoughtfully sought after.

#### Discussion.

The PRESIDENT said he was sure the members were all very much indebted to Mr. Ewing for his valuable paper, which must have cost him a great deal of time to prepare. He thought they would all be able to learn a lesson from Mr. Ewing, who talked of getting 11,000 cubic feet of gas per mouthpiece; at Coatbridge they were well satisfied if they got 9500 cubic feet.

Mr. J. NAPIER MYERS (Saltcoats) agreed that the thanks of the members should be given to Mr. Ewing for his paper, as well as for the trouble he had taken in bringing so much information before them. He thought, however, the statistics towards the end of it might have been taken as read, as no one, though he had a head like a line-of-battle ship, could have carried this mass of figures. He (Mr. Myers) understood Mr. Ewing to say that the secondary air was taken from underneath the last flue of the side retorts. Did he not think it was a weak, or faulty, arrangement to heat the secondary air by the last flue underneath the bottom retorts? Did it not tend to rob the floor of that retort of the heat carried into the furnace? He should like to hear what Mr. Ewing had to say as to the arrangement.

Mr. W. CARR (Stalybridge), on being invited by the President to take part in the proceedings, expressed his pleasure in speaking upon the paper. He said that if he had had a copy of it in his hands, he thought he might have been able to offer some comments upon the work Mr. Ewing had done, and had so carefully described. But, gathering, as he went along, as nearly as he could, the results the author had achieved, he must say that they were particularly good. He agreed with the previous speaker in regarding the setting as very faulty in principle. Whatever the results obtained from it, it did not strike him as being a scientific setting at all. He thought the weak point was the one referred to by the previous speaker—the place where the secondary air supply was taken. He listened very attentively to the paper, and he gathered from it that Mr. Ewing was just persevering with the same setting of retorts that he put in at first. Probably, from the good results he obtained he felt warranted in doing so; but he (Mr. Carr) should have thought that, having accomplished so much with so little, he would have tried to improve upon the matter, and have gone a little farther. Like Mr. Ewing, when he went to Stalybridge early in January some two or three years ago, he found that all the retorts were at work—every mouthpiece there was in the place—and they could not keep the gasholders up. They had to work at reduced pressure for fear of the gasholders landing. During the following summer he took out 92 mouthpieces. He did not try to utilize the arches as they then were, because some of them had seven retorts in them, with direct firing. He took out the whole of the bench, and erected a new installation of regenerative furnaces, on what he considered to be the most scientific principle; and he put in 144 mouthpieces in place of the 92 taken out. But in order to do this, he had to put 9 retorts in every setting—three tiers of three each. During the past winter, he was unfortunately compelled to be away from the works a great deal. He might mention that last summer he started to take the second half to pieces, and reconstruct it; but, owing to his illness in the autumn, he was unable to complete the work. He was left with 70 of the retorts which should have been done away with; and he had to “face the music” with the 144 new retorts erected on the regenerative principle. The men managed to get through the winter very easily, without requiring to put the old retorts to work. They had not been able to accomplish the extraordinary result of getting 10,000 or 11,000 cubic feet of gas per mouthpiece; but he did not feel discouraged by that, because he did not think the make per mouthpiece was a true criterion of the worth of a setting. He could get a great deal more per mouthpiece than he did; but he thought it would be at the sacrifice of economy in working. Of course, his retorts were not so large as those of Mr. Ewing; they were 22 inches by 14 inches. But, even so, he did not, under any circumstances, consider it was wise to go in for a very large make of gas per mouthpiece. He did not find that those people who claimed very large makes per mouthpiece—Mr. Ewing, of course, excepted—produced very cheap gas. But Mr. Ewing had done so and had put in what appeared to him (Mr. Carr) to be, to the best of his recollection, the cheapest setting of retorts he had ever heard of; for £22 per mouthpiece for retort-settings, with ironwork included, was, he thought, exceedingly low. His (Mr. Carr's) brother claimed to have done it at £26 per mouthpiece; and the installation which he himself put in came to a fraction under £27. Mr. Chester, in a paper he read before The Gas Institute in 1894, spoke of a setting coming out at £46, which he considered a very low figure. This included the flooring and all other matters. His own did the same. Outside of the flooring, he did not see how the retort-mountings could be much more extensive in the one case than the other; and as Mr. Ewing had succeeded in doing the work for £22 per mouthpiece, he had

certainly given them something to think about, as to how they were to reduce the cost of their settings. He had listened to the paper with very great pleasure, and he should read it with even greater pleasure, because he had not been able to follow the figures of comparison.

Mr. J. M'GILCHRIST (Dumbarton) said he should be glad if Mr. Ewing would tell them exactly what he included in the £22. It seemed such a very low sum, that he was afraid the price of the excavation, or work of that kind, must have been left out. However, he thought, after what they had heard Mr. Ewing say, they might give Hamilton the very top place in connection with the cheap and economical manufacture of gas. He thought they might call it the Widnes of Scotland. He was very pleased to have heard the paper, and he trusted they would all read it with greater pleasure than they had listened to it.

Mr. D. VASS (Edinburgh) thought that Mr. Ewing mentioned one little point, with reference to the heats being so high that they caused pitching in the main, and had compelled him to lower the heats. He thought it would have been a great advantage if Mr. Ewing had been able to retain his high heats and also to do away with the pitching. He had had a little experience of it during the past winter; and he was glad to say he had got over it by putting in a sort of cushion of sand on the top of the bench. By this means the heat was kept away from the hydraulic main, and they were able to maintain their heat in the ovens. It was only a little experiment on their part; and he was glad to say it had been successful.

Mr. A. WILSON (Perth) said he was in a like position with Mr. Ewing in having these furnaces in use at his own place. He supposed Mr. Ewing was of opinion that this was the best system of firing, and had pinned his faith to it, as he was contemplating the erection of a bench of 112 retorts upon the same system. He (Mr. Wilson) could understand his adopting such a method of firing in a case of emergency, as he had to do the same thing himself. They were in the unfortunate position of being very much cramped for room, and were removing their works; and so he found it necessary to adopt some other system of firing, to enable them to go on until they had the new works erected. He therefore adopted the system Mr. Ewing had advocated. But he did not like it at all. He would as soon see it out in the ash-heap, if he could afford it. He had had a little experience of open furnaces, and also of regenerative ones; and he could assure the members that, in his opinion, the regenerative was not only the best in every way, but the cheapest in the end. It might cost a little more to begin with, but it was really the cheapest process in the long run. Mr. Ewing stated that his carbonizing wages were something like 1s. 8d. per ton. This was not very low—he thought it was just about an average. Also, he would say, from the quantity of spent lime Mr. Ewing had been selling, he thought his purification had cost about an average. Might he take it that probably Mr. Ewing's standing charges had something to do with his cheap selling price for gas? He should like to hear something about this. He was sure all the members would feel greatly indebted to Mr. Ewing for having told them that he got from 10,000 to 11,000 cubic feet of gas per mouthpiece. From Mr. Ewing's own figures, he found that he carbonized 10,600 tons of coal, and made 102 million cubic feet of gas, which was about 9600 cubic feet per ton. There was one other question he wanted to ask—why Mr. Ewing, in his setting, had all the secondary air-ports, or nostrils, so small at the front, and getting larger as they went back.

Mr. A. MACPHERSON (Kirkcaldy) said the first thing that had occurred to him, on looking at the setting, was that it appeared to be a very old and familiar friend of his, designed by him for a small works at Dysart fifteen years ago. He then devised the arrangement for heating the secondary air for the purpose of saving excavation. The foundation was rock; and it would have been very expensive to excavate. He agreed with Mr. Carr that the setting described was not constructed on scientific principles; but he said it was a profitable one for small works. The results which had been obtained with it quite justified its application to any small works where regenerative settings would be far too expensive. They would find that with retorts set on this principle they could easily produce 9000 to 10,000 cubic feet of gas per mouthpiece in 24 hours, at an expenditure of something like 25 per cent. of the entire coke produced. He thought that anyone who wished to introduce such a system in a small place would never rue it. At the same time, he quite agreed with Mr. Wilson that an out-and-out regenerative system was *the* system. He had had experience of direct firing, and also of the semi-regenerative and the full regenerative systems; and certainly he thought the last was the proper setting for works of (say) more than 50 million cubic feet a year. The cost of the settings described seemed to him to be something altogether abnormal. He was afraid there was nothing charged for excavation—preparation of foundations, or floorage, or anything like that, because, from the knowledge he had gained in the construction of the ovens which he had set at Dysart, and which he had since set at other small works, he found that it worked out, without any flooring, but with the preparation of the necessary foundations, at nearly £28. How Mr. Ewing could do the work for so small a sum as £22 was more than he could conceive. He was not calling the figures in question; only it was wise, in these things, to know exactly what was included and what was left out. Otherwise, they might be going on different bases altogether.



The matter which Mr. Ewing met with—the thick tar—he (Mr. MacPherson) had also encountered; and a most peculiar experience he had with it. In working a regenerative setting, he found, to his horror, one Saturday night, that the pressure would not come down in the retort-house, do what he might. It was down everywhere, but only a little from the hydraulic main. Luckily he had a short distance off a cover which he unscrewed, and he found that in a 12-inch pipe there was a passage of only about 3 inches; the other 9 inches being blocked up with thick tar, which he could pull out and spin like a rope. The only way in which they could remove the tar seemed to be by steaming it. However, he thought that, as it had gone so long, it might go a little longer. So he closed it, and kindled up a new set of retorts, to get a stock of gas. After getting this, he opened the pipe and found it to be as clean as possible—the heat of the new retorts had been sufficient to again liquefy the pitchy tar. A very effective method of removing such tar, and doing away with choked ascension-pipes, he had found to be the running in of some weak ammoniacal liquor. He was not quite sure as to how it was brought about; but it struck him that by the cold liquor going in and the hot tar coming off, it was so cooled down as to prevent the naphtha evaporating.

Mr. R. F. HISLOP (Paisley) said it was a well-known fact that regenerative settings were more costly than generators; and he was convinced that, notwithstanding the good results which Mr. Ewing had obtained at Hamilton with the latter, in comparison with the old system of direct firing, if he had adopted a modern system of regenerative settings these results would have been much better still. There was, for instance, greater durability in the settings, as, after two, three, or more years' working, the first renewal was necessary only for the bed of the bottom retorts, and for the regenerators after twelve or fourteen years; whereas with generator furnaces the whole of the settings had to be renewed every two-and-a-half or three years. With modern regenerative settings, the secondary air had a much longer and more effective contact with the waste gases on their way to the chimney, and consequently they met with the producer gases at a much higher temperature; and these two, rising in vertical columns along the length of the producer arch, commingled in or above the combustion chamber, above the arch of the producer, with the result that the heat was distributed evenly throughout the setting, instead of above the fuel, as in the case of the generator settings referred to. Although Mr. Ewing got about 10,000 cubic feet of gas per mouthpiece, 12,000 cubic feet might easily be obtained. Mr. Carr seemed to doubt that Mr. Ewing got 10,000 cubic feet per mouthpiece; but he must bear in mind that Scottish and English coals were considerably different, and that it might be as easy to obtain 12,000 cubic feet of gas per mouthpiece from some Scottish coal as to get (say) 9000 cubic feet from some English coal. With regard to the fuel account, he noted that Mr. Ewing set it down at from 15 to 20 per cent.—an amount which, without complete regeneration, must be entirely erroneous. The error was clearly attributable to finding the coke used by difference—that was, estimating the fuel used from the amount sold, the latter containing a considerable quantity of water. Consequently, if he multiplied his fuel account by two, it would be nearer the mark. In the Hislop settings, the waste gases were utilized, not only in heating the secondary air, but in raising steam for the producer, and in keeping the clinker friable; and, by recent improvements, there was no clinking or using of bars, and no waste of fuel during the heating, and the work was accomplished in about five minutes. They were indebted to Mr. Ewing for his paper, since it had elicited a considerable amount of discussion.

Mr. A. YUILL (Alloa) remarked that there were certain facts specified by Mr. Ewing—the results he had obtained—while in the diagrams he showed the retort-settings. There were several points to which some of them might object. At least, from his own experience of gaseous firing, Mr. Ewing's plan was a mistake; the source of heat being so pent up in the system of flueing. There was a difference between ordinary and gaseous firing, as in the one case they required a much larger draught than in the other. With gaseous firing, they would notice that, when the firing-door was open, the flames belched forth, instead of there being a current of cold air pulled in through the setting when the furnace door was opened for the drawing of the coke. In fact, there was no draught; there was a vacuum—there was no pull at all on the retorts. As to the supply of the secondary air, he thought this was another point which they ought not to copy from Mr. Ewing, because, if they took a section of the supply, as shown, they would find that for the secondary supply they had the one side cold. There might be heat, and a considerable amount of it; but they would not have the same heat as they would if the secondary air were surrounded on the one side by the waste-gas flues, and on the other by the furnace wall itself. Therefore his opinion was that it was a mistake. Then as to the sizes of the air-ports, leading in, and the supply of the furnace gases rising from the producer, he had always found it to be beneficial to concentrate the gases rising from the producer, so as to bring them into intimate contact with the secondary air, so that, as it were, the two would meet and commingle. He had always found that the nearer they brought the secondary air to the supply of the gaseous fuel rising from the producer, the more beneficial it was. With regard to the

cost of fuel, he admitted that if they were able to reduce the temperature of the gases as they left the furnace, they were doing what they could to minimize the cost of fuel. In this case he could not see how they could reduce the temperature of the gases, as they left the retort-setting, to what they found in a full regenerative setting. Therefore, if they were losing heat they were losing in value, no matter what their results might be. A setting of fives was shown. He had always found that a setting of this number was not advantageous, in this sense—that they could not have one unless they thoroughly protected the top retort, which must be at an expenditure of heat, otherwise the retort would be burnt out. Better results, he thought, were obtained in settings of four, six, or eight, because in that form they got a free exit right over the retorts. Mr. Ewing spoke about the pinching of the furnace bars. In his opinion, the setting did not lend itself to allowing them to get the full command which they ought to have. They ought, in his opinion, to have the full command of both the primary and the secondary air, and also of the gases leaving the oven; otherwise they would not have the full command of the setting. He believed the damper had as much to do with the effective working of the oven as the air supply. His friend beside him [Mr. Hislop] had anticipated him to a certain extent with his new arrangement, and the clinking of his furnace bars. Last year he put in one setting in which they had done away with side pans, and had been able to have complete control over the supply of primary air, besides making the system of cleaning much easier than formerly. They only required, as it were, to clean the furnace every two days.

Mr. W. B. M'LUSKY (Selkirk) said he should like to know the quantity of coal put into the retort, the duration of the charge, and, as nearly as possible, the percentage of ash in the coke; also whether Mr. Ewing found it an advantage to burn the fire down every eight hours, and strip the soles free from clinker—whether he found this an advantage for bridging the fire and drawing the ashes from the bottom every 24 or 36 hours, as was common with the Hislop setting. Something had been said about the setting before them not being scientific; but this was altogether beside the question. He thought Mr. Ewing was to be complimented upon the results he had obtained. It was as an ounce of theory to a ton of practice; and Mr. Ewing had his ton of practice. He should like to know whether those who were questioning this setting were realizing, with their scientific settings, results which would compare with those Mr. Ewing was getting. This might explain the reason for Mr. Carr not believing in a great yield of gas per mouthpiece. They in Scotland liked 12,000 cubic feet per mouthpiece, if they could get it; and it had been got in the Border district for eight years consecutively, by Mr. Walker, at Berwick-on-Tweed. Mr. Walker had produced 150,000 cubic feet of gas from twelve retorts. This had never been reached with an ordinary setting. Of course, it was obtained with a "scientific" setting; and if Mr. Ewing got 10,000 cubic feet with his setting, he did well. This also pointed to the benefit of having a manager who was constructed on scientific principles, because they might have a scientific setting, and not a scientific manager. He considered that he had a scientific setting; but possibly he was not a scientific manager, because he could only get 9000 cubic feet of gas per mouthpiece. He should like to ask Mr. Ewing if he found any difficulty with the coke closing when it was more than 4 feet deep, or if he had any difficulty in drawing the air through.

Mr. EWING, in reply, said Mr. Myers and Mr. Carr mentioned that they thought a great amount of heat would be absorbed by the air underneath the bottom of the retort. He (Mr. Ewing) could not say. He had never tested, nor had he the means of testing, to ascertain it. Mr. Carr considered that a regenerative setting would have been better, even at some extra cost. Of course, he had to act according to circumstances, and, from the results, he found that it was cheaper and more effective to work this setting than those he had in the old benches. Mr. M'Gilchrist had spoken about foundations. In connection with these new settings, strange to say, he originally intended to construct them on the regenerative principle; but unfortunately, on account of the quantity of flint rock underneath, it would have been necessary to incur an outlay of not less than £100 in excavating for the producers. The cost per mouthpiece would thus have been considerably more than the figure shown. He had the advantage of a very cheap quotation for bricks, as well as for retorts; and the foundations were very shallow. The brickwork was built right on the hard rock. There was only one part, at the back, where they had to build up about 4 feet, and consequently they constructed the settings considerably cheaper than they would otherwise have done. But he had no hesitation in saying that under more favourable circumstances he could have built a setting for £20 per mouthpiece. Mr. Vass thought it would have been better to have had the main higher. There also he had to work according to circumstances. The "cloth" was cut, and he had to make the best of it. But in his next settings he had the main about 3 feet above the bench, supported on rolled joists. Mr. Wilson, of Perth, asked for information regarding the quantity of fuel sold, and such like. Of course, this was all given in the table, where he showed the quantity of coke sold and not that used in the boilers, and he found with the present settings that, working with a coal yielding about 11 cwt. of coke per ton, there was perhaps from about 8 to 10 per cent. of ash. If he



did not fire the boiler with it (there was a fair quantity used there, and he was sorry to say they did not use breeze), he could sell nearly 9 cwt. of coke per ton of coal carbonized. With regard to carbonizing wages and general statistics, of course he had not heavy standing charges. Even after having spent, during the past six years, between what had been added to capital and ordinary additions to capital, at least £26,000, and taking a lot of money from revenue for unredeemed capital, he supposed that nearly £30,000 had been spent in all. But, with all this, their total loan capital was only £35,000. Mr. MacPherson mentioned that this setting was an old friend of his. He (Mr. Ewing) did not pretend that the setting was original; and he had never done so. It was only a design to suit circumstances. Mr. MacPherson mentioned that his cost per mouth-piece was £28. Circumstances might have varied. He (Mr. Ewing) had his own retort-setter at Hamilton, and he found that he did the work most effectively, and at cost price, which made a big difference. He constructed the whole of these settings, except the ironwork, with his own men. Mr. Hislop had told them of the advantages of regenerative settings. This was altogether beside the question. He (Mr. Ewing) was treating of generator furnaces; and he had better results than the average obtained with regenerative firing. He thought that in gas-works where there was too much complication good results were never realized. The simpler the settings, the better the results. Mr. Yuill said he worked his producers at a vacuum. He (Mr. Ewing) had done so with this setting; and he had found by experiment during 24 hours, and also during another test of three days, a fuel account of 14 per cent. So that he did not see where the advantage came in of the elaboration which there was in regenerative furnaces, when he could get it, with greater simplicity, at about half the cost. Mr. Yuill preferred retort-settings of fours, sixes, or eights. He (Mr. Ewing) had found, in his experience, that a setting of fives was a weak one, though he had had such a setting working for three years without requiring anything more than a little repair to the front. Mr. M'Lusky wanted to know the quantity of coal carbonized per retort. He ran charges varying from 2½ to 3½ cwt. for four hours. By running them for this time he found there was less wear and tear on the retorts. His settings, with the exception of one or two mishaps—the burning away of the arches and the like—he found to run from two to three years; and he had one which had gone on for three years constantly without requiring renewal.

The PRESIDENT remarked that they had learnt a great deal from the paper, but considerably more from the discussion. He was something like his friend Mr. Ewing. Mr. MacPherson said the setting before them was an old friend. Well, he was one of the old-fashioned managers, and he thought it was a great pity that they should have scientific, practical men among them that day who could not work such settings as this. Many years ago he was instructed to make inquiries as to regenerative settings. Settings of threes and fours were the most popular at that time. He made all inquiries as to cost, results, and so forth, and he found that, with his old, unchanged settings, he had better results, at about a third of the cost. He thought it was a great pity that practical men could not get better results without going in for expensive works. His settings at Coatbridge were pretty much the same as those before them, and he obtained first-class results. Both Mr. Ewing and himself had the disadvantage of having a small number of retorts in an oven. If they had a greater number, perhaps their cost would be down 10 or 11 per cent. Another manager might fancy a £46 setting; but so long as he (the President) could get as good results with a cheap setting, he was not going to introduce a dear one. He thought they would all be the better for the reading of Mr. Ewing's paper.

#### EXPERIENCES WITH PREPAYMENT METERS.

By ANDREW WILSON, of Perth.

The introduction of these instruments for the control of the delivery of gas to the consumer marked a new epoch in the history of lighting by gas. By their means it became possible to include as consumers a class "whose room was preferable to their company," before their introduction, but who may now be looked upon as the best paying class of consumers.

Fully two years ago, these meters were introduced in Perth; and, as the popular saying goes, they immediately "caught on," so that at the present time over 1100 are in use. Of these, fully 800 are supplying gas to new consumers; the remainder to bad payers, and those who found a quarterly account too much of a sudden drain.

A certain amount of caution had to be exercised in fixing these meters, as applications for them were at first received from old consumers, despite the fact that the bulk of them were well served, and could well afford to run a quarterly account without feeling any inconvenience. However, in course of time, these unnecessary applications ceased to come in; and now applications are only received from new consumers, or from those who have compulsorily or otherwise ceased to be consumers by the ordinary system. A considerable number of these meters are fixed in conjunction with a grill, boiling-ring, or cooking-stove, which latter are fixed free of charge.

Prepayment meters fixed in this manner are greatly in favour with lodginghouse keepers. Last year the average number of these meters in use in Perth was 1020; the average consumption being 6000 cubic feet per meter. The gas-rate in Perth is 3s. 2d. per 1000 cubic feet; and 20 cubic feet are supplied for 1d., or at the rate of 4s. 2d. The extra revenue from this source was therefore 6s. per meter, or a total of £306. This sum we find covers the interest at 3 per cent. on the extra money expended on these meters; pays the working expenses of the system; and leaves a handsome balance.

The bulk of the meters are two-light dries, costing £1 18s. 6d. each, or 18s. 11d. more than the ordinary two-light meter. This sum, at 3 per cent. on 1020 meters, means £28 18s. 10d. per annum. A collector and a boy assistant are continually employed collecting the coin, at the respective wages of 29s. and 5s. per week, or a yearly sum of £88 8s. After deducting these two sums, we still have the respectable total of £188 13s. 2d. as the net profit by the use of this system over the ordinary one. You will observe I charge all the collectors' wages to this system, which I think I am entitled to do, as extra assistance was required shortly after its introduction.

The working of these meters entails more labour than the ordinary meters, as the coin collected weighs considerably more than a survey-book, and the collector may have to call six times before finding the consumer at home. The bulk of these consumers are millhands, and those whose work necessitates their being from home all day. Thus the collector's work is considerably increased from this cause. We find it also necessary to provide the collector with a light two-wheeled barrow to transport the coin, and a boy to be always in attendance on it.

Several short paragraphs have appeared lately in the West of Scotland papers giving the weight of copper taken by certain gas undertakings from these meters during one month. The figures I forget at present; but Perth with its modest 1020 prepayment meters collected last January 10 cwt. 2 qr. 18 lbs. of coppers from them. Such was the scarcity of coppers in the city during the month that it created serious inconvenience to several of the large shopkeepers, who besieged the Gas Offices clamouring for change. The matter was brought under the notice of my Committee, who could not however see their way to remedy it. Over the year, we collected 306,000 pennies, weighing 2 tons 14 cwt. 1 qr. 19 lbs. Such is Perth's record.

Regarding the meters in use, they are all of Scotch make, and have given us every satisfaction. Of course, at times, they have got out of order; but we found that this was oftener attributable to the fault of the consumer in not paying attention to the printed instructions than to any defect in the meters themselves. It is surprising how some people will disregard or misconstrue the instructions attached to each meter, and try to manipulate the meter in any and every way but the right one. Then, again, bent pennies were a source of great annoyance to us; but I am glad to say this difficulty has been overcome by the makers forming the slot of such a size that a badly bent penny will not enter—at least with any reasonable pressure—and making the case or barrel of the meter large enough so that the penny does not get jammed in it if forced through the slot.

Some of our consumers look upon the meter as a receptacle for all the pieces of tin or other material which may find its way into their possession; and they show an amount of surprise and indignation, when called to account for it, that is worthier a better cause. Others, again, seem to think that the abstraction of the coin from the meter is their just and due right as part owners of the gas undertaking. An example made of one or two of the latter in the Sheriff Court has had a lasting effect on the morals of their would-be emulators. There are others who use the meter as a savings-bank placed handy for their accommodation, by inserting florins instead of pennies. On the approach of the rent-day, many are the applications at the Gas Office for the collector to let them have the balance not due to us to enable them to meet the rent.

Such are a few of the experiences gained during two years' use of the prepayment system; and they are such as to justify our adoption of it.

A scheme to which I look forward with interest, is that of supplying and fixing free of charge, in conjunction with these meters, grillers and boiling-rings. The extra revenue which will undoubtedly accrue from the introduction of such a scheme will, I am sure, go far towards meeting the extra expenditure involved—much less covering the interest.

#### Discussion.

Mr. R. S. CARLOW (Arbroath) said he thought the members were much indebted to Mr. Andrew Wilson for giving them his experience with prepayment meters. At Arbroath, he might say, they did not begin the use of these meters till far on in the year. Their year ended on the 31st of May; and it was after the New Year that they began to use prepayment meters. Since they had adopted them, however, they had put in between 300 and 400 of them. They had placed to capital account upwards of £700 as the price of the meters. On the other hand—he made a note of it on the previous day—they had gained from the prepayment meter system, during that period, nearly £180. This was from the month of January; and during that time, too, they were only putting in the meters occasionally. He considered they were making a very great profit from them. He was quite at one with Mr. Wilson that it was the correct thing



to do to provide certain consumers with prepayment meters. He had put a great many of them in the houses of consumers who used to burn oil; and, on the other hand, he had substituted them for other meters in the cases of consumers who caused a great deal of trouble—people from whom they did not know when they would get their money. If they carried on as at present, he had no doubt they would make a very good profit indeed for the Corporation. He thought the prepayment meter system should be considered by every gas manager present, because there was no risk whatever with it. There was no deposit needed—their money was there; and they should encourage, as far as possible, gas consumption in every way. As Mr. Wilson had said, they connected gas-stoves or boiling-rings, or any other form of gas apparatus, with a prepayment meter; and they were sure of their money. In such towns as Arbroath, where there were a great many mills, they would know that boiling-rings, costing about half-a-crown, were greatly used in the mornings and at meal hours, and gas was consumed by them to a considerable extent.

Mr. T. W. WARD (Stevenston) said that, from his short experience, and with gas at 5s. 10d. per 1000 cubic feet, the members would not expect that he had done very much with prepayment meters; but he had heard a great many complaints about the length of time a pennyworth of gas lasted. It was only from 2½ to 3 hours. In such cases he had found that the consumers were using No. 7 burners. He took off these burners and put in smaller ones; and he had had no complaints since then. He thought gas managers should, in putting in a prepayment meter, look to the size of the burners to be used.

Mr. J. BALLANTYNE (Rothsay) said he had a great many prepayment meters in use in Rothsay. He was about the first to introduce them; and he had had some strange experiences with them, especially where people went to Rothsay for the benefit of their health. They might be sitting up reading their favourite novel, and be just coming to an exciting point, when out would go the gas. This annoyed some; while others thought there were burglars in the house. However, they got over these things; and, so far as he knew, prepayment meters were giving great satisfaction. He thought they had about 600 of them. They very often had to go round to these meters between collecting times. Their regular collections were every four months; and frequently they had to go at two months, and take away the money. They often found as much as from 25s. to 30s. in the box. He rather thought that, in many cases, if they were to present a bill for 7s. 6d. to these people, they would say they were being robbed; but when they put in from 25s. to 30s. themselves, they never said a word. The Corporation had reduced the price of gas since the introduction of these meters; but, instead of changing the setting of the meters, they returned a certain amount to the consumers. When their man called, the consumers, instead of grumbling, were glad to see him, because they knew they would get something back. There was a great future for prepayment meters. They were only beginning to get into some towns. If they were carefully worked—not given to all consumers, but to consumers of other lights, and the like—they would be very profitable. He found he was opening many new accounts; and their income was increasing very rapidly. He considered that towns which were not introducing them were standing in their own light. He did not see why any gas manager should not be able to largely increase, if not actually to double, his consumption, by means of prepayment meters. They certainly cost a little more than others; but they did not give so much trouble now as at first, so that there was nothing to fear. Therefore, in this regard, and taken all through, he thought they had every reason to be thankful that they had prepayment meters at their command, because they gave them the opportunity of having as gas consumers people who would never have been in their ledgers.

The PRESIDENT said he had had a little experience with prepayment meters, as he had about 1400 of them in use at Coatbridge. He thought he was about the first to adopt these meters in Scotland. He was a little reluctant in doing so at first, as he considered they would not have a class of consumers for them. But he had found they had. Now they had somewhere about 25 per cent. of their meters on the prepayment system. Last year they sold about 7½ million cubic feet of gas through these meters. They had given satisfaction to everyone almost. Prepayment meters were largely used in his place as banks. They had had as many as twelve florins in one. It was no uncommon experience for people to come and ask them to take the money out, as the box was too full. They tried Mr. Ballantyne's method of handing money back; but he was not sure that it was altogether a satisfactory one. It certainly put the collector in a rather curious position, because the money must correspond with the index; and they considered that the better way was to set the indices again. They did this. No doubt it gave a little trouble; but, after all, two men did about 100 meters per day. They now had them all set to give 28 cubic feet of gas for 1d. Their ordinary price was 2s. 6d. per 1000 cubic feet. They had found prepayment meters to be a great benefit. Fourteen or fifteen of the largest iron-works in the district had introduced electricity; and they had lost them entirely as consumers of gas. But the extra revenue which had been brought in by prepayment meters had made up for this; and, instead of their having had a decreased consumption of gas in Coatbridge, they had had a slight increase.

Mr. A. WILSON, in reply, said this was his first contribution to their proceedings, and it was certainly very gratifying to think that the members had listened with such patience to one who was a tyro in the matter of reading papers. He found, like Mr. Ward, that people were going to ironmongers and getting large burners; and at first he had a little trouble in this way. Eventually, however, he got consumers to know that they should not use such burners. His Committee, when they introduced prepayment meters, did not see the force of charging poor consumers a higher price for gas than rich ones; and the consequence was that, the consumers by prepayment meters getting their gas at the same price as the others, while the Committee were paying something like 18s. 11d. for a two-light dry meter, they lost upon them that year. The profit derived from these meters did not pay the wages of the men who were put on to look after them. They had gone to the other extreme now, and were charging the prepayment consumers 1s. per 1000 cubic feet more than consumers by ordinary meters; and they would certainly have to come down from that. Last year they had a balance of £188 more than they should have had. This year, he thought, they would manage to have this amount refunded, in part, to the consumers.

### THE AUTOMATIC MANIPULATION OF COKE.

By GILBERT LITTLE, of the New Conveyor Company, Smethwick.

Many a true word is spoken in jest. This truism was uppermost in my mind recently, after a discussion with Mr. Hack as to the best designs of conveyors and elevators to automatically manipulate coke. I had jocularly remarked, "I think, Mr. Hack, you and I have had the most varied experience, and made the greatest number of mistakes in connection with automatic appliances for coke; and therefore we now ought to possess the 'dear bought wit,' which should enable us to steer clear, in future, of the faults of the past." Mr. Hack made it clear, however, that he favours the view which Macaulay gives expression to in his essay on "The Effects of Progress"—that it is unreasonable and ungrateful in us to be constantly discontented with conditions which are constantly improving—as he replied, "I have no objection to your commencing your paper at the North British meeting by that jocular remark, if you will limit it, as far as I am concerned, to the words 'largest experiences;' for while you may feel justified in adding the further remark, 'made the most mistakes,' I cannot debit myself with it. I can only admit having made substantial and important improvements over my first installations of such apparatus." Well, I have formed a less contented estimate of the past in connection with coke conveying appliances than Mr. Hack; and the words of a much older historian than Macaulay, sum up not inaptly the twelve years' experience of the New Conveyor Company: "Wisdom has come through experience, and understanding through length of days." I claim, however, that we have gone on constantly improving, because there was room for constant discontent down till even a recent date.

I shall not take up any of your time describing faulty and discarded designs, but will confine this short paper to a few descriptive comments on the plans before you, as they illustrate some of the latest methods of conveying, elevating, screening, sorting, and stacking coke from moderate sized retort-houses; and the drawings could be modified to suit almost any condition of circumstances to accomplish the automatic manipulation of the coke in a large majority of gas-works.

Before asking you to follow me through figs. 1, 2, 3, 4, and 5, let me in a sentence or two refer to a few other well-known methods. The first mention is due to the arrangement at the gas-works of this flourishing city of Glasgow. You are familiar with Mr. Foulis's system of dwarf locomotives, and trains of tipping trucks—a system very suitable for exceptionally large works, and when arranged in conjunction with elevators to lift the coke, and conveyors to trim and stack it all over the storage yards, or with hoppers, a vast saving in the wear of workmen and wages must be effected.

The birth of the New Conveyor Company to carry on the business of conveyor and elevator specialists occurred just prior to the opening of Glasgow's great Exhibition in 1888. We there exhibited different forms of conveyors for the first time. Since that date I have been indebted to Mr. Foulis for useful hints; and it is only right I should mention here that the satisfactory designs which we have put in to replace the "Made in Germany" appliances of coal-washing plants, were constructed similar to the elevators we supplied to the drawings of Mr. Foulis for the Glasgow Corporation Gas-Works.

Let us now cross the Border to refer to one or two coke-handling plants. In many of the English counties, there are a large number of good systems of automatic appliances manipulating the coke at ranges of coke-ovens. The time at my disposal will not admit of placing particulars of these before you; but any of you who may happen to be in the county of Durham can see the conveyors and elevators we made to the order of Mr. Bower, of West Hartlepool, to carry the coke from a bench of inclined retorts, and deliver it to the waggons on a railway siding. From West Hartlepool, it will repay you to go on to Nottingham, to inspect the elaborate coke-handling plant designed by Mr. W. R. Chester. In the gas-works at Nottingham the coke is taken hot

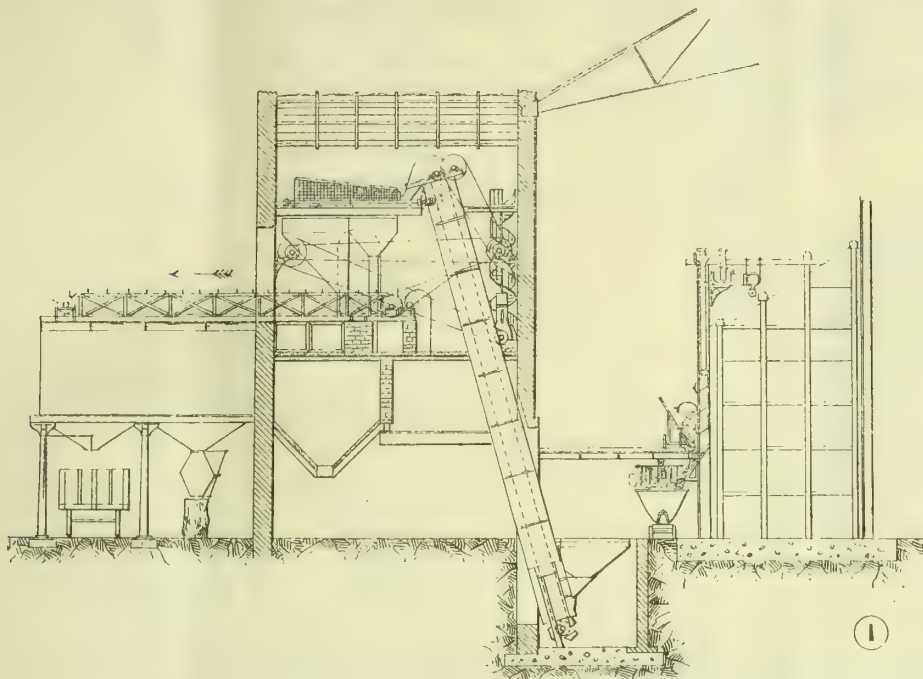


from the retorts, quenched in transit, carried into overhead hoppers, and sized ready for loading into either waggon or trucks. The arrangement also admits of the coke being automatically transferred from the hoppers, through a coke-breaker and screen, to be washed and cleansed for special trades. The machinery can deal with 300 tons of coke per day; and it sorts into five distinct sizes for the special requirements of the markets supplied by Nottingham. Altogether the automatic manipulation of coke at Nottingham reflects the highest credit on Mr. Chester and the contractors for the work. From Nottingham, it is not a "far cry" to Birmingham; so I transmit you there, where you may decide to spend a few hours at the New Conveyor Company's works inspecting conveyors and elevators in all stages of manufacture, and for every purpose. Then we go on to the Windsor Street, Saltley, or Swan Village gas-works of the Birmingham

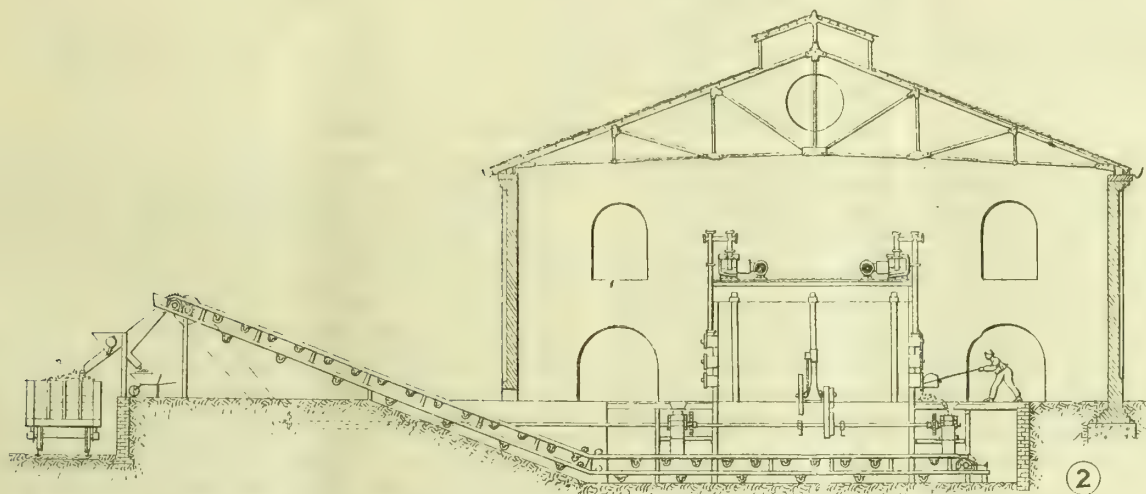
Corporation, to satisfy ourselves that progress and "push" did not cease at Birmingham when Mr. Chamberlain migrated from Municipal distinction to gain Imperial renown.

There are other coke-conveying plants over the Border too numerous to mention; so I direct your attention to the five illustrations as they display sufficient variety to make it clear that one or other of them could be modified to suit almost any gas-works. A further reason for limiting myself to these drawings is the fact that I have had special opportunities of discussing, for several months, the details of these arrangements with the engineers and managers of the gas-works to which they refer—viz., Mr. Foster, at Nelson, Mr. Fenner, at Chesterton, Mr. Carr, at Widnes, and Mr. Morris, at Jersey.

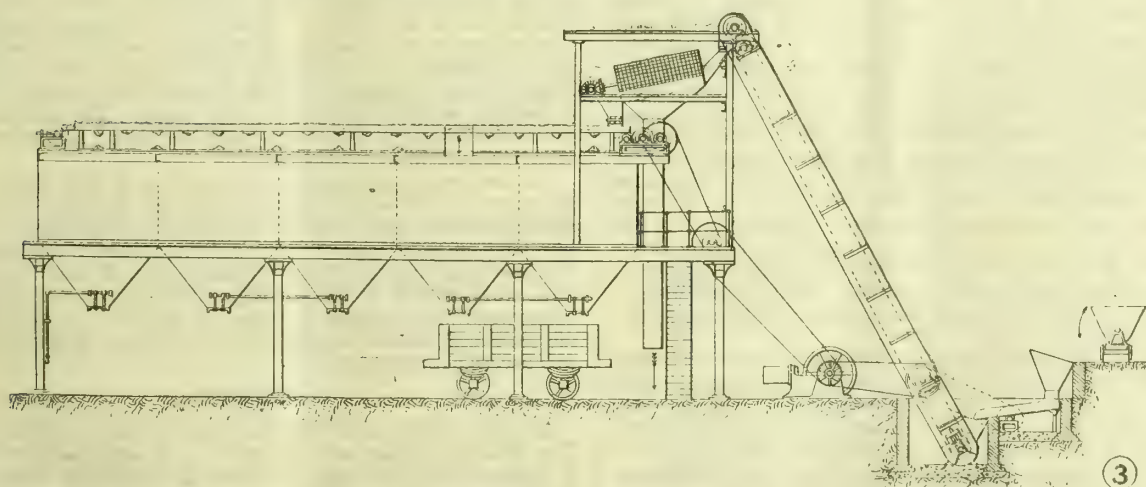
Fig. 1 shows Mr. Foster's arrangement at the Brierfield works



CONVEYOR AT THE NELSON CORPORATION GAS-WORKS.

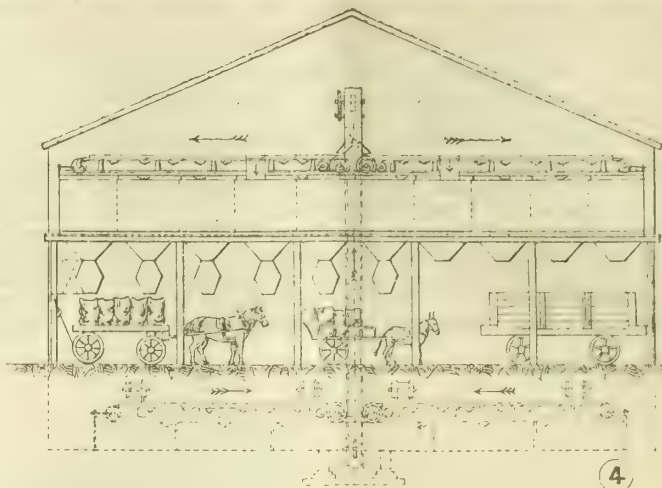
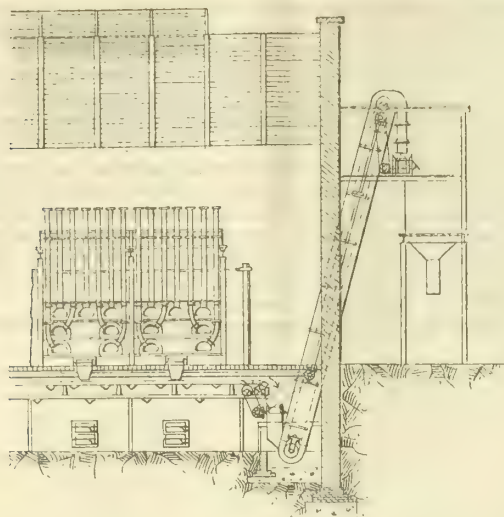


RETORT-HOUSE CONVEYOR AT CHESTERTON.

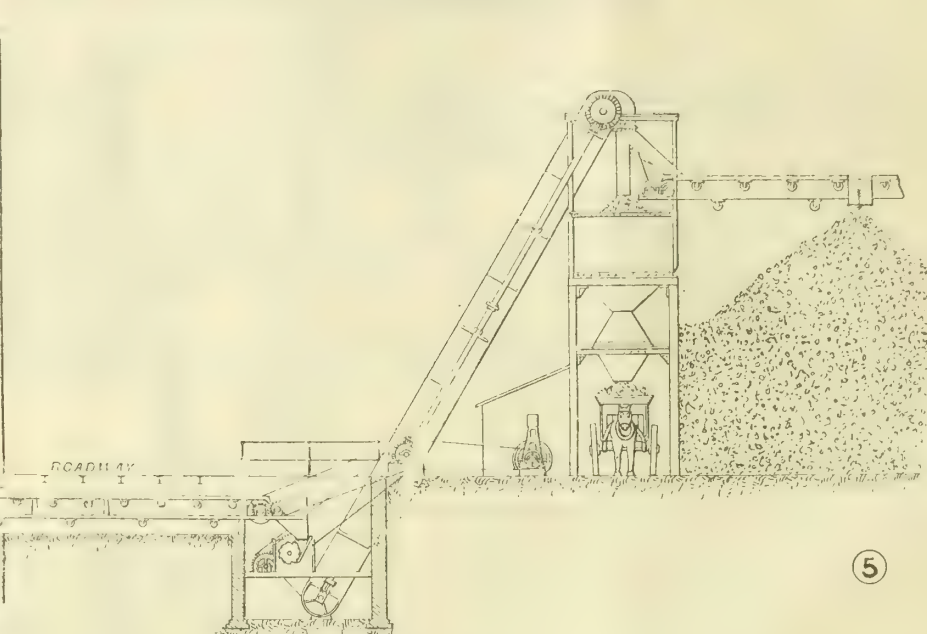
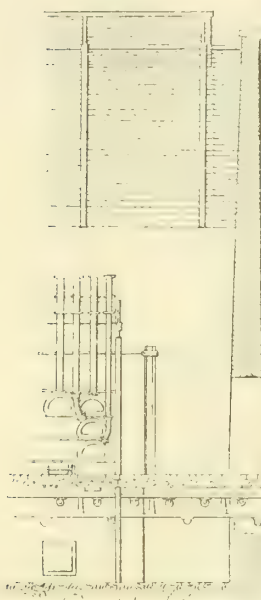


CORE CONVEYOR AT THE WIDNES CORPORATION GAS-WORKS.





CONVEYOR AT THE GASLIGHT AND COKE COMPANY'S WORKS.



CONVEYOR FOR THE NEW RETORT-HOUSE AT JERSEY.

of the Nelson Corporation, Lancashire. We recently completed the contract there for a complete gas-works, as we were the contractors for almost everything from the weighbridge to the manager's key. The carbonizing plant is entirely automatic, from the time the coal is tipped from the waggons until the coke is distributed, as you see (from fig. 1) into the various storage hoppers. The coke slides from the inclined retorts into the tipping truck; the attendant then turns on the water, which sprays over the hot coke until it is quenched; and the truck is next moved, and the contents tipped, to be taken by the elevator to the circular screen. This screen is made to adjust so that the coke can be sized, as desired. As a rule, three sizes are made and distributed into the three ranges of hoppers. The carts or sacks are filled from the hoppers by pulling the levers to open the outlet doors.

Fig. 2 shows the arrangement for the retort-house at Chester-ton. You will observe that conveyors are fixed in front of the benches; and the coke is carried from each bench of retorts by the two conveyors as shown. These, in turn, shoot the coke into the conveyor fixed at right angles, which carries it to the railway waggons. The shoot to conduct the coke from this conveyor to the railway waggons is made with screen bars, which separate the breeze, and discharge it into the shoot as shown.

Fig. 3 shows an arrangement to meet the special requirements of the coke-trade at Widnes. It is, however, suitable for a large number of gas-works; and Mr. Isaac Carr, the Engineer and Manager at Widnes, in giving his consent for this drawing to be made and put before you, wrote me as follows: "I do not know that it contains any special merit over that of any other coke plant. It is simply arranged to suit the local conditions; and that is all that can be said about it." Well, gentlemen, I could say a good deal more about its merits; but I leave the illustration to speak for itself.

Fig. 4 is an illustration of an arrangement for one of The Gaslight and Coke Company's works in East London. The retort-house is over 300 feet long, with two double benches, containing some 200 retorts. You will observe four conveyors run along the front of the four rows of mouthpieces, and convey the coke to the conveyors at the end of the retort-house, which in turn deliver it to the elevator. The elevator drops the coke on to the conveyor fixed above; and this trims it all over the

storage hoppers. You will notice that measuring chambers are fixed on the bottom of the storage hoppers to fill the sacks.

Fig. 5 shows the arrangement for the new retort-house at Jersey. This retort-house (recently completed) is one of the best I have ever seen. I wrote Mr. Morris, the Engineer and Manager at Jersey, asking his permission to make and exhibit this drawing to you; and he replied as follows: "I have no objection to your showing your drawing of my retort-house; but I do not think I have any claim to have it called 'my plan.' The idea arose from our joint conversations." I had accompanied Mr. Morris to works where our coke-plants are in operation; and I also visited Jersey to see the new retort-house, and discuss the best arrangement to meet the special conditions. The result was the method shown on fig. 5. You will notice the coke is conveyed along the front of the benches under the cartway; and, passing through the coke-breaker, it is elevated to the hopper above. The delivery shoot of the elevator is made with a deflecting valve, by means of which part of the coke is delivered to the hopper, and part to the conveyor, to be delivered on the coke-stack; or all the coke can be delivered to the hopper or the coke stack. Under the large storage hopper a smaller hopper is arranged to deliver a certain weight of coke into the carts. The cart is brought under the hopper; the carter pulls the lever; and away he goes within a minute with his load.

I have given very meagre descriptions of the illustrations to you; but it will afford me pleasure to arrange for any gas manager to inspect some of our plants in Scotland. Some of our best installations of self-acting machinery are working in the town and district of the President, Mr. Wilson. In the iron and steel works at Coatbridge automatic arrangements of conveyors and elevators distributing the coal to, and taking the clinkers and ashes from, batteries of furnaces and ranges of gas producers are at work.

#### Discussion.

The PRESIDENT said they had listened to a valuable paper. The drawings shown were splendid, and were easily understood. If the members had any questions to put to Mr. Little, he had no doubt that he would be very pleased to answer them. He supposed their feelings would be that their works were too



small to adopt such appliances as Mr. Little had described; but there were gentlemen present who had large works.

Mr. A. WILSON (Dawsholm) said he had had great pleasure in hearing this paper on conveyors. Of course, the drawings that Mr. Little had shown would, he had no doubt, be suitable for the different works. They had the idea always that conveyors for manipulating coke were not very practicable, as there was such a great deal of wear and tear on them. So that, in the Glasgow works, Mr. Foulis had not adopted such conveyors, but had employed the narrow-gauge railway, with tipping-waggons, which they had found very suitable, and also very economical. Of course, in a great many works, small railways could not be adopted; but in the Glasgow works they answered very well indeed. They had a different arrangement for screening the coke. They did not use an elevator, but a crane with a drop bucket to raise the coke; and they screened it in this way. He had had some experience of a conveyor for the carriage of lime-shell; and the wear and tear was very serious indeed. It was not very encouraging to them to adopt it; and their present arrangement compared favourably with any of those he had seen for dealing with coke. The coke, when screened, fell down different shoots, and was directed into different places, as in the arrangement before them. Of course, each works had to adopt the best means of handling the coke to suit the place.

Mr. A. WADDELL (Broughty Ferry) said he should like to ask Mr. Little the smallest size of works in which he thought it would be advantageous to adopt the apparatus shown.

Mr. LITTLE said that in the first drawing there were only six beds in it; in the second, eight beds; and the last one had only eight beds. There were eight retorts in a bed in the last two, and six in the other.

Mr. WADDELL asked what would be the cost of the plant mentioned as applicable to the smallest works.

Mr. LITTLE replied that he knew of no place where they had so many operations to perform as at Nottingham, where the coke was separated into six sizes. This was very expensive—some-where about £1600.

Mr. A. MACPHERSON (Kirkcaldy) said he had not the slightest doubt that, where the works were of sufficient size, there must be a considerable saving in adopting these machines. He did not know whether the apparatus would be quite suitable for Scottish gas-works; but he had no doubt they could be applied there just as well as in those in England, where they worked chiefly with coal which produced a good coke. In Scotland, on the other hand, they very often had a considerable quantity of useless coke, which came from shale and other coals of that class. But where the coke was all of one quality, he could very well understand that this plant would be of very great service. The only difficulty he could see would be where from one charge they might have good coke, and from another bad. There might be difficulty in the separation of them. Possibly Mr. Little could so arrange it that, instead of the bad coke going into the hopper it could be passed on to another, where it could be at once conveyed away without re-lifting of any description. He could quite see that the apparatus would very much facilitate the work of a retort-house; and certainly, if, as Mr. Little said, it paid to adapt it to a bench of six or eight beds of retorts, there were a large number of works in Scotland, he was quite certain, where they could afford to introduce the plant. The subject certainly was one which he never thought of; but when one saw it demonstrated, it made one think whether it would not show a considerable saving.

The PRESIDENT said he was sure they were all very much indebted to Mr. Little for bringing forward his paper. Like Mr. MacPherson, he had not considered the subject, but, now that the drawings had been put before him, and the apparatus shown thereon described, he possibly might look into the matter. He had seen the apparatus at work in his town, and it was certainly very simple and effective; and if there was anything in it, there was no reason why they should not have it. He had a very go-ahead body of Directors at Coatbridge; and if he could show to them that it would save 5 per cent., and they knew they could borrow money at  $2\frac{1}{2}$  per cent., they would say: "Go on with it to-morrow."

Mr. LITTLE, in reply, thanked the members for their reception of his paper. He thought that the cheaper the coke was the more reason there was for having machinery, because good coke would always pay for hardling.

**Sales of Shares.**—Mr. A. A. Burnett recently sold at Southampton some original £10 shares in the South Hants Water Company, at £26 per share. At a sale at Bury, £4060 ordinary "A" stock in The Gaslight and Coke Company was purchased at the rate of £296 $\frac{1}{2}$  per cent. Ten new fully-paid £10 shares in the Glossop Gas Company were sold last Wednesday at £16 15s. each.

**Cowes Gas-Works.**—The Gas Committee of the Cowes District Council find they are somewhat hampered in their working by the want of capital. By their direction, the Manager and Secretary has been investigating what the requirements in this respect are likely to be during the next five years; and he finds that the total sum needed is £6682, made up as follows: Amount expended to March 31 last, £142; estimated cost of improvements and additions during the next five years, £4538; working capital, £2000. The Council last Tuesday authorized the Committee to apply to the Local Government Board for sanction to the borrowing of the £6682.

## REGISTER OF PATENTS.

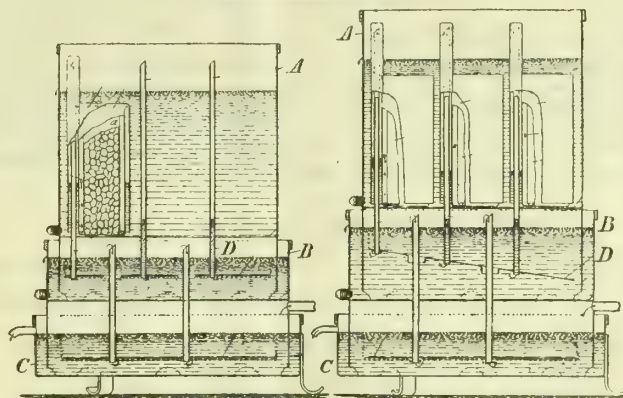
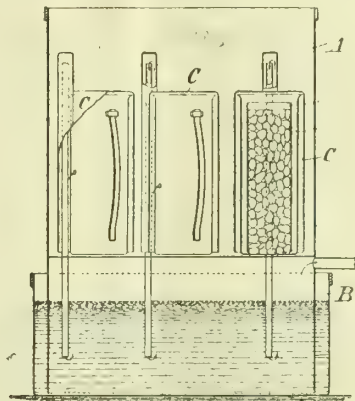
**Acetylene Gas Generator.**—Schülke, J. H., of Berlin. No. 10,305; May 5, 1898.

This type of acetylene gas generator is provided with only one liquid trap common to all the pipes, without there being any fear of interruptions taking place in connection with the gas pressure. The liquid forming the trap may at the same time serve for washing the acetylene gas; and in case of emergency suitable detergents—for instance, copper or iron vitriol—may be dissolved in the liquid.

Fig. 1 shows an apparatus with the ordinary liquid trap. Figs. 2 and 3 show modifications, having several liquid traps arranged beneath each other.

Any number of generators may be inserted into one common receptacle A, which is open above, and whose walls extend beyond the bottom and enter into a liquid receptacle B. Each generator consists of a carbide chamber inserted into a vessel open above. A bell is provided above the latter, which communicates with a pipe in which the delivery-pipe enters, and is tightly passed through the bottom of the receptacle A, and extends with its lower ends below the water level of the receptacle B.

In fig. 1, only one water trap is provided; but two or more such traps may be arranged, as shown in figs. 2 and 3.



In these latter, the walls of the receptacle B extend below, and enter a chamber C. Through the bottom of B are pipes tightly passed, whose upper end enters the chamber above the water level of B, and whose lower end immerses into the water contained in C. In order to extend the way which the acetylene gas must take through the water, plates or walls D (with their edges turned downwards) are preferably arranged at the lower ends of the pipes, and the acetylene bubbles pass along the plates or walls, whereby their cleansing action is increased. The water inlet openings of the carbide receptacles are preferably arranged step-wise, at different heights, whereby the carbide receptacles operate successfully.

In order to set the apparatus in operation, the carbide receptacle with the lowest inlet opening is first placed upon the delivery-pipe, so that water passes in, and generation of acetylene is effected until such a pressure is attained that the water is pressed out of the bell. The remaining generators are then put on to each delivery-pipe individually. Since, however, the water cannot rise to the inlet openings of these generators, which lie higher than those of the first-mounted generator, the generators which are put on last cannot operate until the first generator is completely exhausted. Thereupon a decrease of pressure takes place; so that the water passes to the next higher inlet opening. In order to attain this result with safety, the delivery-pipes may preferably be also of various lengths, in such manner that the pipe corresponding to the generator with the lowest inlet opening is the shortest, and the delivery tubes of the remaining generators longer, according to the height of their inlet openings. Such an arrangement is shown in fig. 3.

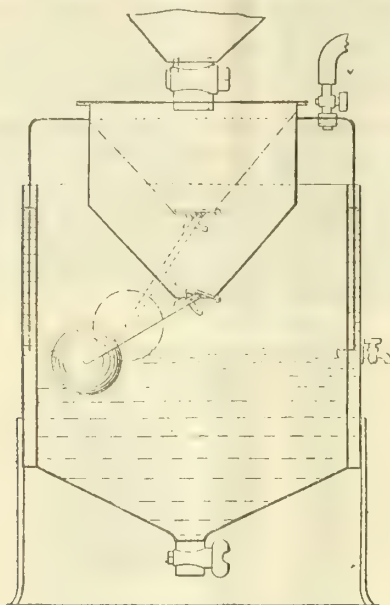
**Automatically Supplying Carbide of Calcium to Acetylene Gas Apparatus.**—Kieffer, F. A., of Paris. No. 20,142; Sept. 1, 1897. Date claimed under International Convention, Feb. 4, 1897.

This invention relates to apparatus for the automatic supply of carbide of calcium in an acetylene gas-generator proportionately to the consumption—consisting essentially of a closed container for the carbide supported within the bell of a gas-generator, and provided at its lower part with an outlet controlled by a valve whose opening and closing are dependent on the fall and rise respectively of the carbide container in the tank.

As shown next page, the container is mounted in the crown of a bell, which dips into an annular water seal contained between the outer and inner walls of a hopper-shaped tank at bottom, and provided with a discharge outlet and cock for the spent carbide, and with a cock at the side



for regulating the level of the water within the tank. The carbide container has a hopper-shaped bottom, provided with an outlet closed by a flap valve acted upon by a float, the arm of which is hinged to the valve, and is adjusted rigidly in position relatively to it by being pinned to a quadrant, so as to regulate the extent of its opening. The container is hermetically closed by a cover, and may be surmounted by a supply hopper capable of being put in connection with the container by a cock for supplying the carbide to the container as the operation proceeds.



The action of the plant is as follows: Water having been filled into the tank until it runs out at the side cock (which is then closed), a sufficient quantity of carbide in small pieces is filled into the container. The float resting at the surface of the water, the valve is raised, and the carbide falls into the water. The acetylene generated raises the bell and container until the float, being no longer supported by the water, allows the valve to close, and thus for the time cut off the supply of carbide. As the acetylene contained in the bell is delivered for consumption through the pipe at the right-hand top of the bell, the latter descends along with the carbide container until the action of the float opens the valve so as to allow a small quantity of carbide to drop into the water. A fresh evolution of gas then takes place, after which the bell again rises and the valve closes, and so on—a supply of carbide proportionate to the consumption of acetylene being thus automatically ensured.

#### APPLICATIONS FOR LETTERS PATENT.

- 16,156.—HALLS, W. C. & C. W. G., "Incandescent gas-burners." July 25.  
 16,176.—MEISCHKE-SMITH, W., "Supporting incandescence mantles." July 25.  
 16,227.—BENNETT, J. F., MOORWOOD, T. P., and MOORWOOD, H. S., "Gas and oil engines." July 26.  
 16,234.—MOSS, R. J., "Generation of acetylene." July 26.  
 16,266.—ENGELHARDT, A., "Manufacture of gas." July 26.  
 16,317.—MOORE, W. N., and KARR, J., "Acetylene gas lamps." July 26.  
 16,366.—BILBIE, J., and DRIVET, H., "Acetylene generators or lamps." July 27.  
 16,380.—SMITH, W. B., "Application of the mechanical energy of gas and other engines to motor cars and for other purposes." July 27.  
 16,387.—KIRSTEN, P., "Indicating deficiency or stoppage in the flow of fluid through pipes or the like." July 27.  
 16,392.—BIHELLER, S., "Producing gas from calcium carbide." July 27.  
 16,457.—BERGER, H. R., "Generating acetylene gas in a pure state." July 28.  
 16,470.—M'LEAN, A., "Tar pavements." July 28.  
 16,479.—WILLIAMS, R., and CLARKE, J. H., "Acetylene gas generators." July 28.  
 16,487.—LEGGE, J. ST. CLAIR, "Acetylene gas generator and purifier combined." July 29.  
 16,546.—HOWARD, C., "Incandescent burners." July 29.  
 16,559.—WILLIAMS, R., "Generation of acetylene." July 29.  
 16,571.—FERRON, C. A., "Gas-burners for incandescent lighting and for heating purposes." July 29.  
 16,578.—DAUBENSPECK, G., "Incandescent mantles." July 30.  
 16,613.—TESTELIN, C., and ROSEAUX, C., "Generating and burning acetylene gas." July 30.  
 16,634.—SCHMIDT, C. V. G., "Generation and regulation of acetylene gas in lamps." July 30.  
 16,670.—BOHNDEL, H. H., and YEATON, C. C., "Production of gas for illuminating and other purposes." July 30.  
 16,672.—LECOMTE, A., and LOESER, I., "Regulating the pressure of, and distributing gas." July 30.

**The Matchless Gas Lighting Syndicate, Limited**, has been registered with a capital of £12,000, in £1 shares (3000 deferred), to carry on the business of a gas company in all its branches.

**Rhondda Gas and Water Works Extensions.**—Mr. Robert H. Bicknell, of the Local Government Board, attended at the Pentre Council Chambers last Tuesday to receive evidence relative to applications made by the Rhondda District Council for sanction to borrow £9500 for gas-works purposes, and £500 for the water-works. The Clerk of the Council Mr. W. H. Morgan, the Gas and Water Manager (Mr. Octavius Thomas), and others gave evidence.

## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### Mr. Grafton on Photometric Standards.

SIR,—I agree with Professor Harcourt, whose letter appeared in the last issue of the "JOURNAL," that 3 cubic inches of pentane of sp. gr. '630 to '631, as used in my experiments, will volatilize in the open; but in making the air-gas in a holder, the air is not subject to movement, and stratification takes place, particularly at low temperatures. Consequently we do not get a homogeneous mixture of air and pentane vapour. I thank Professor Harcourt for drawing my attention to the error "3 oz.," which should read "3 cubic inches" (see *ante*, p. 150). The pentane employed in the experiments satisfied the usual tests as to quality. I fail, however, to see the object of his criticism in this respect, considering that he once wrote "that an air-gas of the same illuminating power is obtained with samples varying in specific gravity between '614 and '645."

I cannot support Professor Harcourt when he says "that the argand burner flame, with its tip screened off, is equally bright" independent of the percentage of pentane vapour in admixture with the air used as a carrier. It all depends upon what time (after lighting the burner) the comparison is made, as to what will be the result. I was one of the first, if not the first, to prove that this "equally bright" was not absolutely a fact; and for the other experimenters' sake it is a pity the experiments are on record to which the Professor alludes.

Professor Harcourt has considerably altered in his opinion of the Dibdin standard during the last year or so; for he admits that "unexpected irregularities, too large to be neglected" (see "JOURNAL" for June 28, p. 1552), have been observed, and which are not wholly due to the glass chimney. This is borne out by the Gas Referees' recent action in notifying their intention of replacing the candles, not to speak of the Dibdin standard, by the Harcourt 10-candle lamp. In my experiments, the same chimney was used throughout, and in one particular position.

Professor Harcourt will find, by reference to the "JOURNAL," that I have made my case out in detail that the Dibdin 10-candle standard is not as represented to be—i.e., it is not equal to 10 average sperm candles; that the length of the flame cannot be altered without affecting the power of the standard; and that the standard light is seriously affected by the percentage of pentane vapour in the air, &c. Such and other questions have been settled to the detriment of the Dibdin standard, since it is shelved by the 10-candle lamp for the time being. A careful operator, possessing a pair of impartial eyes, can easily prove the truth of my figures now on record.

Beckton, Aug. 5, 1898.

W. GRAFTON.

### Profit Sharing.

SIR,—I should like to induce the chairmen, engineers, managers, and foremen of gas-works, to contribute their ideas on, and their experience of, profit-sharing among workmen. I have read the reports you have published on the Livesey and the Richmond systems, also your able leaders on this subject, as I have for a number of years been keenly interested over a system of profit-sharing, and have had hopes of being able to formulate a scheme by which each man and boy (from the manager to the gate-boy) would be paid a share of the profits earned commensurate with his worth in the works. Like the Old Age Pension Committee, I am not able to devise or suggest a system to work practically, or one likely to be a source of anything but dissatisfaction. Whatever system might be adopted the lazy and incapable would still get a share of profits which they had not honestly helped to create.

Therefore for the time being I have dropped the idea of introducing a system to give all our workers a share of the profits, and have introduced a more limited arrangement, whereby all the heads of departments will participate in the profits earned during the next financial year of our Company. Our system is to pay a share of the profits to the secretary, chief-draughtsman, foreman engineer, foreman plater and riveter, foreman pattern-maker, foreman millwright, and also to all our foremen in the iron and retort-bench departments erecting the contracts all over the country. Already we see some satisfactory improvement. The work is done better; fewer mistakes are made; and far more pride is taken in keeping the workshops tidy and the machines in good condition. The various heads of departments appear to feel they now have a far greater interest in the works; they consult freely and fully with each other about the routine in which their respective parts of the contracts are to be dealt with; and with the short experience we have had of this limited system of profit-sharing, there has been such careful and interested attention given to the finishing and despatching of orders that complaints by myself or our buyers show a gratifying decrease.

I regret we did not see our way to a wider application of a profit-sharing system in our works, but I hope not only the chairmen, directors, engineers, and managers of gas-works, but the intelligent and studious working-men, will put their views, suggestions, and experience on this question before the readers of the "JOURNAL," as it cannot but be conducive to the interest of all to ventilate a subject which many think the most likely solution of capital and labour difficulties.

Smethwick, Aug. 6, 1898.

GILBERT LITTLE.

**Reductions in Price.**—The Stockport Town Council last Wednesday adopted a recommendation of the Gas Committee that a reduction of 1d. per 1000 cubic feet be made in the price of gas to consumers outside the borough, making the differential rate 4d., as against 5d.; also a reduction of 2d. per 1000 cubic feet both to inside and outside consumers paying their accounts early—the reductions to come into force on the September rental. The amount previously allowed for prompt payment was 2½ per cent.; and the proposed allowance is equal to rather more than 5 per cent. The Directors of the Wickham Market Gas Company propose to reduce the price of gas from 7s. 1d. to 6s. 8d. per 1000 cubic feet, from Oct. 1 next. In 1874 the price was 10s.; in 1876, 9s. 2d.; in 1878, 8s. 4d.; and in 1880, 7s. 1d., at which price it has since remained. The Lambourn Gas Company have reduced their price to 7s. 1d. per 1000 cubic feet as from the 1st ult.



## PARLIAMENTARY INTELLIGENCE.

### HOUSE OF LORDS.

The following further progress has been made with Bills :—

Bill reported, with amendments : St. Helens Corporation Bill.  
Bills read the third time and passed : Keighley Corporation Bill, Paignton Improvement Bill, St. Helens Corporation Bill, Wey Valley Water Bill.  
Bills Royal Assented : Clacton Gas and Water Bill, Coventry Corporation Gas Bill, Gaslight and Coke Company (Capital Consolidation) Bill, Leyton Urban District Council Bill, Maldon Water Bill, Middlesbrough Corporation (Gas) Bill, Southampton Gas Bill, Tynemouth Corporation Water Bill, Water Orders Confirmation Bill.

### HOUSE OF COMMONS.

The following further progress has been made with Bills :—

Bills read the third time and passed : Carlisle Corporation Water Bill, Filey Water and Gas Bill, Forres Water Bill, Heywood Corporation Water Bill, Newcastle-upon-Tyne and Gateshead Water Bill, Rochdale Corporation Water Bill, Todmorden Corporation Water Bill, Wath-upon-Deane Urban District Council Bill.  
Bill withdrawn : Bury Corporation Bill.

### HOUSE OF COMMONS COMMITTEES.

At the close of the proceedings on the Cranbrook District Water Bill (as reported in the "JOURNAL" for July 26) the Committee presided over by Sir Charles Dalrymple proceeded with the consideration of the

#### HIGHAM AND HUNDRED OF HOO WATER BILL. MID-KENT WATER BILL.

Under the first of these Bills, the Higham and Hundred of Hoo Water Company sought, by an amendment of section 4 of their Act of 1890, an extension of the time during which they might supply water in certain parishes of their district, from seven to ten years. The application was opposed by the Mid-Kent Water Company, who alleged that the Higham and Hundred of Hoo Company had allowed their powers to lapse, and that they could not efficiently supply the districts in question. The Mid-Kent Company also asked that the Act of the Higham and Hoo Company, so far as it related to the parishes in question, should be repealed.

Mr. Edward Boyle appeared for the promoters; Mr. Pembroke Stephens, Q.C., and Mr. R. Saunders, for the Mid-Kent Company; and Mr. Ram, for the Maidstone Rural District Council.

In opening the case, Counsel for the Bill said that the Higham and Hundred of Hoo Water Company were incorporated by Act of Parliament in 1890, to supply an area which included, among others, the parishes of Cuxton, Cobham, Meopham, and Luddesdown. The Act defined the area which the Company should supply, and provided that, if in any parish within their limits the Company should not have made adequate provision for the supply of water within seven years from the passing of the Act, the restriction on the construction of water-works by a Local Authority imposed by section 52 of the Public Health Act, 1875, should not in respect of the Company apply to or be binding on the Local Authority (as defined by that Act) of any such parish. The Company had not supplied the parishes of Cuxton, Cobham, Meopham, and Luddesdown. Really the only thing asked for in the Bill was that they should have ten years, instead of seven, within which to carry out their obligations. Paragraph 2 of the present Bill read: "Section 4 of the Act of 1890 is hereby amended, by substituting the words 'ten years' for the words 'seven years' in the proviso to the said section mentioned; and the said section shall be read and have effect accordingly." The seven years given under the Act of 1890 expired last July. In effect, therefore, the Company were now only asking for a further two years. The only petition against the Bill was that of the Mid-Kent Water Company. After referring to clause 2 of the Bill, the petition stated that the Mid-Kent Company were prepared to prove that they could provide a much greater amount of accommodation, so far as the supply of water was concerned, to the four parishes in dispute than could be given by the Higham and Hundred of Hoo Company; that the Mid-Kent Company's works were within 200 or 300 yards of the parish of Cuxton, while those of the Higham Company were several miles away; that the levels of the latter Company were not such as to permit them to adequately supply the four parishes mentioned; and it wound up by asking Parliament to take them away from the Higham Company and give them to the Mid-Kent Company. The Higham and Hundred of Hoo Water Company was a growing little concern, which had been fairly successful. Last year they earned 3 per cent. on their capital, and paid 2 per cent. to the shareholders. There were no debentures or preference shares; and they had the money to meet a temporary loan of £500. The Company therefore regarded the attempt of the Mid-Kent Water Company—only a limited company—to take away from them powers which had been conferred by statute, as little short of impertinent. They were prepared to show that they could, and were willing to, supply Cuxton, Cobham, Meopham, and Luddesdown districts far better than the Mid-Kent Company could do. If the desire of the latter Company were granted, it would mean that the shareholders of the Higham and Hundred of Hoo Company were not to have the opportunity of securing the fruits of their investment. So far from the Local Authorities, who at present had the power to supply their own districts, being opposed to the Bill, they were in favour of it.

Evidence was then called to show that the Hoo Rural District Council, the Frindsbury Rural District Council, and the Meopham Parish Council supported the Bill, and that the Company had been well managed. In answer to the Chairman, as to why the Higham and Hundred of Hoo Company had allowed their powers of supply over the four parishes in question

to lapse, the Chairman of the Company (Mr. Anderson) said that the Company had desired to proceed cautiously in extending their works. Mr. V. Domenico de Michele and Mr. W. Coles Finch, Engineer of the Brompton, Chatham, Gillingham, and Rochester Water Company, gave evidence as to the practicability of the Higham and Hundred of Hoo Company supplying the disputed parishes by the construction of a new reservoir within their district.

Mr. Pembroke Stephens submitted that the Higham and Hoo Water Company had placed themselves out of Court by their admission that they had allowed their powers to lapse; but the Chairman decided to go on with the Bills in the ordinary way. Mr. Pembroke Stephens then opened the case for the Mid-Kent Company, which he said was formed in 1888, under a Provisional Order, with a capital of £18,000 and proportionate borrowing powers. Unlike other companies in the locality, the Mid-Kent Company had supplied their area, and were now supplying 19,000 persons out of a total population in their limits of supply of 21,000. The recent epidemic in Maidstone, which was close to their district, had had a very important bearing on the Mid-Kent Company. The town applied to the Mid-Kent Company for a supply; and so urgent was their necessity, that though three or four miles of main, he believed, had to be laid, the supply was actually available in Maidstone within a week. It was true that the Company had no express statutory powers to do this; but it was done on the principle on which one threw a rope to a drowning man. The supply had been continued; and Maidstone had asked that it might be increased. Since the Company's first Provisional Order, others had been obtained; and the Company now felt, in view of the supply to Maidstone and of other circumstances in the district which called for a re-arrangement of the existing statutory divisions, that they were justified in coming to have their Provisional Orders fused into one Act, and that further powers should be granted to them for the extension of their works and area of supply, and for an increase of capital. The Company so far had raised and spent £33,000, which they proposed to call original capital; and they now sought power to raise a further £87,000 for the works mentioned in the Bill, and for future working capital. The existing works of the Company consisted of a pumping-station and three reservoirs; and the additional works contemplated were a pumping-station near the existing well, a reservoir at Birling, a rising main connecting the well and reservoir, and another reservoir at Wrotham on the very highest point in Kent, so that from this point it would be possible to supply the whole of the district they sought power over. The only point in dispute between the two Companies was as to which was to supply the parishes of Cobham, Cuxton, Luddesdown, and Meopham, which were within the Higham and Hundred of Hoo Company's present district. The other parishes to which it was sought to extend their powers of supply, included Mereworth, West Peckham, Waterinbury, and Teston, which had been part of the district of the South Kent Company, but were conceded to the Mid-Kent Company in consideration of their agreeing to give the South Kent Company a supply of water in bulk for the rest of the district they retained; Nettlested, Marden, Yalding, and Staplehurst, which the Maidstone Rural Authority had agreed to let them supply; and Smarden and Bethersden, where also there was no opposition. With regard to Nettlested, Marden, Yalding, and Staplehurst, the Company had agreed that the supply should be given within eighteen months from the passing of the Act, on pain of losing their power there. The extraordinary thing about the Higham and Hoo Company and the four parishes in dispute, was that the Higham and Hoo Company had allowed the period within which they might supply expire. Yet they were now seeking to revive this power by extending the original period from seven to ten years. The Higham and Hoo Company said they had the support of a number of Local Authorities; but the favour of the Local Authorities seemed to be due to the fact that the term within which the supply must be given was in the Bill of the Higham and Hoo Company three years, whereas in the Mid-Kent Company's Bill it was six years. The period in the latter Company's case had, however, been altered to eighteen months, so that if there was anything in the argument of the Local Authorities, the Company should have their support.

Sir Sidney Waterlow, a large landowner in Meopham and Wrotham; Mr. P. S. Knaggs, a member of the Parish Council of Meopham; and Mr. R. Green, Chairman of the Wrotham District Council, were called in support of the Mid-Kent Company's case, and gave evidence as to the necessity for water in the various parishes referred to. The feeling seemed to be that they cared little which Company were authorized to supply so long as water was made available; but that seeing the Higham and Hoo Company had not exercised their powers in the four parishes for seven years, it would be better to give authority to supply these to the Mid-Kent Company. In the course of cross-examination, Mr. Boyle stated that the height of the proposed reservoir of the Higham and Hoo Company was 680 feet above sea-level, and that no portion of the four parishes was so high.

Eventually, on Mr. Boyle for the Higham and Hoo Company undertaking (in reply to the Chairman) to commence the work of supplying the parishes within three months of the passing of the Act, and to actually supply within eighteen months, the Chairman said the Committee found the preamble of the Higham Bill proved; the undertaking being embodied in the finding as a condition. The preamble of the Mid-Kent Bill was also found proved, except so far as it was affected by the foregoing decision.

The clauses were adjusted at a subsequent sitting of the Committee.

#### HASLEMERE DISTRICT WATER AND GAS BILL. WEY VALLEY WATER BILL.

These two partially competing schemes were taken together. The object of the Haslemere Bill was to enable the promoters to acquire the undertaking of the Haslemere Gas Company, Limited, and to supply with water and gas a large district which includes Haslemere, Chiddingfold, Shottermill, Thursley, and Frensham, in Surrey; Linchmere, Fernhurst, and other places, in Sussex; and Branshott, Liphook, &c., in Hants; as well as parts of Pefer Harrow, Godalming Rural District, not in the limits of supply of the Frith Hill, Godalming, and Farncombe Water Company, Limited. The Wey Valley Company sought power by their Bill to supply with water a district including Haslemere, Hindhead, Bramshott, Liphook, Thursley, Seale, Hale, Bentley, and Benster.

Mr. Pember, Q.C., Mr. Balfour Browne, Q.C., Mr. Wedderburn, Q.C.,



and Mr. Hans Hamilton appeared for the Haslemere District Water and Gas Company; and Mr. Littler, Q.C., Mr. Horatio Lloyd, and Mr. E. Charteris, for the Wey Valley Water Company. The petitioners against the Haslemere Bill who were represented were the Hambledon Rural District Council, by Mr. Blennerhassett, Q.C., and Lord Robert Cecil; the Farnham Rural District Council, by Mr. Castle, Q.C.; and Messrs. Jonathan and H. Hutchinson, by Mr. Garrett.

The water provisions of the Haslemere Bill were first dealt with. Mr. Pember, in opening, said he believed that neither set of promoters knew that the competing Bill was being brought forward until it appeared; and he expressed the opinion that some arrangement might be possible between the two Companies, under which the district in dispute might be divided between them.

Professor Jonathan Hutchinson, who was the first witness called, said that he had a residence and owned some land and houses at Haslemere. He had made water-works for his own houses, and was prepared to hand them over on terms to the Haslemere Company. This would enable the Company to at once supply the whole of Haslemere town with good water. The Hambledon Rural District Council, which was the Local Authority of Haslemere, had put up some stand-pipes for use by the people. The District Council, however, who opposed the Bill because they said there was no necessity for an additional supply, had refused to allow him to occupy one of his houses on the ground that it had no water; the nearest stand-pipe being too far off.

Mr. G. B. Holroyd, Managing-Director of a Brewery Company having several licensed houses in the Haslemere district, stated that he was one of the promoters of the Bill. He had received constant complaints from his tenants in the district of the inefficient character of the present water supply. In his opinion, the stand-pipes in Haslemere were not sufficient for the purpose for which they were designed.

The Committee having decided to take evidence respecting gas, as well as water supply from the local witnesses, Mr. Holroyd stated that gas was supplied in Haslemere by a private Company who had no statutory powers or responsibilities; but there was no supply of gas whatever in Hindhead and Shottermill. He thought it most desirable that a statutory company should be authorized to supply gas in the district.

In cross-examination, witness denied that the supply of gas by the Company would probably cost a considerable burden on the water consumers, and said it was not proposed to lay down gas-mains throughout the whole of the 200 square miles included in the Company's district. Gas powers were taken for the whole of the district because it might be desirable later on to exercise these powers. Mr. E. O. Preston was one of the promoters of the Bill. Witness was not aware whether he was the Mr. E. O. Preston who advertised as follows in the "Law Times":

To Parliamentary Agents and Solicitors.—A capitalist desirous of promoting Acts of Parliament in approved districts not now adequately supplied with water, is willing to pay a good bonus for the introduction of such business, or would purchase existing Acts of Parliament.—Apply E. O. Preston and Co., 4, Tokenhouse Buildings, London, E.C.

Mr. R. Storr, of Haslemere, stated that he was a property owner in the district, and expressed the opinion that the object of putting up the stand-pipes in Haslemere had been to prevent the introduction into the district of a proper water supply. He was strongly in favour of the Bill, as he thought that a good water supply was highly desirable.

Mr. F. W. King, owner of the White Horse Hotel, Haslemere, also spoke of the inadequacy of the water supply, and said that the local charge for gas was 4s. 7d. per 1000 cubic feet, with 5s. a quarter meter-rent. On Good Friday last, the pressure was so low that it was necessary to illuminate the hotel with lamps and candles.

Mr. Charles Charwood and Mr. W. A. Harris, both of Haslemere, having given evidence on the water question,

Mr. Herbert Hutchinson, son of Professor Hutchinson, said he was an architect and builder, carrying on business at Haslemere and Hindhead. He spoke of the water-works on his father's estates. He stated that several people in the neighbourhood had taken the water provided by his father in preference to that which they could obtain from wells or the stand-pipes. His father had built a house on Museum Hill, Haslemere; and the Hambledon District Council had at first refused to let it be occupied, on the ground that there was no adequate water supply. He believed that by purchasing his father's water-works, the Haslemere Company would obtain an ample supply for Haslemere and Shottermill. The gas-works at Haslemere were by no means adequate; and the advent of a Company to supply Haslemere, Shottermill, and the surrounding districts with gas, would be a boon to the neighbourhood, and would, he thought, be so considered by the inhabitants. In cross-examination, witness said he did not know whether it was necessary to supply gas as far away as Frensham—seven or eight miles off.

Mr. A. W. G. Harding, builder, of Shottermill, gave evidence as to the inadequacy of the present water supply at Shottermill. The water was, he said, mostly from wells, but part was fetched in buckets from springs. In some of the wells, the water was not fit for drinking purposes; and it was therefore necessary to use the spring water. The people in the district were anxious to have a proper water supply; and they would, he believed, like a good gas supply if they could obtain it at a reasonable price.

Some further evidence having been given in support of the water provisions of the Bill, Mr. Joseph Quick, Engineer to the Haslemere Water and Gas Company, expressed the opinion that it was highly desirable to have a proper gas supply introduced into the district. The proposed new gas-works, he said, were in a suitable position, well away from all buildings. In cross-examination, witness said he was not aware whether any of the promoters of the scheme had an interest in the district, except Mr. Holroyd. He did not think that any agreement had been come to at the present time for the purchase by the Company of the existing Haslemere gas undertaking; and he had formed no estimate of what it would cost. He did not know what was the condition of the existing gas-mains.

The Committee intimated that they did not want to hear any more evidence respecting the gas provisions of the Bill; and the promoters thereupon closed their case.

Mr. Blennerhassett said that, as the Hambledon Rural District Council opposed both Bills, he proposed to reserve his remarks until the Wey Valley case had been heard.

Mr. Castle addressed the Committee for the Farnham Rural District

Council; strongly supporting the Wey Valley scheme, and opposing that of the Haslemere Company.

Evidence was next called on behalf of the Wey Valley scheme.

Mr. A. C. Payne, of Frimley, said he was Chairman of the Frimley and Farnborough District Water Company, and one of the promoters of the Wey Valley scheme. The Wey Valley Company's Bill included unopposed provisions promoted by the Frimley and Farnborough Water Company, and the Farnham Water Company, authorizing the extension of their areas and the increase of their capital. Witness explained the proposed works of the Wey Valley Company; stating that there was to be a well and pumping-station north of Crondal, and two wells and pumping-stations on Hindhead. He contended that the Hindhead water ought to be used for the supply of the people in that district, and should not be diverted into Sussex as proposed by the Haslemere Company. The Sussex people might get a supply from the hills south of the county boundary.

At this point, Mr. Pember stated that a compromise had been arrived at between the two Companies. With reference to the gas proposals, the Haslemere Company had undertaken not to supply the northern part of Frensham; and as to the rest, the Rural District Council of Frensham had ceased to oppose them. With regard to the water supply proposals, the Haslemere Company had agreed to leave to the Wey Valley Company Headley and Shottermill. Each Company, said the learned Counsel, would thus take a share of the cream and some of the milk.

Mr. Lloyd remarked that all the Hambledon district (which includes Haslemere) would under the arrangement be included in the Haslemere Company's area, and not in that of the Wey Valley Company. It had been arranged that the latter Company should supply the Haslemere Company with water in bulk from Hindhead, for the high parts of the Haslemere Company's area; and that for the other portions of the area Professor Hutchinson's water should be used.

Evidence was then given on behalf of the Hambledon District Council, who had not entered into the arrangement. Among the witnesses called was Sir Robert Hunter, Chairman of the Haslemere Parish Council, who stated that the larger houses in Haslemere were supplied with water from their own wells; and it was only in the village itself that any question of water supply arose. The well water supply was perfectly satisfactory; and, in his opinion, Haslemere was abundantly supplied. To provide the more thickly populated part of the parish with water, there were now sixteen stand-pipes. From these plenty of good water could be obtained. The sources of supply, so far as the stand-pipes were concerned, were vested in the Parish Council; but a condition had been made by the owner of the land in which the springs were situated that the authority to use the water should become void if any company obtained statutory powers to supply the district. Therefore, if this Bill passed, the Local Authorities would have to give up the supply of water; and this would be a very serious loss to the people of Haslemere. There was at present no water-rate, so called, in Haslemere; but the sanitary rate had to pay for the cost of pumping. Roughly speaking, this amounted to £50 a year, which was practically 1½d. in the pound. The main objection to the Haslemere Company's Bill was that if it were passed, the District Council and the Parish Council would lose the control of the water supply, and largely that of sanitation. The Council objected to any Company acquiring statutory powers to supply gas in their district, just as they did with respect to water, as they did not for ever wish to lose the control of both the gas and water supply.

Dr. Hall, Medical Officer of Health for the Hambledon Rural District, said he was satisfied with the water supply of Haslemere, and with the progress that was being made in the district in sanitation generally. He thought the Hambledon District Council might be relied on to make any improvement that was needed. Between 1894 and 1897, he had not been able to trace one death to faulty water supply. In cross-examination, however, witness admitted that he had every year called attention to the necessity of improving the water supply.

Mr. Blennerhassett contended that the supply of gas, as well as of water, should be in the hands of the Local Authority. He admitted that the Hambledon District Council had not attempted to supply themselves with gas up to the present, but pointed out that they might do so at any time; and he said they ought not to be deprived for ever of the opportunity of doing so by the transfer of the present local undertaking to the new Company. The Council took up a similar position with regard to the water provisions of the Bill. Counsel remarked that Mr. Preston, one of the promoters of the Haslemere Water and Gas Company, was a speculative purveyor of water, a buyer of parliamentary powers, and a stranger to the district. He must be looked upon as a mere speculator, entering into the scheme for the purpose of making money out of it. The other promoters were in much the same position; and, in view of the opposition of the Local Authorities, the Hambledon District Council submitted that the Haslemere Bill ought not to be passed.

The Committee decided that the preamble of the Haslemere Bill was not proved. With reference to the Wey Valley Bill, they thought the preamble proved as far as the portion of the area in the neighbourhood of the town of Farnham was concerned—the water to be supplied from the Crondal source—and also as regarded the proposed extension of the limits of supply and new powers to be given to the Frimley and Farnborough and the Farnham Water Companies. They announced their intention of throwing out the portion of the Bill relating to the supply of the Shottermill district and the use of Hindhead water.

Mr. Lloyd and Mr. Castle both protested respectfully against the rejection of the Shottermill portion of the Wey Valley scheme, on the ground that they had not called all their evidence regarding it, in view of an intimation from the Committee that they did not wish to hear any more. The Chairman said the Committee thought they had heard enough evidence to form the conclusion which had been announced; but they were willing to hear any more which Counsel might think it was desirable to tender.

Some further evidence was then given, including that of Mr. E. K. Burstal, who stated that the only practically available source of supply for Bramshot, Shottermill, &c., was Hindhead. Witness said that this portion of the scheme had large local support.

The Committee, having again considered the matter, altered their former decision, and passed the scheme of the Wey Valley Company as regarded Shottermill, Bramshot, Liphook, and Headley, and the obtaining of a supply of water from wells at Hindhead.



## LEGAL INTELLIGENCE.

## SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Thursday, Aug. 4.

(Before the MASTER of the ROLLS and Lords Justices CHITTY and COLLINS.)  
*Fielden v. Mayor of Morley.*

This was an appeal by the plaintiff from the order of Mr. Justice Byrne, made on the 28th of April, and reported in the "JOURNAL" for May 3 (p. 1015), dismissing the action, which claimed an injunction restraining the defendants from obstructing a certain catchwater, or in any way causing or allowing water to collect and flow on the land of the plaintiff. At the conclusion of the arguments, on the 19th ult., their Lordships reserved judgment, which was delivered to-day.

The MASTER of the ROLLS said the real question was whether the defendants were entitled to send water from their aqueduct on to the plaintiff's land, making good any injury caused, or whether they were bound not to send any water on to his land. The defendants had made a bye-wash in the side of the aqueduct, to allow the storm water to escape through a natural gully; and the plaintiff contended that they had no right to do this in such a way as to allow water to come on to his land, though it was admitted that the usual and proper mode of providing for storm water was to make such outfalls as the one complained of, and that no better spot could have been selected for it with the view of doing the least possible damage to the adjoining land. The outfall was constructed under the powers of the Morley Corporation Water-Works Act of 1890; and the Court would not interfere on the ground that it might have been differently constructed or put in another place. If damage was done to the plaintiff's land, his remedy was by action for compensation, and not by injunction. The obstruction was merely temporary, and might never happen again. The plaintiff had never yet suffered, nor was he likely to suffer, any damage from the defendants' works. The whole dispute had arisen from the plaintiff having insisted upon an erroneous view of his rights, based upon an exaggerated idea of what was meant by the word "water-tight." The appeal failed, and must be dismissed with costs.

Monday, Aug. 8.

*Southwark and Vauxhall Water Company v. Wandsworth District Board of Works.*

To-day the Court delivered their reserved judgment in the defendants' appeal from the order of Mr. Justice Kekewich made on the 8th ult. (see *ante*, pp. 160, 259).

The MASTER of the ROLLS said this was an appeal from the order of Mr. Justice Kekewich, by which he restrained the defendants, until judgment or further order, from lowering the surface of the streets in their district under which the pipes and mains of the plaintiff Company were laid, in any manner that would leave such pipes and mains without sufficient covering of soil or other material to protect them from frost, without first altering the position of the pipes and mains by placing them at such a depth below the surface as that they would not be exposed to greater danger from frost. It appeared that the District Board of Works had, in pursuance of the powers conferred by the Metropolitan Local Management Act, 1853, lowered the surface of certain footpaths under which there were some pipes belonging to the Company. They had not touched the pipes; but the Company said that while lowering the paths defendants had exposed the pipes to the action of frost. This was their complaint. The section under which the defendants had lowered the street was section 98 of the 18 & 19 Vict., cap. 112. This section simply conferred a power. Its language imposed no duty; the words being, "it shall be lawful." Under certain circumstances, these words might impose a duty as well as confer a power; but it was for those who contended it did both to make good their contention. The defendants had not touched or disturbed the plaintiffs' pipes—they had in no way injured them; and this circumstance distinguished the case from that of *The Gaslight and Coke Company v. St. Mary Abbotts*, where the pipes were injured by a steam-roller. The plaintiffs assumed that they were entitled to have a certain amount of soil over their pipes; but there did not appear to be any ground for such an assumption. The order appealed from would be discharged, and judgment entered for the defendants, with costs; the costs in the Court below to be taxed as between solicitor and client.

Lord Justice CHITTY said he was of the same opinion. The decision would affect not only Water Companies but Gas Companies, who had the privilege of laying pipes under the road, and for which privilege they did not make any payment. The road authority had not altered the position of the pipes or disturbed or interfered with them; but the effect of the works, which had been lawfully executed, was to bring the surface of the street nearer the pipes which remained *in situ*. In executing the work, the defendants had not been guilty of any negligence. He was unable to find any express duty cast upon the defendants, when they altered the level of the road, whether by raising or by lowering it, to change the position of the pipes for the benefit of the Company owning them. The real question was on whom the expense of altering the position of the pipes was to fall. He was of opinion that it must fall on the Company, who were under no statutory obligation as to the depth at which the pipes should be placed below the surface. It was for them to put the pipes at such a depth as to protect them from frost.

Lord Justice COLLINS concurred.

## HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Thursday, Aug. 4.

(Before Mr. Justice NORTH.)

*Jordeson v. Sutton, Southcoates, and Drypool Gas Company and Others.*

This morning, judgment was delivered in the above action, which was heard in February (see "JOURNAL," Vol. LXXI., pp. 284, 348, 409).

Justice NORTH, after describing the position of the plaintiff as owner of 24 houses in Clyde Terrace, Hull, and the exact situation of the property in relation to the defendant's works, went on to narrate the history

of the Company, the various Acts of Parliament under which their powers were derived, and the proceedings which gave rise to the action—viz., the erection of a large gasholder, more than 105 feet in diameter, with three lifts of 35 feet each; making a total height of 105 feet, at a short distance from the plaintiff's property. For the purpose of this holder, the defendants, Messrs. Holme and King, Contractors employed by the Company, commenced in the summer of 1896 the digging out of a circular trench 37 feet in depth, which had now been completed; and within it a strong and solid wall had been erected, cemented, and puddled. It was well known to all acquainted with the district, that at the depth of about 16 feet there was a bed of running silt about 6 feet thick, and that special precautions would have to be taken to seal it up, and prevent it escaping into the trench. The Contractors selected one particular method out of several which had been described in the evidence; and he had already decided that in so doing they were not guilty of any negligence. At the same time, he thought they had failed to recognize the greatness of the risk. At any rate, the means taken proved insufficient; and the result had been disastrous. The barricade was inadequate to keep out the silt, a quantity of which escaped; the surface of the adjoining land was disturbed; and the buildings were cracked and injured to a serious extent. The trench itself was completed by Sept. 15, 1896, when the wall was commenced, which was finished in November. The damage to the plaintiff's buildings was first noticed in August; and it was not really disputed that it arose in consequence of the running out into the trench of what was in the silt bed. There was some difference of opinion as to whether what escaped was water only, or water mixed with sand; and on this question he had already expressed the opinion that it was not water only—the fact that the further one got from the trench the less disturbance there was of the soil, and the less damage to the buildings, appearing to be conclusive. If water only had escaped, he thought the subsidence would have been uniform over a larger area; and possibly no injury would have occurred to the cottages. With regard to the effect of the gasholder on the light coming to the windows of the plaintiff's property, there was not much divergence of opinion; and he thought the plaintiff's witnesses had given their evidence very fairly, and unusually free from exaggeration. They substantially agreed that until the holder rose above 68 or 70 feet, the effect would not be very serious; but that if this height were exceeded, it certainly would be. The direct sunlight would be cut off for several hours from some of the houses, which would be rendered unwholesome and gloomy, and their value would be seriously diminished. He was therefore clearly of opinion that there had been considerable damage to the plaintiff's property by reason of the withdrawal of the lateral support to the ground; and that if the gasholder were completed as proposed, the light would also be seriously interfered with. His Lordship then went into a long examination of the authorities with regard to the right to lateral support from adjoining land—reading several passages from previous judgments, and also those bearing on the contention of the defendants that what they had done was justified by their Acts of Parliament; and he came to a conclusion adverse to the defendants on all points. He also held that the Contractors were liable as well as the Company with respect to the damage caused by subsidence. With regard to the interference with the light, he had no option but to grant an injunction, because the case did not come within any of the exceptions in which damages might be given instead. But as it was clear from the evidence of the plaintiff's witnesses that if the gasholder were carried to a height not exceeding 68 feet it would not materially affect the plaintiff's rights, he should, while granting the injunction in the usual form, add a proviso that it was not to prevent the defendant Company from raising their gasholder on its northern side to the height of 68 feet from the surface of the ground. With regard to the interference with the support to the plaintiff's land and houses, the intended work had been completed in an apparently satisfactory manner; and since then no further subsidence had taken place, nor was any anticipated. One of the witnesses said the buildings seemed to have come to their new bearings. No injunction, therefore, was required; but the plaintiff was entitled to damages for the injury he had sustained. In the ordinary course, he (Justice North) should have directed an inquiry in Chambers as to this; but, as both parties asked him to settle the question, he somewhat rashly agreed to do so. Having referred to some of the evidence given on this point, he said he thought the damage from loss of rent, and injury to the buildings which would have to be made good, might be put down at £340, in which he did not include anything for loss of light, or any damage which might arise hereafter from future subsidence, because, according to a recent decision of the House of Lords, the latter would give a fresh cause of action. There would be judgment against the Company for the costs of the action, and against the Contractors for the costs of so much of the action as related to the subsidence.

Mr. HALDANE, Q.C., asked his Lordship to stay execution for a short time, in case the defendants should wish to carry the case further, and stated that the gasholder had now been completed.

His Lordship said he understood that it was not necessary, or even contemplated, to use the holder to its full height, except in the winter time; so that the injunction would not be any real inconvenience. The costs would be taxed and paid on the usual undertaking of the Solicitors to return them if the appeal were successful. With regard to the damages, he would suspend the payment of them if the defendants would undertake to pay 4 per cent. interest on the amount.

Mr. HALDANE agreed to do this.

## EASTBOURNE COUNTY COURT.—Thursday, Aug. 4.

(Before His Honour Judge MARTINEAU.)

Disputed Rates and the Quality of Water at Eastbourne.

To-day his Honour gave judgment in an action brought against Mr. R. G. Job, by the Eastbourne Water Company, for the recovery of £4 2s. 6d., water-rates. There was a counterclaim by the defendant for £1 10s. for damages alleged to have been sustained by him owing to a breach of contract on the part of the Company in respect of the quality of the water supplied. This was one of a number of cases which came before his Honour at a special sitting on the 20th of June last, in which similar points were raised; but Mr. Job's was the only one taken. Among the witnesses called were Dr. W. G. Willoughby (the Medical



Officer of Health for Eastbourne), Sir E. Frankland, F.R.S., and Professor Dewar. Judgment was reserved.

Mr. MOORE appeared for the Company; the defendant was represented by Mr. LAWSON LEWIS.

His HONOUR observed that there was no question as to the amount of the rates. Water had been supplied by the Company; and it might be taken that, subject to the counterclaim, the amount demanded was due and owing. The counterclaim was for £1 10s. as damages, on the ground that the Company neglected to comply with their statutory duty or obligation to furnish the defendant with a sufficient supply of good and proper water for domestic purposes, in consequence of which he suffered damage. The sole question was as to the right of the defendant to recover on the counterclaim. About the main facts, there was no dispute. Having cited the different sections of the Company's Acts and of the Water-Works Clauses Act, 1847, bearing upon the subject, he remarked that by section 35 of the latter Act the Company undertook to provide and keep in their mains a supply of pure and wholesome water sufficient for the domestic use of the inhabitants; and under section 36, a failure to supply after a demand in writing and the tender of an agreement to use the water by the required number of owners, rendered the Company liable to forfeiture, and to a penalty of 40s. a day during neglect, unless such neglect was attributed to frost, unusual drought, or other unavoidable cause or accident. From 1859, the year of the formation of the Company, to 1895, as he understood, the inhabitants had a sufficient supply of pure and wholesome water. In 1895, owing to the drought, the water in the Bedford Well became deficient in quantity, with the result that the sea water filtered through the strata into the well. This condition of things was due to natural causes, and could not have been caused by the Company; and he did not see any negligence or want of care on their part leading to the vitiation of the water. It was caused by no defect in the reservoirs or means of supply; and, so far as he could see, it was not possible for the Company to deal with the water in respect to this vitiation. The Company took measures to obtain another supply elsewhere; and the water was now of good quality. The question to consider was whether the Company were responsible for a breach of duty. He had some doubts as to the effect of the words "pure and wholesome." According to the experts called on the part of the Company, "pure" meant free from organic matter; in which case the water which was contaminated by sea water was pure. Further, it was sent out in the same condition as at the sources, and was the only water which the Company had power to supply. He was not prepared to accept the view of the experts as to the term "pure;" and he was disposed to give to it its popular application. He did not think brackish water could be treated as pure; and he was of opinion, therefore, that during the period of contamination the water supply was not pure and wholesome. Upon the question of the liability of the Company, his opinion was that they were not liable. They were authorized to supply the water taken from the Bedford Well and other sources; and they had supplied this water. The contamination of the water was due to no defect of the Company; and it was supplied by them just as it was derived from the springs and sources authorized by their Special Act. The Company had used all reasonable means to provide and keep in their mains a supply of pure and wholesome water. Even if the Company had committed a breach of statutory duty, his opinion was that an action would not lie in these circumstances; the only remedy for a consumer being by a proceeding under Section 36 of the Water-Works Clauses Act. It appeared to him that the Company had done all in their power to repair the mischief, for which they were not really responsible; and there would be judgment for them for the amount claimed—leave being given to appeal.

Mr. LAWSON LEWIS asked for a further adjournment of the other cases, in order that the defendants might consider the course to be taken.

This was agreed to; the question of costs being reserved until the hearing of the other cases.

#### Question as to Shipping a Cargo of Sulphate of Ammonia.

In the Queen's Bench Division of the High Court of Justice, on Monday last week, before Mr. Justice Bigham, Messrs. Hecker and Co., exporters, of London, sought to recover damages from the Cunard Steamship Company, Limited, for breach of contract entered into with the defendants to convey 30 tons of sulphate of ammonia to an Italian firm in Bologna. The ship was to sail for Venice. According to the case for the plaintiffs, the agents for the Steamship Company had constantly called upon them soliciting their carrying orders. The plaintiffs received an inquiry from the Italian firm in Bologna for the sulphate of ammonia, for the supply of which plaintiffs entered into a contract with the Sheffield Gas Company. They rang up, by telephone, the representatives of the Cunard Line in London, and eventually it was arranged that the ammonia should be shipped by the *Aleppo*, which sailed on March 18. The goods, at the request of the defendants, were forwarded from Sheffield to the Canada Dock, Liverpool. The *Aleppo* sailed on March 18 without the goods, whereupon the plaintiffs wrote holding the defendants responsible. The reply of the Cunard Company was that, by the foot-note at the end of their circulars, they were not liable for any goods which were not received alongside in time. It appeared that the plaintiffs had asked the defendants to sample and weigh the ammonia; and it was alleged on the part of the Shipping Company that this process had delayed the arrival of the goods alongside. It was further stated that sulphate of ammonia exuded moisture, and that to put it on the top of cargo would have been to injure other goods. His Lordship refused to allow the defendants to plead that the goods were not brought alongside in time because of the weighing; holding that it was a defence thought of at the last moment. In the result, the Jury found that there was a contract that the goods should be shipped by the *Aleppo*, and awarded the plaintiffs £1 damages. Judgment accordingly.

**Drogheda Water-Works Purchase.**—In order to complete the purchase of the water-works, the Drogheda Corporation have arranged for a temporary loan of £23,382 from the Bank of Ireland, pending the issue of Corporation stock.

## MISCELLANEOUS NEWS.

### THE GASLIGHT AND COKE COMPANY.

The Half-Yearly Ordinary General Meeting of this Company was held at the Chief Office, Horseferry Road, Westminster, on Friday—Colonel W. T. MARINS (the Governor) in the chair.

The SECRETARY and GENERAL MANAGER (Mr. John W. Field) read the notice calling the meeting; and the seal having been affixed to the register of shareholders, the report of the Directors, given, with the accounts, in the "JOURNAL" last week, was taken as read.

The GOVERNOR said that, before dealing with the business generally, he might perhaps first welcome the proprietors for the first time at a meeting in that room. The rapid and considerable increase of the Company's business during the past few years had rendered it absolutely necessary for them to have larger office accommodation. The only site available for the purpose was that on which the building in which they were assembled stood. It was formerly occupied by a lot of disused and out-of-date gasholders, which were a nuisance to the station and the neighbourhood, and of very little use to the Company; but they stood at a considerable sum in their books. They had therefore debited to revenue the whole cost of the improvement as regarded the amount of capital standing to the debit of the gasholders, &c.; and the only part chargeable to capital had been the extra accommodation that had been provided. The charges were respectively £16,000 to revenue and £14,000 to capital. It was rather unfortunate that the Company should have to bear this special charge in the last few half years, when things had been more or less adverse to them; but, as the proprietors were aware, the Directors did not shrink from disagreeable duties. When a thing had to be done, they did not postpone it because the time was not convenient. The hall in which they were met would be used daily as a dining-place for their very large staff of clerks, whom they hoped to supply there with a good and wholesome dinner at a reasonable rate. The neighbourhood of Horseferry Road was not remarkable for convenience as regarded dining. He next had to refer with great regret to the loss they had sustained by the death of Mr. Henry Noel. Their late colleague had been a Director of the Company even since the amalgamation with the London Company; and he had endeared himself to every one of his colleagues, who heard of his sudden decease with great regret. About a month after Mr. Noel's death, they were fortunate in finding among the proprietors a gentleman thoroughly qualified to take his place—he referred to Mr. John Miles, whom they had elected to the vacancy. Mr. Miles had had long experience in the management of important public Companies—perhaps the most important being that ancient Corporation, the New River Company. He was also connected with Gas Companies—the Brighton Company, for instance; and he brought to them not only ability but also experience. Passing to the report and accounts, he remarked that the first paragraph summed up in a few lines the result of the half-year's working; and he would therefore only take the salient points in the accounts. Statement No. 3 showed that on capital account the half-year's expenditure had been £159,500; and the items analyzed were as follows: The retort-house and purifier-house at Beckton, which were required in anticipation of the next winter's working had cost £26,000; the mechanical stoking machinery, £5000; the extension of railway and jetty accommodation, which was to meet the ever-increasing work of their coke and coal stores, and generally, £4000; the extensions of mains and services, £4000—making a total outlay of £39,000 at Beckton. At Bromley and Nine Elms, on oil-gas manufacturing plant, which was available not only for the enrichment of coal gas, but also to meet any sudden emergency on dark and foggy days, they had spent £25,000. He might say, with respect to the cost of oil-gas manufacturing plant, that, speaking roughly, it compared with ordinary gas making at a cost of about one-half. On the offices in which they were assembled, they had spent for this half year £9000 out of revenue; on show-rooms at various parts of their district (which, he might say, were yielding most satisfactory returns), they had spent £5000; and on sundry works the outlay had been £2500. In the distribution department, their expenditure had been on new and additional service pipes £20,000. He looked upon this as one of the most, if not the most, satisfactory item of expenditure which they had to record, because it meant the steady increase of their business. On mains, they had expended £10,000; and on meters and stoves, £49,000. These two items again were for the same reason eminently satisfactory. These outlays would bring the Company an abundant profit. Notwithstanding this expenditure, their capital per 1000 cubic feet of gas made remained at the same figure as at June of 1897; and that in spite of the very small increase this half year in their sale of gas. As the proprietors were aware, no additional capital had been raised during the past half year. They were, he might say, rather sorely in need of capital; but they meant to try, if they could, to get through the half year without raising any capital, so that their next issue might be when they came under their new Act, when it would consist of the new form of stock. Their bankers were generally very kind to them; and unless there should be an unprecedented tightness of money (which he did not think they need anticipate), they would be able to go on without asking for any further capital until the commencement of 1899. He must, however, say, as a matter of precaution, that they could not stop their business; and if necessary they must have capital. They could only stop their business by disobliging their customers, and starving their district. Not only must they be ready to supply the wants of their consumers, but they must always be prepared to anticipate the latter's requirements in a liberal manner. He felt sure that the Court would have now, as they had always hitherto had, the support of the shareholders in making a proper and due provision for the extension of their business which they might reasonably look for. Turning to No. 4 account (the revenue account), there were one or two interesting items. First, of course, was the gas-rental. They had sold more gas by 1·66 per cent. than they sold in the June half of 1897. This was equal to an



increase in the half-year's gas-rental, at last year's price, of £25,000. Under the circumstances this was—he would not say a very satisfactory figure, but not an unsatisfactory figure, because they began the half year with very little hope of anything of the kind. The drop they had in their output of gas for January was 4 per cent., and for February it was 1½ per cent. At the beginning of March they stood something like 5 per cent. behind. In view of this serious loss of rental, and in view of the undoubted higher price the Company would have to pay for coal, he thought the proprietors would agree with him that the Directors were not acting at all with undue haste when they put the sliding scale into operation, and increased the price from 2s. 10d. to 3s. per 1000 cubic feet. If they had not done so, and the consumption had not recovered itself, as it did in a marvellous manner—because in March they had an increase of over 11 per cent., and the increase for the rest of the half year was fairly satisfactory—the whole of their reserve fund might have been swept away, and a considerable diminution in the dividend must have taken place. Having done what they all conceived that it was their duty to do in the interests of both consumers and shareholders, and following out the undoubted provisions of their Act, and carrying out the law both in its letter and spirit, they put up the price of gas from 2s. 10d. to 3s. per 1000 cubic feet; and they were now able to ask the proprietors to declare the statutory dividend, and, instead of sweeping away the reserve fund, to add £51,000 to it. He thought no further justification could be asked for for the policy they had felt bound to adopt. The question of the sale of gas was becoming every year—and he might almost say every month—a more uncertain quantity, and now depended very much on the presence or absence of clouds and on the height or depth of the thermometer. The experience of the past half year had shown this in the most remarkable degree. As he had told them, the heavy drop in the consumption of gas which occurred in January and February—which ought to have been their heaviest months and their largest gathering-time—was occasioned by the unprecedented conditions of the atmosphere; there being hot days all through these months. In March, however, there was a sort of blizzard, and an Arctic spell of a week or ten days, when the consumption went up by leaps and bounds—at the rate, on some days, of 22 million cubic feet. This was another reason why they must have plenty of margin of plant to meet any unforeseen demand. The stove-rental showed a very handsome increase of £2677, which included a small rental charged for automatic meter stoves. Coke had given them very good results in the half year. There had been a rise of 1s. 4d. for coke—a figure which he believed compared favourably with other Companies, and which had brought in an additional £30,000. A large part of this was, no doubt, due first to improved trade generally. Both the cement and other trades who used their coke had been in a much more flourishing condition than for some time previously, and naturally they had been able to pay more for their fuel. Secondly—and this was another interesting point, which he had mentioned before—it was due to the decreased quantity of coke they had for sale, which was caused by the large amount they used for making carburetted water gas. They therefore at the same time had an increased demand and a diminished supply, which must tell favourably on the price. He was glad to be able to inform the meeting that this improvement in the coke returns was not only fully maintained at the present date, but that the Directors had just settled their Beekton coke contracts for the coming twelve months at prices which would result in much more favourable figures than those for the past half year. With respect to tar, the return under this head was very slightly below the figure of June, 1897. It was an unfortunate statement to have to make, and their only consolation—and it was very poor consolation—was that they had not done worse than their neighbours. Ammoniacal liquor and its products showed a considerable improvement over the corresponding figures of last year. This was due not only to the better market price of sulphate of ammonia, which had gone up £2 per ton during the last few months, but also to the improved methods of dealing with their ammoniacal liquor, for which they were very much indebted to their intelligent Manager at their products works. He was very glad from his place to be able to express their indebtedness to Mr. Wilton for the way he had thrown himself into this work in the interests of the Company. He might say that their total residual products showed an improvement of 12½d. per ton of coal carbonized on the figures of the June half of 1897; and when they looked at the large amount of material dealt with by the Company, this made a great difference in their accounts. In reference to the expenditure, there was not much to call for special comment. Coals and enrichment had cost them in the past half year a little over 4d. a ton more than in June, 1897. But when they deducted the proceeds of the residuals, the net cost of their coals showed a reduction of 7d. per ton, or a saving of close upon 1d. per 1000 cubic feet of gas. This was a matter upon which he thought they might fairly congratulate themselves. He knew that it was customary in some places to say that nothing but optimism ever came from the Directors' side of the table; but he did not object to being optimistic when there was good cause for it. He never saw any reason why the shareholders should not hear good things inside when they heard so many bad things outside regarding the state of their affairs. The carbonizing results were again better. The quantity of gas sold per ton of coal and enriching material used was 278 cubic feet more than in June, 1897; and he wished, in connection with this result, to say that it reflected the highest credit on their engineering staff generally. It must mean very careful and skilful carbonization when they could raise the quantity of gas sold per ton of coal by as much as 278 cubic feet in six months. This was the first opportunity he had had of expressing the sense of the great loss the Company had sustained by the death of Mr. John Methven, who was the Manager for so many years at the Beekton station. Mr. Methven was too well known in the gas world generally for it to be necessary to say much with reference to his qualifications; but particularly was he known in connection with his photometric attainments. He (the Governor) was sure the shareholders would join with the Directors in lamenting Mr. Methven's loss, and in condoling with his widow and other relatives. The Company's wear and tear charges showed a small reduction; but he did not think that they could look upon this—at any rate yet—as an actual saving, although, no doubt, it was evidence that rather less of their yearly repairs were completed by the end of June this year than had been customary in past years. Still, he looked for no material increase in wear and tear charges for the

year as a whole. Distribution charges showed an increase of nearly £5000. But considering the large increase in the number of their services, stoves, and meters, they must be prepared for an increase in these charges; and the advance was perfectly legitimate. He might tell them (if he was not wearying them with statistics) that they had now 210,900 ordinary consumers and 90,600 automatic meter consumers. Altogether, they had 320,000 meters in use; and they had supplied and fixed about 172,000 stoves. They also supplied gas to nearly 4000 gas-engines. There was now almost a stove to every two customers. This showed how very greatly the value, comfort, and convenience of gas-stoves were felt by people generally. He did not think he need go through any other items of the accounts; but he should be very glad to answer any question on them. The net result was a gross profit of £668,816, against £508,713 this time last year. The increase in the profit was £160,103; and only £35,000 of this was due to the increase in the price of gas, from the 1st of April last. This left as the result of better trading and working, £65,000 more profit for the half year, which he hoped they would think was not unsatisfactory. Their capital charges were rather less than they were in June, 1897, which was, of course, owing to the reduction of ½ per cent. in the dividend consequent upon the increase of 2d. in the price of gas. On the other hand, they had to pay £1500 more for debenture interest, and £4800 more for bank interest; the two sums making £6332. The reduction in the dividend was £13,187; so that there was left a net saving of £6855 in capital charges for the half year. After providing for the preference charges, amounting to £414,591, they were enabled that day to declare a dividend at the statutory rate of 12½ per cent., and to carry forward the balance of £51,854 to the credit of next half year. This was not only satisfactory to his mind, as he hoped it would be to the proprietors', but the prospects for the current half year were also very encouraging. Although they had to face a large increase in the cost of coal, the improvement in other departments of the Company's business was now, he thought, so assured that they might fairly anticipate a result equally good when they met again next January. He would only mention one point on this, which was that up to that day the increase in their sales was a little over 5 per cent. The increase in the price of coal to which he had referred had been brought about by two disturbances in the coal trade. The first was the anticipation on the part of the coal-owners that one effect of the operation of the Workmen's Compensation Act of last year would be an increase in the cost of production. The extra cost apprehended on this account immediately added 6d. to 1s. per ton to the price of coal generally; and since that time they had had that most deplorable labour conflict in South Wales, which had made every kind of coal very scarce indeed. The strike had added another 1s. or more per ton to the price of coal; and though he could only congratulate certain of their neighbours, who bought coal some time before their own Company did, and thus got it cheaper, he was afraid that those who bought after the Company would pay a great deal more. In fact, the price now quoted for coal approached the figure ruling at the time of the coal famine 25 years ago, at the close of which certain optimistic people told them that they would never hear of such prices again. It showed how a comparatively little disturbance in the production of coal in the United Kingdom had far-reaching effects; and they themselves, as well as steam-coal users, must bear their share of the burden. They could only hope that wiser and more conciliatory counsels might prevail, and that the conflict would shortly come to an end. He thought they would agree with him that if any justification were needed for their action in raising the price of gas from April last, it was to be found in the serious drop in their rental, and the serious increase in the price of coal. They had in their Company one very satisfactory item in connection with the coal question—namely, that on the 30th of June they had a stock of coal of 145,000 tons, which was equal to five weeks' consumption, and which had all been purchased under the low price of the late contracts. In addition to this quantity, they had a further 75,000 tons of coal due to them as arrears under those contracts, which would have to be delivered. Altogether, therefore, this half year would get the benefit of 220,000 tons of the cheaper coal; and this would tell favourably on their working. In view of this increase in the price of coal, the capital outlay he mentioned in his opening remarks would be very useful indeed. The two additional sets of oil-gas plant they had put down at Nine Elms and Bromley were already in working order, and would be fully ready for the coming winter; and he hoped that they would have plenty of coke to supply their own needs as well as more than they could have hoped for, under the circumstances, to sell. In connection with the question of their oil-gas supply, they would be aware that a Committee of the Home Office had been sitting with reference to the subject of carburetted water gas for illuminating purposes. He did not know whether they had yet concluded their labours; but he thought not. The Committee was presided over by Lord Balfour; and various members of their own staff and engineers of gas companies generally had given evidence. They hoped that the result would be that a reasonable amount of carburetted water gas would be allowed to be mixed with coal gas in the future. It had been found to be perfectly innocuous in proper proportions, and certainly it made gas cheaper and more easily produced for the consumer. However, they must wait the Committee's decision before they could say anything further on this. With reference to the question of photometry, the Gas Referees had recently notified their intention to substitute for the legal test-candles a new pentane lamp. Of course, the Directors had no wish whatever to evade any obligation imposed on the Company by the parliamentary bargain of 1876; and if the new lamp was found, after careful experiment, to be the true equivalent of 16 candles, the Directors would be perfectly prepared to accept it. Should, however, the lamp be found to necessitate the supply of gas of higher illuminating power than 16 candles, under the Act, they would be bound to object to put this burden on the Company. He hoped that, when the standard was properly adjusted, they might be able to adopt it with advantage both to the Referees, the testers, and their own officers. The next matter referred to in the report was the Company's Consolidation of Stock Act. He was happy to say that their Bill had passed through all its stages, and it received the Royal Assent last Tuesday. Their £13,000,000 odd of capital, with a standard dividend of 10 per cent., would in January next become £33,000,000, with a standard dividend of 4 per cent. The present £100 of 10 per cent. capital would become £250 of



4 per cent. capital; but the dividend received on the £250 would be exactly the same as was now received on the £100. He must congratulate the proprietors on having obtained the Act so successfully without alteration. The representatives of the consumers—the local bodies, the London County Council, and the City Authorities—as in duty bound, opposed the Company as hard as they could, and caused them a great deal of trouble and much additional expense; but the latter would come mainly out of the pockets of the consumers. The Directors got the Bill through, however, without any alteration, except an addition—it was not an alteration—put in by the House of Lords; being a declaratory clause that no increase in the value of the stock which might accrue by reason of the passing of the Act was to be taken into account by any arbitrator hereafter in fixing the amount to be paid by a public authority if they should desire to purchase the Company's property. He did not think there was much chance of their desiring to purchase the undertaking; the London Water Companies had to be dealt with first. If the Gas Companies' turn should come, the basis of price, if the price had to be fixed by arbitration, would have nothing to do with the market price. But it never had had; market price being a fluctuating matter arising from many accidental circumstances. The Directors, therefore, raised not the least objection to this clause being added to the Bill, which, with this exception, had passed through the House of Lords in identically the same shape as it was introduced into the House of Commons; and he believed it would be of great value to them. The only other matter in respect to Parliament was the resolution passed by the House of Commons, on the motion of Mr. Cohen, to appoint a Select Committee "to inquire into the powers of charge conferred by Parliament on the Metropolitan Gas Companies, and to report as to the method in which these powers have been exercised, having regard to the differences of price charged by the various Companies." He had some reason to believe that the form in which this reference was first drafted was directed simply against their own Company. But it was pointed out that there was no reason whatever why their Company should be put on its trial any more than any other Company; and that if Parliament desired information with respect to the effect of legislation which affected all the Metropolitan Gas Companies, it should include them all. He was glad to say that this view was taken by the mover of the resolution, which therefore appeared in the form named. With respect to the Committee in question, he was exceedingly glad that it had been appointed. He was quite sure that they would be able, willing, and anxious to give the Committee the fullest information on every point on which they might desire it. They had not, and they never had had, anything to conceal with respect to their Company. Everything had been explained to the shareholders, returns had been made to Parliament, and the Auditor of the Board of Trade had overhauled their accounts from time to time; and there was no information which they could offer which could not have been obtained without a Committee. Parliament, however, had ordered the Committee, to whom the Board would give the fullest possible information. The only other matter left for him to refer to was the question of compensation for accidents. Hitherto the Directors had dealt with accident cases on very liberal lines indeed, as they thought that it was the wish of the shareholders, as it was their own, that those who came to harm in the Company's employ should be treated fairly and liberally. Neither themselves nor their employees were at all delighted at this legislation having passed. They were already quite contented, and preferred to be under the old legislation. However, they must carry out the law. The course they had decided to take for the present was merely this: To watch what the effect of the Act would be, coupled with their own existing sick-fund, which they had brought into line as far as they could with the Act, giving rather better terms than the Act. For instance, they gave compensation for the first fortnight; whereas the Act gave nothing for the first fortnight. They would watch the effect of the Act and their own sick-fund for the next year; and they proposed to set aside £5000 to meet any extra cost that might accrue to them under the Act. As to the future, he had no wish to prophesy smooth things, or to be an optimist beyond what was justifiable; but he thought he might tell the shareholders that the Directors looked forward to the coming half year with far less apprehension than they did at the commencement of last half year. They had passed through six months of storm and stress, great anxiety, and a good deal of controversy; but in the end they had floated into smooth water. Their rental appeared to be increasing; he thought they would do well with coals and residuals; and he hoped to meet them next January with as good a story, if not a better one, than he had had the pleasure to unfold to them that day. He concluded by formally moving the adoption of the report.

The DEPUTY GOVERNOR (Mr. Howard C. Ward) seconded the motion.

Mr. C. E. JONES said that he would not for a moment depreciate the prospects of the Company. They had, however, a small increase in the sale of gas, and he should be glad if the Governor could offer any other explanation of this besides that of atmospheric influences. He had spent a long period in the coal areas of this country; and in his opinion, coal would never be much cheaper than it was now. There were certain causes which operated to keep up the price of coal. If, however, they paid more for coal, it followed that they would get more for coke; and he was glad to see that they were dealing with the problem of the output of coke in a very sensible way. His impression was that the answer to the coal-owners was to employ water gas. He was very pleased to find that their residuals had increased in value, although tar seemed to be a drug on the market. He thought the attention of the authorities might be very advantageously directed to the employment of tar mixed with asphalt for the making of roadways. As regarded sulphate of ammonia, he should like to see something done to encourage its sale. He used himself to send out small parcels of the article to those possessing a knowledge of agriculture, and thus secured customers; and he thought this example might be followed by the Company. With the exception of a little friction in certain quarters, everything had gone off well in connection with the raising of the price of gas. He was never a great believer in the sliding-scale himself, and it was capable of various interpretations; and they must not be at all surprised, when they next went to Parliament, if the sliding-scale proved to be a stumbling-block.

Mr. GEORGE LIVESSEY said he wanted to congratulate the Directors on their success in carrying their Bill through Parliament. He also desired

to congratulate them on the improvement in the market for coke and ammoniacal liquor, which had worked off the adverse balance of the previous year, and enabled them to meet the proprietors with a more satisfactory statement of accounts. He could not, however, congratulate them on the surplus, because he regarded the source from which it was derived as the very worst possible; two-thirds having been obtained from the consumers by the rise in price, the other third coming out of the shareholders' pockets. Before proceeding to deal with the accounts, he desired to clear up one point. The Governor had given a "Reply" to his (Mr. Livessey's) speech of last February; and he was quite willing to fall in with the Governor's view in deprecating any further discussion on this matter. He must, however, say one or two words. In his "Reply," the Governor said that he (Mr. Livessey) was animated by personal animosity towards him and Mr. Field; this view being based on a letter written five years ago, from which a misquotation was made, while the most important qualifying part was omitted. He had several times read what he said last February, and he could see nothing whatever in his remarks personally derogatory to him or Mr. Field; and in regard to Mr. Field, it was quite the other way. His attack last February was not on the Directors or on Mr. Field; but he did impeach the management, and said that he saw no hope of an improvement until he (the Governor) gave up the reins. He would be very glad to qualify that by saying "or until you alter your system of management." It would be a great satisfaction for him to see the system of management of the Company altered, and the Company put in its proper position as the leader of the gas industry of the world. It would, however, be anything but satisfactory to him to feel that he had done him any injury by any act or word of his. His attack was just the same in character as that which was continually taking place on the part of the Opposition to the Government of the country, and nothing more. As to other statements in the Governor's "Reply," he feared he must characterize many of them as misleading statements; but he did not intend to go into this matter, as he feared it might weary the proprietors, and he did not think it would do any good. Turning to the accounts, the general result was satisfactory; but he found that, on the expenditure side, there was practically no improvement—that the cost of gas per 1000 cubic feet made was, within a fraction of 1d., the same as it was a year ago. The cost of carbonizing wages was slightly lower in amount, but not lower per ton of coals used; and when he spoke of this he deducted 1½d. per 1000 for the cost of making water gas, and taking the difference as the cost of carbonizing. He did the same last year; and he found that last year the cost was 3s. 4½d. per ton. This year it was 3s. 4½d. per ton. There was, therefore, certainly no improvement in the carbonizing wages. But he did give credit to the carbonizing department for improved working. Last year the make per ton of coal was only 9917 cubic feet; whereas this year it was 10,167 cubic feet. This was so far good, though it was an improvement on what was bad previously. With respect to the Governor's remarks, in reply to his (Mr. Livessey's) statement last February that the carbonizing wages ought by this time to have been 1s. less per ton, the Governor stated that to have done so, and put in the necessary machinery to have effected this saving, would have entailed an expenditure of £1,000,000. His (the speaker's) reply was that their neighbours had done so; and it could not have cost them less in proportion than it would have cost this Company. The Brentford and South Metropolitan Companies had done this; and he saw no reason why The Gaslight and Coke Company should not also have done so. He did not believe it would have cost £1,000,000 or anything like it; for ever since 1889 they had had to spend large sums of money in renewing their retorts, and alterations could then have been made. With regard to the question of capital, he noticed that the Governor found fault with him for taking the last seven or eight years, and omitting all reference to the previous six years, when the capital account was being reduced in proportion to the business done. He did this advisedly. In 1883, he drew the attention of the Company to the excessive expenditure of capital, and from that time for a number of years the greatest care was exercised—in fact, the capital was materially reduced per ton of coal. But in the last seven or eight years they had reverted to the old system of extravagance. Taking the last twelve months, he found the increase of capital was £395,000, while the increase of business had been 391 million cubic feet. These figures worked out at £1011 per million cubic feet of gas sold. It was true that the increase of business was very small—only 2 per cent.; and it was also true that it was misleading, under ordinary circumstances, to take a single year. But when this followed a number of previous years in which an excessive amount of capital had been expended, he considered it an indication that there was no change in the system. In fact, the Governor said in his "Reply" that it was "a vindication of the principles upon which the business of this Company has been and will be conducted by the Court."

The GOVERNOR: Do you allow anything for providing for the future?

Mr. LIVESSEY: You have been providing for the future for the last seven or eight years.

The GOVERNOR: We are always doing so.

Mr. LIVESSEY: Well, there was the fact of the great expenditure of capital which he had mentioned. Continuing, he said he had gone far enough back. He had gone back to 1869, from the time when The Gaslight and Coke Company absorbed the two City Companies, and included the whole expenditure on Beckton and all their works. He found that the total expenditure of the Chartered Company from 1869 amounted to £497 per million cubic feet of gas sold. They had had in that time an increase of 11,783 million cubic feet; and it worked out at £497 per million cubic feet of gas sold. The Company had built new works. There were two other Companies in precisely a similar position. The Commercial Company had a limited district, incapable of extension. He had taken that Company's accounts since their amalgamation with the Ratcliff Company in 1875, and found that they had met all their extensions of business, including new works at Poplar, at an expenditure of £308 per million cubic feet. The South Metropolitan Company had erected new works since their amalgamation with the Phoenix Company, and their total increase of capital on the increased business came to £359 per million cubic feet sold. Therefore he maintained that The Gaslight and Coke Company had spent on new works in round figures about £150 per million cubic feet of gas sold more than the other Companies; and this £150 excess represented nearly £2,000,000, which cost something near £200,000 a year for interest.



The GOVERNOR dissented, and referred to the debenture stock that had been raised.

MR. LIVESEY (continuing) stated that the expenditure included a very large portion of the "A" stock, and that bore 12 to 13 per cent. He held that at any rate the interest on the £2,000,000 went a long way to account for the difference of 3d. per 1000 feet more required by The Gaslight and Coke Company to pay their dividend as compared with what was required by the other two Companies. His reason for drawing attention to this capital outlay was to try and induce the Directors to alter their principle, and to spend capital as carefully as the other Companies did. Turning to the Directors' report, the first paragraph related to the increase of price. He was very sorry indeed that they had had to increase the price; and he was not at all sure that it was absolutely necessary. However, the price was increased, and their dividend was reduced. One reason for the increase of price was that they worked more expensively than the other Companies, and because, though they had an unrivalled district, they had not cultivated it as they might have done. The Governor mentioned in his "Reply," as a proof that The Gaslight and Coke Company had not an unrivalled district, that in fourteen years the consumption in the case of the South Metropolitan Company had increased 111 per cent., while the increase of the Chartered Company had been only 42 per cent. This was an extraordinary fact—that a Company less than one-third of the size of the Chartered had a greater absolute increase than the larger Company. He (Mr. Livesey) contended that this was one of the most conclusive pieces of evidence that could be given as to the advantages of low prices. He quite agreed with the Governor that the thermometer had a deal to do with the matter from year to year; but here was an experience extending over a large number of years. The fact that the South Metropolitan Company had been selling gas at some 6d. or 7d. per 1000 cubic feet less than the Chartered Company had a good deal to do with the great increase in the sale by the South Metropolitan Company as compared with the small increase of the Chartered Company. He held that it was their duty to make friends wherever they could; and he believed that by fair dealing towards the customers, and by showing them every possible consideration, they might cultivate friends. He was quite sure of the advantage attending the allowing of discounts to large consumers. The South Metropolitan Company did so; and it was done all over the country. He maintained that it was a right thing to do, and that it did a great deal to satisfy the consumers. In other ways the consumers' interests ought also to be considered to the utmost; and if this had been done, the Chartered Company would have had a larger increase. The time had come when gas companies must seek business, and must adapt themselves to the requirements of their customers, just as was done in any ordinary business; and he believed that, if the Chartered Company did so, they would find the benefit in a much larger increase of business. If they had had the increase of business which they might have had, and had worked as well as the other Companies, they would have been able to sell gas at 2s. 6d. per 1000 feet, which would have meant that the consumers would have paid about £500,000 less, and the shareholders would have had another £90,000 a year in dividends. He regarded the position of the Company as a very serious one; and the Court did not see it. The Governor, in a reply to his (the speaker's) letter a fortnight ago, said "There are two points in your letter in which I am not able to agree: 1, As to the 'most serious position' into which you state our management has brought the Company, you are quite right in your opinion that the Court, with perhaps one exception, does not realize its existence." This was further evidence to his mind of the hopelessness of the Company's present position. So long as they persisted in their present system of management, so long it seemed to him the Company would not occupy the position which it ought to hold. This was the only Company in the United Kingdom using more than 100,000 tons of coal a year (excepting the Alliance and Dublin Consumers' Gas Company) that charged more than 3s. per 1000 cubic feet for gas. The Dublin Company used 133,000 tons, their price being 3s. 5d.; but they had the worst district. If they wanted to find companies charging as high as 3s., they must go to the small ones. The reason why The Gaslight and Coke Company met with such poor results was their system of management. He wished to speak with every respect of their General Manager, but he did maintain that, while that gentleman was an admirable Accountant, a thoroughly honest man, and completely devoted to the interests of the Company, he had not the commercial faculty. The Governor said in his speech at the last meeting, that at the beginning of March, there would be, he knew, an undoubted increase in the price of coal.

The GOVERNOR: I said we expected it.

MR. LIVESEY said so did other people. Common report credited their General Manager with dealing with this question. He tried to get in at the old rates, and their contracts were deferred from March to May, with the result that they had to pay from 1s. to 15d. per ton more than they paid last year. Other Companies, however, bought their coal in March and April, and at an advance of only 3d. or 4d. a ton. If the Boards of those other Companies had had control in this Company, they would have bought all the coal that they required at an advance of not exceeding 6d. a ton, and have saved in this way at least £50,000. Mr. Field, however, he understood, stood out for the old price; but it was impossible to get in at that rate, and they had to pay all the more. He held that if Mr. Field had been a man of commercial faculty he would have seen the necessity of paying more, and would have got in at a lower price than he did. The Governor had spoken of a "one-man Company." It was the business of the Chairman to watch the markets, and to keep himself posted with the general trend of prices. He conferred with his colleagues from time to time. This year a coalowner called on the Chairman at the works to renew a contract. That was in March. He asked for an advance of 6d. a ton; but it was seen or felt that he would take an advance of 3d. This was reported to the Board, by whom the matter was thoroughly discussed, and they agreed to offer an advance of 3d. on their old contract price; and practically they got their coal at that price. He maintained, with all deference, that this was the way in which so important a business as a coal contract ought to be managed. No one man ought to do it; it was too important a matter. He wished Mr. Field no harm. What he desired was that that gentleman should retire on a very handsome pension; and if the Directors proposed to pay him his full salary, he (the speaker) would hold up both his hands for the proposal. Mr. Field had

worked hard for the Company; but he was not the right man in the right place. The Board appointed a Director last year; and the appointment met with universal approval. The gentleman was one of the ablest in the gas profession; and they all thought that, with this gentleman on the Board, they would see a great improvement in their working. He had, however, been on the Board for a year; and, so far, he (the speaker) could see no improvement whatever. Judging from the result, it would seem that all his experience and his efforts to help the Company were futile. Reference had been made by the Governor to the death of Mr. Henry Noel. A month after, it was stated, a man in every way suited to occupy the position was appointed. But he thought that a little slip was made in that matter. Mr. Noel died on the 7th of June; and at the next Board meeting, on the 17th, the vacancy was filled up. He thought he could understand the haste with which Mr. Miles had been appointed. He suspected that the Directors were afraid that some of the shareholders might, if they heard of the vacancy, write and suggest successors; and it was to forestall such a contingency that the vacancy was filled up. He might, of course, be mistaken in his view.

The GOVERNOR: You certainly are.

MR. LIVESEY, continuing, said that what the Company wanted was not a general Director. Mr. Miles was a good man of business (as a matter of fact, he was a Director already of no less than eight companies); but he knew nothing special in connection with gas. What the Directors ought to have done was to have strengthened the previous appointment that they had made when Mr. Woodall was elected. He knew it would be said "You want a place;" but he did not appreciate the honour at all, nor did he wish to increase his work or responsibilities. He maintained, however, that the Board ought to have been strengthened by another man from the gas profession to help Mr. Woodall. His only desire was to see this great Company in its proper position, but so long as they, with the richest district in the world, charged 9d. per 1000 cubic feet more for gas than other companies supplying poor districts, there must be dissatisfaction, and a feeling that the Company was not properly managed.

SIR RICHARD H. WYATT ventured to think that, instead of Mr. Livesey coming to their meetings and "throwing dirt" on the directorate, he should in a friendly manner, not in a public place, consult with them in regard to what was best to be done for promoting the interests of the two Companies. He should certainly object to Mr. Livesey being appointed on the Board of The Gaslight and Coke Company, with that gentleman's views as to labour directors. He considered that it was quite impossible to follow the speech of Mr. Livesey, full of figures as it was. He earnestly appealed to him not to come there and make attacks on the Company, and thereby cause their interests to be adversely affected. When a gentleman in Mr. Livesey's position came there and proclaimed that the Company was in a serious position, the statement might have very prejudicial effects on them.

A SHAREHOLDER said he thought that they ought to be very much obliged to Mr. Livesey for coming there as he did, and advocating that the Company should be carried on in a less wasteful manner. He was a shareholder in the South Metropolitan Company, and he wished The Gaslight and Coke Company were under the same management.

Another SHAREHOLDER wished to ask whether they could hold out any hope to the public at large that they would have a reduction in the price of gas shortly.

The GOVERNOR, in reply, said that no one would be better pleased than he to be able to say exactly when they hoped to take off the extra 2d., or a portion of it. It all depended on the course of their business, and the price of coal. Mr. Jones had said that the increase in their rental had been very small; and that was true. But they had a very different district to that of the South Metropolitan and Brentford Companies. He supposed that theirs was the most electrically lighted district in the world. Mr. Jones had also said that coals would never come down again, and that the existing high prices were permanent. But they had always found that when coal went to an unduly high price, new pits were opened, and the price soon came down again. History repeated itself; and he had very little doubt that when the labour troubles were at an end, if prices did not go down too rapidly, more pits would be opened and the prices would fall again. As to water gas, they were following the policy advocated by Mr. Jones. They were also acting on his policy in regard to sulphate of ammonia. As regarded their going to Parliament, and Mr. Jones's remarks about the sliding-scale, he thought that nothing had come out clearer in all their parliamentary fights during the last few years than the sacred character which attached to a parliamentary bargain; and in reference to the capital already raised under Acts of Parliament, he did not believe for a single moment that a public breach of faith would be committed by Parliament. With respect to further capital which they might have to raise in the future, it was another question altogether. He rejoiced that Mr. Livesey was in a less combative mood than he was six months ago; and he accepted that gentleman's statement that he intended no personal attack on them last February. He had no doubt that he did not intend personally to attack any one; but it had all the appearance of being such an attack. It had been an expensive matter to circulate his reply to their 12,000 proprietors; but he had only received four replies at the outside—three of them entirely approving of the reply, and one of them approving it except the question of meter rental, on which the correspondent agreed with Mr. Livesey. It had another result, in having reduced the market price of their stock from £315, at which it was prior to February, down to £282. It was quite true that 15 or 17 per cent. of the drop was on account of the loss of  $\frac{1}{2}$  per cent. dividend; but all the rest was the result of what occurred last February. Fortunately, the price of the stock had since gone up, and was now just under £300, which he thought a little low, taking the 4 per cent. value, which appeared to be the general value of gas investments now. Then Mr. Livesey said that he thought they were in a very serious state. He could not understand how a Company which had gradually reduced the price of its gas for many years, had made great concessions to the public, and had only gradually increased its dividend within the lines of its legislation and now paid 12 $\frac{1}{2}$  per cent., could be said to be in a very serious condition, with a continued increase in its business, although it was small compared with that of the South Metropolitan Company. The public had had reductions in the price of gas to the tune of £13,000,000 within the last twenty years; and it could not have been very bad management to have produced such a result. As regarded their carbonizing wages, and the extra amount of capital he said it would be



necessary to spend in order to bring their wages to anything like the level of Mr. Livesey's, £1,000,000 was the figure that was given to them by Mr. Trewby; and he could not go behind it. Mr. Livesey, he also noticed, did not allow enough for expenditure which had to be made in advance, and which did not produce for the time being the extra million cubic feet of consumption. They had at Beckton some very large works, which hardly existed at any other gas-works in the world; and a good deal of their capital could not strictly be called applicable to producing the increase of the million cubic feet. Mr. Livesey said that other Companies had gone to this expenditure, and had got the results he mentioned; and The Gaslight and Coke Company were gradually doing the same thing. But the other Companies had not had to do what their Company had had to do—do away with a lot of old works, and annihilate a large amount of capital, which stood in their books, but which there was nothing now to represent. They had been forced to do this by Parliament. As to the buying of coal, all the Companies did not purchase their coal in the same way; but they did very much what Mr. Livesey suggested—they watched the market. Fortunately, Mr. Livesey had made his purchases better; and he congratulated him. As regarded working generally, he did not find that they were so much worse off than their neighbours, even on the south side of the river. He found that last half year their residuals brought them in 6s. 11½d. per ton, as compared with 6s. 8½d. in the case of the South Metropolitan Company. Then, as to the net cost of coal, they had improved on the June half of 1897 12½d. per ton, as compared with 7½d. in the case of the South Metropolitan Company. They had also sold 278 cubic feet more gas per ton of coal than they did a year ago; but the South Metropolitan Company had apparently gone down 40 cubic feet. But he did not attach importance at all to these figures. They saw no reason why they should give discounts to their large consumers. They treated them all alike; and they believed this was in accord with their Acts of Parliament. As regarded the personal question in connection with the Board, he regretted that it had been raised. He accepted Mr. Livesey's correction as to the date of Mr. Miles's election as a Director; but he (the Governor) knew that the vacancy was inevitable—Mr. Noel having been ill for a long time. There was, however, no indecent haste in filling up the vacancy. There was no expectation of any suggestion on the matter coming from shareholders; and there was no "sharp practice" of any sort or kind. He believed in cheap gas just as much as Mr. Livesey; and the efforts of the Board were directed to selling it as cheaply as they possibly could. But they had drawbacks which Mr. Livesey had not. He was quite sure that if they had been "a Court of Cowards" they would not have raised the price when they did; but they had always held that the right thing ought to be done at the right time. He repeated that the action they took in this matter was justified. He then put the motion, and it was carried unanimously.

Resolutions were afterwards passed empowering the Directors to dispose of property belonging to the Company which was not now required for their purposes, and authorizing the holding of the next half-yearly meeting in January instead of February.

A discussion followed on a motion of Mr. HENRY HOUNSOM to the effect that a verbatim report of the proceedings of the meeting should be circulated among the proprietors.

The GOVERNOR said he estimated that the cost would be about £200; whereas the "JOURNAL OF GAS LIGHTING" and other papers gave a very fair résumé of what took place.

Mr. LIVESEY stated that the South Metropolitan Company had for some years circulated the "JOURNAL" report; and the last time it cost them only about £13 for nearly 8000 shareholders.

On being put to the meeting, the motion was lost on the show of hands.

The proceedings then terminated.

#### BRENTFORD GAS COMPANY.

The Half-Yearly General Meeting of this Company was held on Friday, at the Charing Cross Hotel, Mr. HOWARD CHARLES WARD in the chair.

The SECRETARY (Mr. W. Croxford) having read the notice calling the meeting, the Directors' report and the accounts for the half year ended June 30 last (*ante*, p. 262) were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said he thought the shareholders would be satisfied with the result of the past six months' working—at any rate, the Directors were very well contented with it. He had nothing startling to tell them; but, besides having earned their dividends, they had a little surplus. The amount available for distribution was £59,390; and this enabled them to pay the customary dividends—namely, at the rate of 5 per cent. per annum on the preference stock; at the rate of 12 per cent. per annum on the consolidated stock; and at the rate of 9 per cent. per annum on the new stock, 1881. In the half year under review, their sales of gas had increased by 6·3 per cent., as compared with an increase in the corresponding period of 1897 of 9·68 per cent. They had to remember, however, that the months of January and February of this year were very unfavourable, as regards the weather, for gas companies. Taking account of this fact, he thought the increase of 6·3 per cent. on the increase of 9·68 per cent. in the corresponding six months of the previous year was not unsatisfactory. Of course, their customers grew in numbers half year by half year; and this was particularly marked in the case of consumers by automatic meters. The number of these meters in use in the Company's district on June 30 last was 13,312, as against 9567 at the same date in 1897—showing an increase of about 40 per cent. This looked as if the use of gas, for heating and lighting purposes, was not being disregarded. They were busy putting up water-gas plant at Brentford and also at Southall. At the former place, in fact, it had been completed, and had been in use with considerable success. Not only did they make gas, he believed, cheaper by means of this plant, but the illuminating power was more under control. The installation at Southall was also being proceeded with without delay. The new plant had to be paid for, and money had to be found for the purpose. Therefore, during last half year, they had put up for sale by auction £15,000 of new stock, 1881, as intimated to the proprietors at the last meeting; and he was pleased to say it realized £31,330, or a pre-

mium of £16,330. The average price obtained for the stock was £208 16s. per cent., which was very good. Of course, the premium of £16,000 odd was not available for distribution in the form of dividends, but would go into the general capital of the Company. It would be necessary to put up by auction a further £15,000 worth of new stock at the end of October or the beginning of November. So far during the current half year their sales of gas had increased at the rate of 9 per cent., which was very satisfactory for the summer months. Turning to the revenue account, the proprietors would see that the half-year's revenue from sales of gas by meter and public lighting amounted to £110,502, as compared with £104,040 at June 30, 1897—a very considerable increase. The revenue from public lighting showed a decrease for the six months of about £400. They had one or two electric lighting corporations in their district; and they were fond of sticking up electric lights in the highways and byways. But the curious fact was that the reduction in this Company's receipts from public lighting was accompanied by an increase in the number of public lamps. The explanation of this was the great appreciation of incandescent gas-burners. Then, the rental of meters had gone up; but although the number of stoves was larger, the rental derived from them had decreased a little. The shareholders would naturally ask how this was. The fact of the matter was that they used formerly to charge a rental for stoves supplied by the automatic meter system. But the Board found that this caused a little grumbling on the part of the consumers; so they had made "a virtue of necessity" and discontinued the charges, especially as they thought it was, to some extent, reasonable, seeing that by the automatic meter system the price charged for gas was higher than the ordinary price. The result had been that, whereas the rental for stoves was £1694 for the corresponding half year of 1897, the amount for the six months under review was only £1566. Their residual products had yielded rather better returns; the sum received for them in the half year having been £22,000 odd, as compared with £19,500 in the corresponding six months. If they looked on the debtor side of the account, he thought they would find that everything had gone on satisfactorily. The item of repairs and renewals of meters had increased very considerably; but that was a healthy sign, as it indicated the progress made by the Company's business. The ordinary meters were replaced by new ones to the extent of one-twentieth, or by 5 per cent. every year; and the contractor also kept the meters in repair. Their stoves were written down by 12½ per cent. per annum. As regards the automatic meters, they were written down by 10 per cent. per annum; and the automatic fittings, by 15 per cent. He thought that Mr. Field (one of the Auditors) was very well satisfied with this rate of depreciation. In the past ten years their capital had increased by 35 per cent.; but, on the other hand, their business, as shown by the quantity of coal carbonized, had grown by 70 per cent. In 1888, their capital per ton of coal carbonized was £7 4s. 7d.; but during the past year it was £5 19s. 11d.—a material and satisfactory reduction.

Sir RICHARD HENRY WYATT seconded the motion.

Replying to a proprietor, the CHAIRMAN stated that in 1894 the capital of the Company was £835,600; whereas it was now £949,980. The additional capital was represented, of course, by assets in the form of buildings, mains, coals, &c.

The motion was put and agreed to unanimously.

On the motion of the CHAIRMAN, seconded by Sir R. H. WYATT, the dividends recommended in the report were agreed to.

Mr. J. E. CORBYN then proposed a vote of thanks to the Chairman and Directors, which was seconded by Mr. BORRADALE, and passed.

On the motion of Mr. ANDREW THOMSON, seconded by Lieut.-Col. ELYARD, and supported by the CHAIRMAN, a similar compliment was paid to the Engineer and Manager (Mr. J. Husband), to the Secretary, and to the other officers of the Company.

Mr. CROXFORD having briefly acknowledged the vote, the proceedings terminated.

#### CRYSTAL PALACE DISTRICT GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held last Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Charles M. Ohren) having read the notice convening the meeting, the Directors' report and the accounts for the six months to June 30, as summarized last week, were taken as read.

The CHAIRMAN moved—"That the report of the Directors and the accounts be received, adopted, and entered upon the minutes." He said he could assure the proprietors that it was with feelings of great pleasure that the Directors met them on this occasion, and submitted this motion. For some time past, he must confess (as he dare say the proprietors must have noticed from the remarks made on the Directors' side of the table) that they had not been altogether happy in regard to the state of the Company; but now they were in the very satisfactory position of being able to come before the proprietors with the statement that the Company had "turned the corner"—that, whereas for some years past the Company seemed to be losing ground, they were now on the upward track again. The accounts showed that, while in the corresponding half of 1897 they were deficient by £3669 of the amount required for the dividends, in the past half year they were only £438 short. This was largely due to an improvement in the working, and to a certain improvement in the receipts for coke and sulphate of ammonia. The increased income from coke was due to an advance in its value, but the increase in the receipts for sulphate of ammonia was attributable to two causes—partly to an improvement in its value, and partly to an increase in its production. Previously they had been making only a very small quantity of ammonia; and, though they were not now doing what they hoped to accomplish shortly, they were working considerably better in this respect than this time last year. The result was that, while last year the Company only realized for products 5s. 7d. per ton of coal carbonized, they had this year obtained 6s. 7d., or an increase of 1s.—equivalent to £2600 in the half year. Coal had cost about the same per ton; but receiving 1s. extra per ton of coal carbonized for products, brought down the net cost of coal from 7s. 11d. in 1897 to 6s. 11d. in 1898. Still, so far as this extra 1s. was concerned, they only took credit for a part of it—the greater part (taking



coke and sulphate of ammonia together) being due to the improved market values. Turning to the other side of the account (which, he remarked, was really the most important), he said that the amount the residual products had realized might be entirely beyond the control of the Directors. The residuals might produce a higher price, of which the Company obtained the benefit, but for which the Directors could not take credit. On the other hand, the residuals might realize a very low price, whereby the Company suffered loss; but no blame could attach to the Directors, because it was beyond their power to control it. But in the matter of expenditure, they had something which was, within certain limits, under their control. He did not mean to say the expenditure could be reduced to an unlimited extent; but in the year there had been a very considerable improvement. Last year they were in the position, in regard to the carbonizing wages, of standing at a very high figure—nearly 3s. 6d. per ton of coal carbonized; to be exact 3s. 5-86d. This was unsatisfactory; and it was particularly unsatisfactory because some other companies had succeeded in materially reducing their carbonizing wages in the years that had elapsed since the great rise of 1889, when the Gas Workers' Union came into existence. In this connection, it was rather unfortunate that the Crystal Palace District Gas Company should have had him (Mr. Livesey) as their Chairman at this particular time, because the Governor of The Gaslight and Coke Company, in a very elaborate reply to strictures of his on their working, dragged in the Crystal Palace Company, and said: "It is, however, permissible to compare this Company's [The Gaslight and Coke Company's] wages with those of the Crystal Palace District Company; and the comparison shows that, although that Company has all the advantages of Mr. Livesey's experience and of his profit-sharing scheme, its carbonizing wages are higher than those of this Company, and its carbonizing results are worse than those of any other Gas Company in or near London." This was a pretty sweeping declaration. But the carbonizing results in the past half year showed a considerable improvement. In the first place, their Engineer (Mr. S. Y. Shoubridge) and those who were under him, had increased the make of gas per ton from 9440 cubic feet to 10,029 cubic feet. The former figure was very low; and it was perfectly true that the results then were worse than those of any other Company in London. But he did not know that there was any necessity for the Governor of The Gaslight and Coke Company to say so. However, they had now got up to a make of 10,029 cubic feet per ton of coal; and he expected it would go higher still—at any rate, he considered that an increase in production of nearly 600 feet of gas per ton was a good step in advance in the course of a year. Then as to cost, the carbonizing wages had come down from nearly 3s. 6d. per ton of coal to 3s. 3-4d.—a reduction of close upon 2-4d. per ton. On a previous occasion, he felt it his duty to state that the workmen were not doing their best—they were not giving the Company a fair day's work for a fair day's wage. He, therefore, felt it was only just to say now that they had improved considerably; and when he told the proprietors that they had, for a smaller payment in wages (£912 less), produced more gas, and yet had used less coal, they would agree that the men had been doing their duty in a much more satisfactory manner. The quantity of coal carbonized in the six months was 2223 tons less, which was equal to a reduction of 4 per cent.; and, as they had produced 3 per cent. more gas, they had an improvement in this department of about 7 per cent. He believed Mr. Shoubridge would tell them that he was not at all satisfied with this, and would not be satisfied until he showed a still further improvement. [Mr. Shoubridge assented.] At any rate, the better working reflected great credit on their Engineer; and he (the Chairman) was glad of the opportunity of saying that the men had responded in a proper spirit, and were doing their work much more satisfactorily than previously. Now the Company he previously referred to had had no decrease in their carbonizing wages—in fact, last year the wages averaged 3s. 4-4d. per ton of coal, while this year they were 3s. 4-5d.; so they had gone up 0-1d.; as against their own decrease of nearly 2-4d. Then there was another satisfactory point; but perhaps the proprietors would not consider it so. He referred to the maintenance and repair of works and plant, which was £2200 more than in the first half of last year. This, in his opinion, was highly satisfactory. It showed they were putting the works into proper order, and were able to do it out of revenue. There were certain portions of the plant that had run down; and Mr. Shoubridge had been devoting his attention to restoring the works to a thoroughly perfect condition. This, as he had said, they had been doing out of revenue; so that the favourable results which the Directors were able to present to the proprietors that day could not be attributed to any undue charging to capital of amounts that perhaps ought not to go to capital. On the contrary, they had charged to revenue everything they could; and nothing had been placed to capital other than was necessary and proper. When the charge for maintenance and repairs was reduced to the "per ton of coal carbonized" basis, it would be seen that it had gone up from 2s. 3-85d. to 3s. 2-3d., or rather more than 10-4d. He was quite certain of one thing, that there was no money spent by a gas company that was more productive than money wisely laid out in putting the works in good order. The net result, as he had said, was that, whereas they were this time last year £3660 short of the amount required to pay the dividend, they were on this occasion only £438 short, which was equal to about 3d. per 1000 cubic feet of gas. They had done this, and yet maintained the low price of gas. They had not found it necessary to increase the price. It had remained at the low figure, for a suburban district, of 2s. 7d. per 1000 cubic feet; and the Directors saw their way clear to continue at this rate, and pay full dividends. They also hoped to accumulate a little surplus; and they believed that shortly (he could not say how soon, but they hoped it would not be long) they would be able to reduce the price to the figure at which it once stood—viz., 2s. 6d. per 1000 cubic feet. Altogether, he did not know that he had ever felt happier in standing before a meeting of shareholders when presenting a report than he did that day; for he certainly did not expect they would recover so rapidly. He expected, and so did his colleagues, that there would be a considerable deficiency in the past half year. The reserve fund still stood at an ample figure; and the Board were now looking forward to adding something to, instead of drawing from, the reserve fund. Therefore he was justified in the opinion that, far from a threatened increase in price, a reduction had come within measurable distance.

The DEPUTY-CHAIRMAN (Mr. Frederic Lane Linging) seconded.

The CHAIRMAN having replied to some remarks by a shareholder, who

contrasted the present position of the Company with what it was during the time of the late Engineer, the motion was put and unanimously carried.

On the proposition of the DEPUTY-CHAIRMAN, seconded by Mr. JAMES GLAISHER, dividends at the rate of 5 per cent. per annum on the preference stock and of 5½ per cent. on the ordinary stock, less income-tax, were declared.

Mr. H. D. ELLIS said it was usual at such meetings to pass a formal vote of thanks to the Board for their able management; but he did not think he would be rightly interpreting the wishes of the proprietors if he made it a mere matter of form on this occasion. A gas company might have a good district, good works, and a good Act of Parliament; but all three were not worth much without good management. In the Chairman, his colleagues, and the officials, they had excellent management; and he was sure the proprietors ought to express their gratitude to the Board for the way in which they had conducted the business during the past half year. There were one or two pleasing points in the accounts which he might be allowed to briefly refer to. Not the least was the fact that wear and tear was charged as high as carbonizing wages, which was a very unusual feature in gas companies' accounts. Nothing could be more sound than charging all they could to revenue, and so relieve the capital. When a company had a good year, it was wise policy to put the extra money earned into the works or into the reserve fund rather than into the pockets of the proprietors; it would do much more good. Another point which had struck him was that the amount of unaccounted-for gas was particularly satisfactory this half year; it seemed to him to be very low indeed. The Chairman had referred to the possibility of making a reduction in the price of gas; and he had also adverted in this connection to the possibility of increasing the reserve fund. He (Mr. Ellis) should be glad to see the reserve fund increased. It was at a good figure now; but it could be better. If a lower price meant an increase in the dividend, he should be very thankful to have it; but he would much rather that the extra dividend should be put into the reserve fund or the works. The proprietors were getting good dividends now; and they ought not to be greedy. The market value of stocks and shares did not depend so much on the dividend as on the stability of the concern, and the power to maintain the dividend; and a good reserve fund was a guarantee that it would be maintained.

Mr. T. GUYATT seconded the motion, which was carried *nem. con.*

The CHAIRMAN sincerely thanked the proprietors for the way in which the motion had been submitted and passed; remarking that the Board had experienced the kindness of the shareholders at times when they had not been able to come before them under such favourable circumstances as at present. They felt, especially on this occasion, that the vote was not meant to be an empty compliment; but a thorough expression of the good feeling of the proprietors towards them. Before concluding, he moved a hearty vote of thanks to Mr. Shoubridge and Mr. Ohren, and their respective staffs.

Mr. LINGING seconded the motion, which was agreed to.

Mr. SHOUBRIDGE, in responding, assured the proprietors that the improvement in the results of the half year had afforded the employees very great satisfaction, as it showed that the concern was rapidly ascending from the period of depression through which it had been passing, and that it would soon take its rightful place among the gas companies of the country. He ought perhaps to say, with regard to the large expenditure on repairs and maintenance, that, if the proprietors looked into the matter, they would find that the amounts spent under this head had been, for some years past, considerably less than in the case of the other Suburban Companies; and, of course, the works had suffered in consequence. They were now putting this right. A great deal had been accomplished in the past half year to remedy the deficiencies that existed; but still more remained to be done. No doubt in the current half year, the expenditure might possibly be diminished. But, as the Chairman had rightly said, it was remunerative expenditure; and it had helped them to bring about the improvement in the working results. He firmly believed that, in a very short time, they would, in addition to paying for all repairs out of revenue, be in a position to put a large sum to the reserve fund.

Mr. OHREN having briefly replied, the proceedings terminated.

## BROMLEY GAS CONSUMERS' COMPANY.

### Half-Yearly Report and Accounts.

In the report which the Directors of the above-named Company will present at the half-yearly general meeting next Thursday they state that the quantity of gas made in the six months ending June 30 shows an increase of 6 million cubic feet over that of the corresponding period of 1897. With the exception of tar, residuals have recently realized better prices. Coals, however, are dearer. The works and plant, under the supervision of Mr. W. Woodward, are in excellent condition. The accounts accompanying the report show that the sale of gas produced £16,302; the rental of meters, £479; and residuals, £4131—the total receipts being £21,226. The expenditure on the manufacture of gas came to £11,278 (coals costing £8441); on distribution, to £391; and on management, to £1501—the total expenditure being £14,239. The amount carried to the profit and loss account is £6987; and the balance on that account is £27673. The Directors recommend the declaration of dividends at the rate of 11½ per cent. per annum upon the ordinary 10 per cent. shares, and 8½ per cent. per annum upon the ordinary 7 per cent. shares. This will absorb £6062, and leave a balance of £1611 to be carried forward. The quantity of coal and cannel carbonized in the six months was 11,222 tons; the residual products being: Coke, 11,222 chaldrons; breeze, 2139 chaldrons; tar, 104,135 gallons; sulphate of ammonia, 78 tons 11 cwt. The make of gas was 112,991,000 cubic feet, of which 106,741,500 cubic feet were sold and 1,668,500 cubic feet were used on the works; leaving 4,581,000 cubic feet unaccounted for.

**Nelson Gas-Works Extensions.**—The Nelson Corporation on Wednesday adopted a proposal of the Gas Committee to apply to the Local Government Board for their sanction to the borrowing of £40,000 for gas-works extensions.







### THE WORKMAN-DIRECTOR SCHEME OF THE SOUTH METROPOLITAN GAS COMPANY.

It may be remembered that in the concluding paragraph of the half-yearly report of the Directors of the South Metropolitan Gas Company which appeared last week, reference was made to the draft of the proposed scheme for the election of Employee-Directors which is to be submitted to the shareholders for their approval to-morrow. The principal portions of the scheme are as follows:—

The preface, or preamble, sets forth that by Section 19 of the South Metropolitan Gas Act, 1896, provision was made for authorizing the Directors of the Company to prepare a scheme for the election of one or more Directors by the shareholding employees, when the investments of the latter should exceed the nominal amount of £40,000, and submit it to a special general meeting for adoption. In the event of its approval, it is to be laid before the Board of Trade, and, on being passed by the Board, is to be published in the "London Gazette," and remain in force for three years, or till the employees' investments fall below the nominal amount above named. The qualification of the employees' representative upon the Board was originally to be the holding of not less than £250 nominal value of the ordinary stock of the Company. Under the Act of last year, however, the money qualification was reduced to £100. As the total investments of the employees now exceed the nominal amount of £40,000, the Directors have prepared the following scheme.

1. *Interpretation.*—In this scheme, "the Company" means the South Metropolitan Gas Company; "employees" means persons in the employ of the Company, and holding stocks in the capital of the Company; "Employees' Director" means a Director elected by the employees.

2. *Commencement of Scheme.*—This scheme shall come into operation as soon as it has been adopted by the shareholders of the Company in manner provided by the South Metropolitan Gas Act, 1896, and approved by the Board of Trade, and shall continue in force for three years and no longer, subject to cesser if the amount of the investment of the employees in the stock of the Company shall fall below the nominal amount of £40,000.

3. *Number of Employees' Directors.*—Employees in receipt of weekly wages shall have the power to elect two Directors, herein referred to as "the two Directors," and employees on the staff receiving salaries payable monthly shall have the power to elect one Director, or three in all.

4. *Scale of Voting.*—Every employee shall have for this purpose one vote for every £10 of stock held in his own name, or jointly with that of his wife or child, up to £100 . . . . . 10 votes.  
One vote for every £25 above the first £100 up to £300 . . . . . 8 additional votes.  
One vote for every £50 above the first £300 up to £1000 . . . . . 14 " " "

Above £1000 no more votes; thus giving a maximum of 32 votes.

5. *Qualification of Employees' Director.*—The qualification of an employees' Director shall be the having been not less than seven years in the employ of the Company, and the having held for not less than twelve months prior to the date of election, and the continuing to hold, not less than £100 in the Stock of the Company.

6. *Nomination of Candidates.*—The Company shall, one calendar month at least prior to the date of election, make out an alphabetical list of all the employees possessing the necessary qualification to act as Directors, giving the name of the station at which each candidate is employed, his length of service, and his occupation. Such list shall be printed and posted up for seven days in conspicuous places at the various works or stations of the Company, and shall be supplied to any shareholding employee on application at the head office or the office of his station. Any qualified employee not wishing to be a candidate can have his name withdrawn by writing to the Secretary to that effect within eight days from the posting up of the list; and his name shall forthwith be struck out of the posted lists.

7. *Selection of One Candidate by each Station.*—For the first election (when the two Directors are to be elected), every voter at each station, and at subsequent elections when, in consequence of death or retirement, only one Director is to be elected, every voter at each station except the station at which the Director remaining upon the Board is employed, shall be supplied with a voting-paper in the form prescribed in the Schedule A attached hereto. Such voting-paper shall be addressed personally to each voter, and shall contain the names of all the workmen employed at the station who are qualified and willing to act as Directors. If he desires to record his vote, he shall place his full number of votes, as set out on the voting-paper, against the name of any one candidate whom he thinks best fitted to become a Director, sign the paper, and hand it to the persons—viz., one officer nominated by the Board, and the last elected workman member of the Profit-Sharing Committee—who shall be appointed to receive it. In the event of any candidate receiving a majority of the total number of votes polled at his station, he shall be the selected candidate for that station; but should this not be the case, new voting-papers shall be issued containing the names of the two candidates who received the highest numbers of votes. A second vote shall, in that event, be taken; and the candidate who receives the highest number of votes shall then be the selected candidate for that station.

8. *Final Voting for Two Workmen-Directors.*—When this selection has been made, another voting-paper (Schedule B), containing the names of the selected candidates of the several stations, shall, on the first occasion of electing two Workmen-Directors, be supplied to every voter at all the stations. Voters must put the full number of their votes against each of any two names, or their voting-papers will be spoiled and their votes lost. At subsequent elections, when only one Director is to be elected, the process as set out in this clause shall be repeated, with the single alteration that the full number of votes shall be placed against one name only.

9. *Representation of Various Stations.*—No station shall at any time have more than one Workman-Director on the Board.

10. *Retirement of Employee-Directors.*—One Director of the two Directors elected under this scheme shall retire after the first Board meeting in the month of November every year. If duly qualified, the retiring Director shall be eligible for re-election. The first retirement shall be settled by ballot, the following ones by rotation.

11. *Time of Election.*—The first and succeeding elections, except in the

case of unexpected vacancies, shall take place between the 1st of September and the 1st of November in each year, on a date to be fixed by the Board. Employee-Directors whose turn it is to retire shall continue to serve until their successors are appointed and take office. In the event of retirement at other than the usual time, or the death of an Employee-Director, a successor shall be elected within two months, at a date to be fixed by the Board, who shall take the place, and retire in the turn, of the late Director.

12. *Fees.*—The Employee-Directors shall have their ordinary duties and the pay attaching thereto suspended during the time that is found to be necessary for their duties as Directors. The fees shall "bear some proportion to the amount of their qualification," relatively to those of ordinary Directors, which are equal to one-fifth part of the nominal value of their qualification, and will accordingly be about £20 per annum. The fees for their service as Directors shall be the amount they would have earned if they had been at their ordinary employment, plus 10s. 6d. for each weekly attendance.

13. *Staff Representation.*—The above regulations shall, so far as is necessary and practicable, apply, *mutatis mutandis*, to the election of a Director by the salaried officers of the Company.

Passed by the Board, July 6, 1898.

[Schedule A is the form of voting-paper for the selection of the station candidate; and Schedule B, the form of final voting-paper.]

### THE PLYMOUTH CORPORATION AND THE GAS COMPANY.

#### The Opposition to the Company's Bill.

At the recent Annual Meeting of the Plymouth and Stonehouse Gas Company (see Vol. LXXI., p. 1582) the Chairman (Mr. G. Henderson) and the Deputy-Chairman (Mr. J. A. Bellamy) complained of the hostile attitude which the Corporation maintained towards the Company. The immediate cause of these remarks was the fact that the Corporation had lodged a petition against the Bill promoted by the Company this year. This petition was at the last moment withdrawn; but, as the Chairman explained, the Company had then been put to an expense of £1000 in preparing to meet it. The Parliamentary Committee of the Town Council have now drawn up a report upon their action, which seems to be intended as a reply to the Gas Company, and is altogether so interesting a document, and so instructive a revelation of the ways of municipal corporations, that no excuse is needed for reproducing it in the "JOURNAL."

#### The Plymouth and Stonehouse Gas Bill, 1898.

This Bill appeared to prejudicially affect the Corporation and also the inhabitants of that part of the borough in the immediate neighbourhood of the gas-works. The Corporation was affected: (1) By the provision in the Bill by which the Company sought the privilege of supply in those parts of the borough not already in the Company's limits of supply, and in which, but for the Bill, the Corporation would have a right of supply by the operation of the Public Health Act of 1875. (2) By the provision enabling the Company to manufacture and store gas on the lands proposed to be acquired from Mr. Ward. In this connection it should be mentioned that the promoters omitted to incorporate in the Bill the provisions of the statute law which would save the rights of the public to restrain the commission of nuisances. (3) By the provisions extending the limits of the Company's supply.

A petition was accordingly presented against the Bill by the Corporation, claiming protection with regard to these and subsidiary matters. It was further claimed in the petition that the illuminating power of the gas should be increased, and a central testing-place provided.

With regard to No. 1, the Corporation was advised that the special circumstances of the case were such that the Company would probably succeed in its attempt to deprive the Corporation of its right. The Corporation having declined to yield, the opposition to the Bill on this head was, in view of the advice above referred to, abandoned.

With regard to No. 2, an effort was made by friendly negotiation to incorporate in the Bill a provision enabling summary proceedings to be taken in respect of such nuisances as have from time to time arisen at the gas-works, but without result. A clause was ultimately agreed to, incorporating the provisions of the general law. This has been, at the instance of the Corporation, inserted in the Bill; thus saving the rights of the Corporation and the public in relation to any nuisance which may arise on the lands proposed to be used for the purposes of the Bill.

With regard to No. 3, the following clause was agreed, and has been inserted in the Bill: "Provided also that the Company shall not, by any exercise of their powers in regard to the expenditure of capital or otherwise within the area added to their limits of supply by this section, either increase the price charged for gas within the existing limits of the Company, or prevent or hinder the reduction of that price under the provisions of the Act of 1894." With regard to the illuminating power of the gas, this having been recently raised by Parliament at the instance of the Corporation from 14 to 15 candles, it was felt undesirable (although the illuminating power is not regarded as satisfactory) to incur expense in raising a controversy in Parliament on the subject.

The Committee are glad to be able to report that it was not found necessary to brief Counsel or to incur expense beyond the trifling cost attendant upon lodging the petition, and in settling the provisions necessary for the protection of the Corporation.

**Incandescent Gas-Lights at Marlborough Gate.**—An improvement has been effected in the lighting at Marlborough Gate (the gateway across the road leading into St. James's Park from Pall Mall) by the substitution of incandescent burners for the old flat-flame ones in the two centre lamps. Each lamp has two burners, and the combination gives the light of 400 candles with a total consumption of 16 cubic feet of gas per hour, as compared with 30 candles for a consumption of 12 feet under the old arrangement. The new burners have been placed by the Welsbach Incandescent Gas-Light Company, Limited.



## GLASGOW CORPORATION GAS AND ELECTRICITY SUPPLY.

## The Annual Reports.

As mentioned by our Scotch correspondent last week, the reports of the Committee of the Glasgow Corporation on Gas and Electricity for the year ending the 31st of May have been issued.

The Gas Committee report that the gross revenue amounted to £631,644, and the gross expenditure to £526,355, to which was added depreciation written off capital to the amount of £35,716—making the discharge £562,071, and leaving a balance of £69,573 to be carried to profit and loss account. The Committee had to meet the following requirements during the year: Annuities on stock, £33,603; interest on borrowed money and redeemed loans, £29,713; sinking fund, £5615—altogether, £68,931; leaving a surplus of £642. To this there is to be added the balance of £360 brought from last year; making a sum of £1002. Out of this the Committee had transferred to the contingent fund £500; leaving a balance of £502 to be carried forward. The Committee regret that the market for residuals has been unfavourable to the Corporation, with consequent reduction of income from this source; the average price received per ton of coal carbonized having been 2s. 0.22d., as compared with 2s. 1.72d. in the previous year. Coke realized £2200 more—the increase being due to the greater quantity sold. The average price received was 5s. 0.75d. per ton, compared with 5s. 2.12d. in the preceding year. The Committee, as usual, advertised for tenders for coal to be supplied during the coming year; and they have concluded contracts for a portion of the quantity required. Notwithstanding the decreased value of residuals and an increase in the price of coal, the Committee recommend that the price of gas be continued at 2s. 2d. per 1000 cubic feet. The quantity of gas sold or accounted for during the past year was 4,800,357,000 cubic feet; being an increase of 174,376,000 cubic feet, or 3.77 per cent. The sinking fund, with its accumulations, now stands at £348,531. The works and pipes have been maintained in an efficient condition. The construction of the new gasholder, referred to in the last report, is well advanced, though not to the extent anticipated by the Committee; and it is very doubtful if it will be of use during the coming winter. Additional retorts, condensers, scrubbers, and purifiers are in course of erection at the Dawsholm works, and will very shortly be completed. These extensions will exhaust the ground available for manufacturing purposes belonging to the Corporation Gas Department; and it will be necessary to obtain parliamentary powers next session for the purchase of additional ground for the erection of works to meet the continually increasing demand for gas. The use of oil gas for enriching purposes at the Temple Gas-Works, continues to give entire satisfaction; and a considerable extension of the oil-gas plant is in course of construction. About 22 miles of new mains were laid during the year, to supply the increasing demand in several districts. The greatest quantity of gas sent out in 24 hours was 31,354,000 cubic feet, and the maximum daily make was 27,446,000 cubic feet. The number of meters in use on May 31, 1898, was 186,327—an increase of 6963. During the year, 18,091 meters were repaired; 20,836 were examined while in use, of which 17,342 were found in a satisfactory condition and 3494 defective—the latter being removed. The number of gas-stoves let out on hire on May 31 was 13,551. The number of gas heating and cooking appliances sold during the year was 1532.

The Electricity Committee report that the gross revenue amounted to £36,360, and the gross (or working) expenditure to £18,890, to which is added depreciation written off capital to the amount of £8945—making a gross discharge of £27,525, and leaving a balance of £8525 to be carried to the profit and loss account. Out of this sum the Committee had to meet the following requirements: Interest on loans, £4814; and sinking fund, £1537—together, £6351; leaving a balance of £2174, which has been placed to the credit of the reserve fund account. In order to maintain the undertaking in its present favourable position, the Committee, taking advantage of the prosperous state of the finances, have transferred from revenue to capital, for depreciation on machinery and plant at John Street and Waterloo Street stations, and on accumulator battery stations and the Mitchell Library plant, in addition to the usual amounts, the sum of £3243, which is included in the above sum of £8945. The Committee propose several alterations upon the system of charging for energy. The quantity of electricity sold to private consumers during the year was 1,885,902 units; being an increase of 46.48 per cent. on the preceding year. The number of private consumers on May 31, 1898, was 1437; being an increase of 347. The quantity of electricity used for street lighting was very little higher than in the preceding year—viz., 228,134 units, as compared with 210,422 units—there having been only seven additional lamps erected; making a present total of 119. The number of 8-candle lamps applied for (or the equivalent in other devices) was 150,000; being an increase of 42.6 per cent. as compared with the year 1896-7. The number of units consumed per lamp fixed for private consumers was 15.47, as compared with 12.48. New mains and feeders were laid to the extent of about 13 miles, in order to meet the ever-increasing demand for electricity. The question of the extension of the supply has received full attention; and new works and plant are already in course of erection at Port Dundas. The Pollokshaws Road site is also being prepared as rapidly as possible for the new works and plant which will be erected there during this year. No further supply can possibly be given from Waterloo Street; but it is hoped that a considerable addition can be afforded from Port Dundas for the coming winter, and from the Pollokshaws Road station during next year. New mains are being laid in various parts of the city; and the street lighting of the electric tramway route is well advanced.

**Godalming Water Supply.**—The Godalming Town Council have resolved to purchase the Frith Hill, Godalming, and Farncombe Water Company's undertaking; and a Committee has been formed to arrange all formalities and, if necessary, to promote a Bill in Parliament for the acquisition of the undertaking. According to the terms agreed upon in the negotiations, the Corporation's liability in purchasing the concern will be £67,250, involving £2858 8s. 7½d. yearly. The annual repayment of existing loans is equivalent to a rate of 2s. 1½d. in the pound on the district rates.

## HEYWOOD CORPORATION GAS SUPPLY.

## Local Government Board Inquiry.

At Heywood, last Thursday, Colonel A. J. Hepper held an inquiry on behalf of the Local Government Board into an application of the Heywood Corporation for powers to borrow £10,000 for the purposes of the gas undertaking. The Town Clerk (Mr. J. H. Baldwick) stated that the application was made under a Provisional Order granted by the Board last year, by which previous Local Acts were amended so as to permit of the purchase and utilization of certain lands for gas purposes in lieu of other lands for which powers had been obtained, but which were now found unsuitable. The present gas-works occupied a site of 2½ acres only; and they would require to be extended at a future date. The lands mentioned in the schedule of the Order had now been purchased for £1347, which, with the addition of £153 for legal charges, fencing, &c., made a total of £1500, for which sanction for borrowing powers was required. A sum of £2000 was for new mains for the next four years, and a similar sum needed for penny-in-the-slot meters. The Corporation had made an experiment with these meters with very satisfactory results; and it was consequently proposed to spend £400 per annum for the next five years in providing them. A sum of £3000 was required for gas cooking-stoves. There was a large demand for these stoves; and there were already 2014 of them in use. An additional sum of £600 was necessary for a coke-breaker and plant, and £900 for a store-room, stables, &c. Mr. Baldwick explained that the total borrowing powers, including annuities for the gas undertaking amounted to £133,330; and there had already been overspent on capital account £1324. Evidence in support of the application was given by Mr. J. Diggle, Mr. Walter Whatmough (the Gas Engineer), and Mr. W. H. Booth (the Borough Accountant). On the Inspector asking if any person wished to make any remarks in reference to the application, Mr. E. Collier, without opposing the application, asked if the Town Council were taking any steps with regard to the electric light. He thought the expenditure of £10,000 would be unwise if the Corporation should decide to adopt the light. Mr. Maden, the Chairman of the Gas Committee, replied that the Town Council had not taken any action in regard to the matter; and he could not say what might be done. The Inspector remarked that if they adopted the electric light they would still require their gas-works. Mr. Maden admitted this. The inquiry then ended; and subsequently the Inspector visited the gas-works.

## PUBLIC LIGHTING IN AMERICAN CITIES.

The last report of Mr. Henry Hopkins, the Superintendent of Street Lighting for the City of New Haven (Conn.), a copy of which we have received from the author, contains abundant proof that his interest in the subject of public lighting is by no means confined to the city with which he is officially connected. This is strikingly shown by the fact that he has included in his report to the Common Council of the City some statistics relating to other towns which it may be useful for us to reproduce.

Dealing first with New Haven, the Committee on Lamps report that at the beginning of the financial year, there were in use 412 electric street lights; 4 arc lights in public buildings, 719 gas-lamps, and 504 naphtha lamps; making a total of 1639. During the year the Committee put up 30 electric lamps, 38 gas-lamps, and 17 naphtha lamps, and discontinued the use of 14 gas-lamps and 11 naphtha lamps. The total number in operation on Dec. 1, 1897, was therefore as follows: Electric street lights, 442; arc lights in public buildings, 4; gas-lamps, 743; naphtha lamps, 510—total, 1699. Excluding the arc lights, there were upon the streets 1695 lights—an increase of 56 in the year. Incandescent gas-lights to the number of 105 were in use; and upwards of 175 requests were received for improved Welsbachs—showing the satisfaction given by the incandescent gas system. The expenditure of the Lighting Department amounted to \$75,300, whereas the sum appropriated was \$78,348. The Department handed over \$2463 to the City Treasury (being the only one who could respond to the call of the Controller), and carried forward \$585. Referring to this fact in his report, Mr. Hopkins remarks that the aim of the Committee has been to conduct their business at as small an expense as is consistent with reliable and increasing service; and he points to the facts of a healthy increase in the number of public lights, a decrease of complaints, and an unexpended balance handed over to another department, as evidences of their success. With regard to the lighting at New Haven, he reports favourably upon both the gas and electric divisions. The lighting by naphtha is mostly resorted to in the outlying districts; and the lamps are not very favourably regarded by the public, as, being subject to severe tests from high winds and the destructive habits of mischievous boys, they do not burn very steadily. Moreover, the naphtha is apt to become gummy, and clog the burners with carbon. Mr. Hopkins, of course, favours a change to gas-lamps.

Coming to Mr. Hopkins's collected statistics, we find that it costs New Haven, on an average, \$478 per mile to light the streets. This works out to 64c. per head, as compared with 50c. in New York City, 64c. in Cleveland, 80c. in Baltimore, \$1.73 in Providence, \$1 in Cambridge, 88c. in Worcester, 57c. in Washington (D.C.), and \$1.01 in Detroit, where there is a municipal plant. Where coal is used, the average candle power furnished per hour by electric street lights in New England is 472 for 1c.; whereas New Haven gets 488-candle power per hour for this amount. Providence has 700 lamps of 18-candle power, costing \$30 per lamp per annum for 4000 hours' burning. The entire care of the lamps is undertaken by the contractors, who furnish the burners (5 feet) and the gas; the Municipality providing the posts and lanterns, and replacing all the broken glass. Cleveland has 5591 lamps of 18½-candle power, the cost of which is \$17.51 each per annum for 3760 hours' burning. A 4½-foot burner is used, which is provided by the Municipality, who furnish the posts and lanterns, and restore broken glass. The contractor supplies the gas only. Washington has 5701 gas-lamps of 25-candle power. The life of the contract is one year; and the price is \$20 per lamp. The lights burn



4000 hours—the contractor taking all care; and the burner used is a 5-foot one. The contractor furnishes the gas and the burners; and the authorities of the city provide the posts, lanterns, and replace broken glass. Baltimore has 5565 gas-lamps of 25-candle power. There is no contract. The City pays at the rate of \$1.25 per 1000 cubic feet of gas consumed. A 5-foot burner is used; the City taking all care of the lamps, and furnishing all the fixtures. Lowell has 850 gas-lamps without any contract. The City pays \$1 per 1000 cubic feet for the gas consumed. The hours are 1850 per year; the City taking all care of the lamps, and furnishing all the fixtures. Dayton has 1230 lamps of 16-candle power, and pays at the rate of \$19 per lamp per annum. A 4-foot burner is used; the burning-time being 3674 hours per year. The contractor takes all care of the lamps, furnishes the gas and burners, and repairs all broken glass; the City furnishing the posts and lanterns. Buffalo has 5800 lamps of 18-candle power on a five-year contract, for which they pay at the rate of \$14 67½ per lamp per year on a time-table of 3948½ hours. The entire care of all the lamps is taken by the contractors. The size of the burners is determined according to location, ranging from 4 feet to 6 feet. The contractors furnish the burners and gas, and repair broken glass. The City provides the posts and lanterns. Newton has 885 gas-lamps of 17-candle power on a three-year contract at \$16.50 per lamp, burning 2200 hours per lamp per annum. The contractors furnish gas and 4-foot burners, and reglaze; the City furnishing the posts and lanterns. The City of New York had 25,545 lamps before the city proper was merged in Greater New York; the lamps ranging in candle power from 20 to 81. The price paid there is from \$12 to \$23 per annum, owing to a number of Companies being in the field. The average price of all the Companies is \$20.79. The \$12 rate is fixed in the charter of the Company by the State Legislature. The number of burning hours is 4000—the contractors taking all care. A 3-foot burner is used. The contractors furnish the burners and gas, and repair all broken glass; they also paint the fixtures when so ordered. The City furnishes posts and lanterns. Boston has 7592 lamps, of 17 to 26 candle power; the price paid ranging from \$20.47 to \$32.58. The time-table is 3828 hours; the contractors furnishing nothing but gas. A 4-foot burner is used. The City provides all the fixtures, as well as the labour to clean, light, and extinguish. The City of New Haven, with 743 gas-lamps ranging from 18 to 23 candle power, on the new contract pays \$22.25; the burning hours being 4000 per annum. The contractors take care of the lamps. A 4-foot burner is used; the contractors furnishing the gas and burners, repairing all broken glass, and painting fixtures when so ordered, the City providing the posts and lanterns.

The following are some of the prices paid by adjoining cities for street lighting by naphtha: Elmira has 463 naphtha lamps of 18-candle power, on a three-year contract, at \$27.38 per lamp per year, the lamps only burning until 2 a.m. The contractors furnish oil and fixtures, and maintain the lamps, the City supplying nothing. Lowell has 550 20-candle lamps without any time contract, and pays \$25.55 per lamp per annum; burning 1850 hours. The contractor takes all care, furnishes the fixtures, and reglazes the lamps; the City providing only the posts. Washington has 1025 lamps of 18-candle power on a yearly contract, a \$20 price, and a 4000-hour schedule; the contractor taking all care, and furnishing all fixtures, except the posts, which are provided by the Municipality. Providence has 1400 lamps of 18-candle power on a three-year contract at \$22.50 per lamp. The time table is 4000 hours; the contractor taking all care, and furnishing all fixtures, except the posts, which are supplied by the City. Binghamton has 274 18-candle lamps on a three-year contract at \$23.75 per lamp. The number of burning hours is 4000. The contractor takes all responsibility, and furnishes the burners, oil, and oil-tanks; the posts and lanterns being put up by the town authorities. Newhaven has now 510 lamps of 20-candle power at \$19.97 per annum on a 4000-hour schedule. The contractor keeps the lamps in order, and furnishes oil, burners, lanterns, and tanks—the City providing the posts.

### ELECTRIC LIGHTING NOTES.

In consequence of the continued increase in the demand for the electric light at South Shields, the Electric Lighting Committee have secured the permission of the Town Council to make application to the Local Government Board for their sanction to the borrowing of £20,000 for the purpose of providing additional plant.

One of the amusing illustrations of the unreliability of the electric light with which readers of the "JOURNAL" are familiar occurred at the meeting of the Waterloo District Council last Wednesday. In the course of the proceedings, a letter was read from the Local Government Board intimating that an inquiry would be held into the application of the Council for the purposes of electric lighting. Subsequently, however, as though to demonstrate to the members that they were relying upon an unstable illuminant, the electric light suddenly went out, plunging the Council Chamber into darkness. Fortunately a number of candles were at hand; and these were utilized until the light came on again. This little incident caused considerable amusement among the councillors; one of them, at the close of the meeting, remarking in a humorous vein, that, in accordance with the spirit of the age, he wished to protest against ritualistic practices being introduced into the Council by using candles except for lighting purposes.

A Local Government Board inquiry was held at Yarmouth last Friday with reference to a further loan of £4800 for the extension of the Corporation electric light works. The Borough Surveyor stated that sanction had already been received for £35,200; so that the proposed loan would make £40,000. As to the progress of the works, they were opened in January, 1893, with 700 lamps installed; and there were now 12,500 lamps installed, with applications for 1000 more. The works had not yet earned sufficient to pay the whole of the interest and sinking fund. In the first year the deficit was £700; in the second year, £730; and last year, £411. This year he anticipated there would be no loss whatever. The deficit was paid out of the rates. He declined to call it loss, because he intended they were saving up for future generations. The Inspector (Mr. H. P. Boulnois) said he did not think it proper to burden electric light undertakings from the start with interest and sinking fund. There was no opposition to the application.

Exeter people continue to complain that the electric light in the streets of the city is not all that the fancy of the Corporation painted. It is accused of being erratic and frivolous, while the residents of Queen Street have the additional cause of complaint that it makes such dark patches that their doorways have become depositories of rubbish. Last Wednesday a memorial from those especially aggrieved was presented to the City Council, who passed it on to the Electric Light Committee. Mr. J. W. Williams took advantage of the opportunity to emphasize the complaint that nearly two-thirds of the principal thoroughfares had been in darkness owing to defects in the arc lamps. Alderman Domville, the Chairman of the Electric Lighting Committee, explained that the cause was the breaking of the Jandus globes in the interior of the lamps. These were removed, and replaced with others by the Council's Engineer. The contractors had been communicated with; and the question of how far they could be charged with the defects would be considered later.

At the meeting of the Leeds City Council last Wednesday, the Chairman of the Parliamentary Committee (Mr. Wilson) moved—"That the Corporation, in pursuance of section 59 of the Leeds Electric Supply Order, 1891, do give notice in writing to the Yorkshire House-to-House Electricity Company, Limited, being the undertakers for the purposes of the said Order, requiring them forthwith to sell to the Corporation their undertaking upon the terms contained in sub-section (1) of the said section 59." In doing so, he remarked that, by the Provisional Order they had lately obtained, the Corporation had acquired what had not recently been granted to any corporation—viz., the power to issue irredeemable stock bearing interest at 5 per cent. There might be two opinions as to whether it was advisable to issue such stock; but, in consequence of Lord Justice North's decision in regard to the Sheffield case, it was found to be absolutely necessary, if they were to deal with the Leeds House-to-House Electricity Company on the best terms, that they should at any rate have power to issue 5 per cent. irredeemable stock. The motion was carried.

Last Thursday, the Hampstead Vestry decided to take up a loan of £39,980 from the London County Council (part of £51,500 asked for) "in respect of expenses incurred in buildings, plant, &c., under the electric lighting undertaking;" this loan being repayable in 42 years by annual instalments at 3 per cent. interest, and all repairs and renewals during that term being met by a sinking fund provided for the purpose, or [sic] from maintenance account. In this connection, it is interesting to note that this Vestry's electric light capital account now shows a debit balance of £32,356. An interesting debate ensued about a letter from the Solicitors of Mr. Martin D. Rucker, the well-known financier, who alleged that the Vestry have been "infringing certain letters patent in respect of an invention for improvements in distributing electricity and apparatus therefor" of which he is the proprietor. As it appeared that similar claims have been made on many other electric lighting undertakings, and that legal proceedings have already been commenced against the London Electric Supply Corporation, Limited, the Vestry decided, as recommended by their Committee, to join with other corporations and companies in defending the action; and they empowered the Vestry Clerk to take all necessary steps in the matter.

A conference of Corporations and Vestries who are members of the Municipal Electrical Association was held last Friday afternoon at the Westminster Palace Hotel, under the presidency of Mr. A. H. Gibbings, of Bradford, to consider their course of procedure with reference to the action referred to in the preceding paragraph. Some fifty Corporations and other bodies throughout the country are concerned; and it is understood that, if the action is successful, proceedings will be taken against each of the other Local Authorities owning electric lighting undertakings. Representatives were present from Blackpool, Huddersfield, Bolton, Halifax, and South Shields. The proceedings were private; but reporters were officially informed that a resolution was passed agreeing to combine to assist the London Electric Supply Corporation in defending the action; and, if necessary, to carry the case to the House of Lords.

The prospective litigation already alluded to caused a depression in a large number of electric lighting shares early last week; and some exclusive information on the matter published by one of the London evening papers was confirmed the next day by the "Statist," which gave the following explanation: "We understand from an authoritative source that a serious litigation under the patent laws threatens a large number of electricity supply undertakings. In the year 1835, a patent was granted for this country to Messrs. Zipernowsky and Deri, of Buda Pesth, in respect of their method for the distribution of high-tension electrical energy by means of induction transforming devices, which reduce the current to a lower pressure suitable for use on consumers' premises. This patent, which, we understand, has been bought up by a Syndicate, has recently been amended—of course, making it more favourable to the patentees; and it is claimed that it controls the systems of distribution in use by all the electricity works in the country where the alternating-current system is in use, comprising more than half the works now in operation. At any rate, notices have been served on all these works, alleging an infringement of the patent, claiming damages for the unauthorized use of the invention, and demanding an undertaking to discontinue the use until a licence has been secured. The works using the low-tension system are not affected—such as, for instance, the Westminster, St. James's, Kensington, Charing Cross, and Notting Hill Companies. In the case of the London Electric Supply Corporation, Limited—one of the largest concerns in the kingdom—the matter has advanced to the writ stage; so that it is evident the owners of the patent intend to bring the matter to an issue. Should the result of the action sustain the claims of the patent, the works involved will have on hand a question of royalty of serious importance. In the cases of the large concerns, such as the London Electric, the Metropolitan Company, the City Company, the House-to-House Company, and the provincial companies at Leeds, Newcastle, and Sheffield, the royalties would, without a doubt, amount to a very considerable sum; and the Companies may be compelled to submit to whatever terms were dictated. In the majority of cases, the changing of the system is practically out of the question, on account of the large amount of capital expended on plant and transforming apparatus peculiar to the alternating system. It is estimated that up to the present about £8,000,000 sterling has been expended on works employing the high-tension alternating-current system, of which probably not less than £1,000,000 has been spent in transforming apparatus alone.



THE NEW WATER-WORKS FOR SHEFFIELD.

Progress of the Langsett Reservoir.

The members of the Water Committee of the Sheffield Corporation, accompanied by the Mayor (Mr. H. Sayer), the Chairman of the Committee (Alderman Gainsford), the General Manager of the water-works (Mr. W. Terrey), and the Resident Engineer (Mr. Watts), recently visited the new storage works which are being constructed in the Little Don Valley. The Langsett reservoir, it may be remembered, is being carried out jointly by the Corporations of Sheffield, Rotherham, and Doncaster; and 500 men are now engaged upon the work. Operations have been going on for seven or eight months. The discharge tunnel, which was begun in January, is one of the most interesting parts of the work. The whole length of 340 or 350 yards has been driven—5000 cubic yards of earth having been excavated; and about 180 yards of it is arched and bricked. In the remaining portion, the work has reached different stages. In some places all the excavation is finished, and only requires the attention of the bricklayers; in others, the boring is in an incomplete state. The excavation is principally through shale; no coal having been met with. The nearest seam runs out at Bridgeholme, a little distance away, and overlies the shale strata in which the central core of the embankment is being sunk. Through the tunnel, 9 feet high and 9 feet wide, the whole water of the reservoir, except the overflow, will pass. Entering partly by one mouth of the tunnel in the reservoir, and partly by means of valves at higher levels, the water will flow unchecked until it reaches the bottom of the valve-shaft, where the discharge will be regulated. The shaft is a pit some 65 feet deep, 14 feet square at the bottom, and 12 feet in diameter at the top, situated midway along the tunnel. At the bottom will be three valves, for dealing with the water which runs in from the lower depths of the reservoir; and at two points in the descent—one 26 feet and the other 33 feet from the surface—two other valves, for admitting the higher supply. The latter, of course, will be in most constant use. About 30 feet of the upper limits of the reservoir is really the working capacity. It will not be necessary to go below this (the reservoir has an average depth of about 90 feet) except in case of drought. Yet the lower valves should be kept in order; and they will be worked at least once a month. Mr. Watts is making provision, by the construction of a tank to hold 28,000 gallons, for exercising the valves by hydrostatic pressure, instead of by manual labour only. After passing through the valves, the water enters the pipes which convey it to the outlet of the tunnel, and to the mains.

The puddle trench, begun last November, is another part of the works with which good progress has been made. Its total length will be 600 yards; and 260 yards have now been opened out—about 16,000 cubic yards having been excavated. The embankment will contain 800,000 cubic yards; and 71,500 cubic yards of puddle are required. The depth of the trench, which will be filled up by a solid concrete wall, is about 80 feet; and in making it there is found abundant evidence that, though the Little Don runs down the valley in only a narrow stream, there is an

abundance of water in the neighbouring ground. The embankment will be 630 feet wide at the base; and the foot of it has now been put in, but not yet faced with stone.

A prominent object in the valley is a long temporary viaduct, which has been erected for the purpose of conveying the earth excavated from the trench. Three steam-cranes and three stone-breakers are at work, and there are three locomotives and five portable engines. Tramways have been laid down all over the works; there are 3½ miles of them. The accommodation railway, connecting the water-works with the Stocksbridge Railway three miles away, is approaching completion. The works, it is expected, will be completed about four years hence. Then the wooded slopes of the hills will be submerged; the huge embankment which is now marked out in profile will dam up the water; and a reservoir, 120 acres in extent, capable of holding 1400 million gallons of water drawn from a drainage area of 5203 acres, will have been added to the other storages of Sheffield. Great as the capacity of the reservoir will be, a rainfall of 12 inches on the gathering-ground will be sufficient to fill it.

Following the above visit, the Water Committee, with several other members of the Council, last Wednesday made a tour of inspection round the reservoirs, in the Loxley Valley. This watershed is the largest possessed by the Corporation, and contains four reservoirs—Damflask, Agden, Dale Dike, and Strines. None of them are as big as the huge dam now being made for the storage of the waters of the Little Don, though the Damflask reservoir approaches it in size, having a capacity of 1158 million gallons, as compared with the 1400 millions which Langsett will hold. But the size of the whole works is nearly twice as large as that of Langsett—the four reservoirs, when full, containing 2786 million gallons. Together, they form the low-level system of the Sheffield supply; the high-level system consisting of the reservoirs at Redmires and Rivelin, which drain from a much smaller watershed, and have an aggregate capacity of 901½ million gallons. The reservoirs were found by the visitors to be remarkably well filled for this time of the year.

LOCAL AUTHORITIES AND THE UPPER WATERS OF THE DERWENT.

The right of Leicester to the upper waters of the Derwent is not to go unchallenged, as other towns have designs on the same source for augmenting their water supplies. According to a report which was presented to the Derby Town Council last Wednesday, the Water Committee have come to the conclusion that the promotion of a Bill for obtaining a supply from the river named can no longer be deferred. In their judgment, too, any action in the same direction on the part of other local authorities should be strongly opposed, and their opinion is shared by the Derbyshire County Council. The Town Council agreed with the Committee, and empowered them to take the necessary steps to promote a Bill for obtaining an additional supply of water from the Derwent. Meantime, ratepayers

GAS AND WATER COMPANIES STOCK AND SHARE LIST.

Referred to on p. 299.

| Issue.         | Share | When Dividend. | Dividend or Bonus. | NAME.                       | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue.           | Share. | When ex-Dividend. | Dividend or Bonus. | NAME.                                | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|----------------|-------|----------------|--------------------|-----------------------------|-----------------|---------------------|------------------------|------------------|--------|-------------------|--------------------|--------------------------------------|-----------------|---------------------|------------------------|
| £              |       |                | p. c.              |                             |                 |                     | £ s. d.                | £                |        |                   | p. c.              |                                      |                 |                     | £ s. d.                |
| GAS COMPANIES. |       |                |                    |                             |                 |                     |                        |                  |        |                   |                    |                                      |                 |                     |                        |
| 590,000        | 10    | Apl. 15        | 10½                | Alliance & Dublin 10 p. c.  | 28½-24½         | ..                  | 4 5 9                  | 75,000           | 5      | June 29           | 6                  | Malta & Medn., Ltd.                  | 43-51           | ..                  | 5 14 3                 |
| 100,000        | 10    | "              | 7½                 | Do. 7 p. c.                 | 16-17           | ..                  | 4 8 3                  | 541,920          | 20     | June 10           | 5                  | Monte Video, Ltd.                    | 14-15           | ..                  | 6 13 4                 |
| 900,000        | 100   | July 1         | 5                  | Australian 5 p. c. Db.      | 105-107         | ..                  | 4 13 6                 | 617,946          | Stk.   | Feb. 24           | 93                 | Newcastle & Gateshead Con.           | 235-240         | ..                  | 4 1 3                  |
| 200,000        | 5     | May 26         | 6                  | Bombay, Ltd.                | 64-6½           | ..                  | 4 8 11                 | 252,355          | Stk.   | Jan. 3            | 3½                 | Do. 3½ p. c. Db. Stk.                | 113-117         | -2½                 | 2 19 10                |
| 40,000         | 5     | "              | 6                  | Do. New, £4 paid.           | 44-5            | ..                  | 4 16 0                 | 150,000          | 5      | May 26            | 8                  | Oriental, Ltd.                       | 72-73           | ..                  | 5 8 3                  |
| 380,000        | Stk.  | Feb. 24        | 12                 | Brentford Consolidated      | 280-285         | ..                  | 4 4 3                  | 135,000          | 5      | "                 | 8                  | Do. New, £4 10s. pd.                 | 6-6½            | ..                  | 5 10 9                 |
| 240,000        | "     | "              | 9                  | Do. New                     | 215-220         | ..                  | 4 1 10                 | 15,000           | 5      | "                 | 8                  | Do. do. 1879, £1 pd.                 | 12-13           | ..                  | 4 11 5                 |
| 50,000         | "     | "              | 5                  | Do. 5 p. c. Prf.            | 140-145         | ..                  | 3 9 0                  | 60,000           | 5      | Mar. 11           | 7                  | Ottoman, Ltd.                        | 6-6½            | ..                  | 6 6 2                  |
| 159,375        | "     | June 10        | 4                  | Do. 4 p. c. Db. Stk.        | 130-135         | ..                  | 2 19 3                 | 500,000          | 100    | June 1            | 6                  | People's Gas & 2nd M. of Chicago Bd. | 103-108         | ..                  | 5 11 1                 |
| 220,000        | Stk.  | Mar. 30        | 11½                | Brighton & Hove Orig.       | 268-273         | ..                  | 4 4 3                  | 848,070          | 10     | May 26            | 6                  | River Plate Ord.                     | 9-9½            | ..                  | 6 6 4                  |
| 218,820        | "     | "              | 8½                 | Do. A. Ord. Stk.            | 195-200         | ..                  | 4 5 0                  | 250,000          | Stk.   | June 29           | 4                  | Do. 4 p. c. Db. Stk.                 | 97-99           | ..                  | 4 0 10                 |
| 933,500        | Stk.  | Feb. 24        | 5                  | Bristol, 5 p. c. max.       | 127-132         | ..                  | 3 15 9                 | 250,000          | 10     | Apl. 29           | 10                 | San Paulo, Ltd.                      | 154-163         | ..                  | 6 1 3                  |
| 420,000        | 20    | Ma. 30         | 11½                | British                     | 53-55           | ..                  | 4 1 9                  | 135,000          | Stk.   | Mar. 30           | 10                 | Sheffield A.                         | 245-248         | ..                  | 4 0 8                  |
| 50,000         | 10    | Mar. 11        | 11½                | Bromley, Ord. 10 p. c.      | 25-27           | ..                  | 4 5 2                  | 209,053          | "      | "                 | 10                 | Do. B.                               | 245-248         | ..                  | 4 0 8                  |
| 75,000         | 10    | "              | 8½                 | Do. 7 p. c.                 | 20-22           | ..                  | 3 17 3                 | 447,427          | "      | "                 | 10                 | Do. C.                               | 245-248         | ..                  | 4 0 8                  |
| 500,000        | 10    | Apl. 29        | 6                  | Buenos Ayres (New) Ltd      | 9-9½            | ..                  | 6 6 4                  | 5,213,168        | Stk.   | Feb. 24           | 5½                 | South Metrop., 4 p. c. Ord.          | 143-146         | +1                  | 3 13 0                 |
| 98,122         | Stk.  | June 29        | 4                  | Do. 4 p. c. Db. Stk.        | 98-100          | ..                  | 4 0 0                  | 1,185,846        | "      | July 14           | 3                  | Do. 3 p. c. Db. Stk.                 | 100-103         | ..                  | 2 18 3                 |
| 150,000        | 20    | July 14        | 8½                 | Cagliari, Ltd.              | 30-31           | ..                  | 5 6 5                  | 60,000           | Stk.   | Mar. 11           | 12                 | Tottenham and A.                     | 285-295         | ..                  | 4 1 4                  |
| 100,000        | 10    | June 10        | 7                  | Cape Town & Dis., Ltd.      | 15-16           | ..                  | 4 7 6                  | 60,000           | "      | "                 | 9                  | Edmonton B.                          | 205-215         | ..                  | 4 3 9                  |
| 50,000         | 50    | May 3          | 6                  | Do. 6 p. c. 1st Mort.       | 58-60           | ..                  | 5 0 0                  | 182,360          | 10     | June 10           | 7                  | Tuscan, Ltd.                         | 123-133         | ..                  | 5 3 8                  |
| 550,000        | Stk.  | Apl. 15        | 13½                | Commercial Old Stock.       | 315-325         | ..                  | 4 3 1                  | 149,900          | 10     | July 1            | 5                  | Do. 5 p. c. Dbs. Red.                | 100-103         | ..                  | 4 17 1                 |
| 200,750        | "     | "              | 10½                | Do. New do.                 | 252-257         | ..                  | 4 1 8                  | WATER COMPANIES. |        |                   |                    |                                      |                 |                     |                        |
| 200,750        | "     | June 10        | 4½                 | Do. 4½ p. c. Db. dc.        | 148-153         | ..                  | 2 18 10                | 746,164          | Stk.   | June 29           | 10½                | Chelsea, Ord.                        | 313-318         | ..                  | 3 6 0                  |
| 800,000        | Stk.  | June 10        | 12                 | Continental Union, Ltd.     | 207-212         | ..                  | 5 13 2                 | 150,000          | "      | "                 | 5                  | Do. 5 p. c. Prf.                     | 170-175         | ..                  | 2 17 2                 |
| 200,000        | "     | "              | 9                  | Do. 7 p. c. Prf.            | 197-202         | +2                  | 4 9 1                  | 160,000          | "      | "                 | 4½                 | Do. 4½ p. c. Prf. Stk., 1875         | 148-152         | ..                  | 2 19 3                 |
| 51,600         | Stk.  | Feb. 24        | 14                 | Croydon A 10 p. c.          | 310-315         | ..                  | 4 8 11                 | 175,785          | "      | Mar. 30           | 4½                 | Do. 4½ p. c. Db. Stk.                | 157-162         | ..                  | 2 15 7                 |
| 168,400        | "     | "              | 11                 | Do. B 7 p. c.               | 255-265         | ..                  | 4 8 0                  | 1,720,560        | Stk.   | Apl. 15           | 8                  | East London, Ord.                    | 227-232         | ..                  | 3 9 0                  |
| 555,000        | Stk.  | Feb. 24        | 5½                 | Crystal Palace Ord. 5 p. c. | 127-132         | ..                  | 3 19 7                 | 654,740          | "      | June 29           | 4½                 | Do. 4½ p. c. Db. Stk.                | 157-160         | ..                  | 2 16 3                 |
| 60,000         | "     | "              | 5                  | Do. 5 p. c. Prf.            | 142-145         | ..                  | 3 9 0                  | 390,000          | "      | "                 | 3                  | Do. 3 p. c. Db. Stk.                 | 103-105         | ..                  | 2 17 2                 |
| 496,090        | 10    | July 28        | 11                 | European, Ltd.              | 28-24           | ..                  | 4 11 8                 | 700,000          | 50     | June 29           | 7½                 | G'd Junction, 10 p. c. max.          | 115-118         | ..                  | 3 3 7                  |
| 542,060        | 10    | "              | 11                 | Do. £7 10s. paid.           | 164-173         | ..                  | 4 14 4                 | 310,000          | Stk.   | Mar. 30           | 10                 | Do. 4 p. c. Db. Stk.                 | 142-147         | +2                  | 2 14 5                 |
| 5,922,230      | Stk.  | Feb. 10        | 12½                | Gaslight & Coke, A. Ord.    | 295-300         | -2                  | 4 1 7                  | 708,000          | Stk.   | Feb. 10           | 14½                | Kent                                 | 360-365         | ..                  | 3 16 9                 |
| 100,000        | "     | "              | 4                  | Do. B, 4 p. c. max.         | 120-125         | ..                  | 3 4 0                  | 160,000          | "      | "                 | 7                  | Do. New, 7 p. c. max.                | 213-218         | ..                  | 3 4 8                  |
| 665,000        | "     | "              | 10                 | Do. C, D, E, 10 p. c. Prf.  | 308-313         | ..                  | 3 3 11                 | 406,200          | 100    | "                 | 7½                 | Lambeth, 10 p. c. max.               | 298-303         | ..                  | 3 6 0                  |
| 30,000         | "     | "              | 5                  | Do. F, 5 p. c. Prf.         | 154-158         | ..                  | 3 3 3                  | 350,000          | Stk.   | Mar. 30           | 4                  | Do. 7½ p. c. max.                    | 227-232         | ..                  | 3 4 8                  |
| 60,000         | "     | "              | 7½                 | Do. G, 7½ p. c. do.         | 230-240         | ..                  | 3 2 6                  | 500,000          | 100    | Feb. 10           | 13                 | Do. 4 p. c. Db. Stk.                 | 140-145         | ..                  | 2 15 2                 |
| 1,300,000      | "     | "              | 7                  | Do. H, 7 p. c. max.         | 195-200         | ..                  | 3 10 0                 | 1,000,000        | Stk.   | Feb. 10           | 14                 | New River, New Shares                | 492-497         | ..                  | 2 19 6                 |
| 463,000        | "     | "              | 10                 | Do. J, 10 p. c. Prf.        | 308-313         | ..                  | 3 3 11                 | 1,000,000        | Stk.   | July 28           | 4                  | Do. 4 p. c. Db. Stk.                 | 140-145         | ..                  | 2 15 2                 |
| 476,000        | "     | "              | 6                  | Do. K, 6 p. c. Prf.         | 184-188         | ..                  | 3 3 10                 | 902,300          | Stk.   | June 29           | 6                  | Southw'k & V'xhall, Ord.             | 166-171         | +3                  | 3 10 2                 |
| 1,061,150      | "     | June 10        | 4                  | Do. 4 p. c. Db. Stk.        | 131-133         | ..                  | 3 0 2                  | 126,500          | 100    | "                 | 6                  | Do. do. 7½ p. c. max.                | 157-162         | +2                  | 3 14 1                 |
| 294,850        | "     | "              | 4½                 | Do. 4½ p. c. do.            | 148-153         | ..                  | 2 18 10                | 489,200          | Stk.   | "                 | 5                  | Do. do. 5 p. c. Prf.                 | 168-172         | ..                  | 2 18 2                 |
| 958,000        | "     | "              | 6                  | Do. 6 p. c. do.             | 198-203         | ..                  | 2 19 1                 | 1,019,585        | "      | Apl. 15           | 4                  | Do. 4 p. c. A Db. Stk.               | 141-144         | ..                  | 2 15 7                 |
| 70,000         | 10    | May 12         | 8                  | Hongkong & China, Ltd.      | 134-143         | ..                  | 5 10 4                 | 1,555,066        | Stk.   | June 10           | 10                 | West Middlesex                       | 297-302         | ..                  | 8 6 3                  |
| 8,800,000      | Stk.  | "              | 10                 | Imperial Continental        | 210-215         | ..                  | 4 13 0                 | 200,000          | "      | "                 | 4½                 | Do. 4½ p. c. Db. Stk.                | 162-165         | ..                  | 2 14 7                 |
| 376,400        | 100   | Aug. 2         | 4                  | Do. 4 p. c. Dbs. Red.       | 98-101          | +2                  | 3 19 3                 | 200,000          | "      | Mar. 11           | 3                  | Do. 8 p. c. Db. Stk.                 | 104-106         | ..                  | 2 16 7                 |
| 473,600        | Stk.  | Feb. 10        | 3½                 | Do. 3½ p. c. Db. Stk.       | 103-106         | ..                  | 3 6 0                  | * Ex div.        |        |                   |                    |                                      |                 |                     |                        |
| 560,000        | 100   | Apl. 1         | 5                  | Met. of Mel- 5 p. c. Db.    | 110-112         | ..                  | 4 9 3                  |                  |        |                   |                    |                                      |                 |                     |                        |
| 250,000        | 100   | "              | 4½                 | bourne 4½ p. c. Db.         | 107-109         | ..                  | 4 2 7                  |                  |        |                   |                    |                                      |                 |                     |                        |

† Next dividend will be at this rate.



of Leicester have had the present position and the prospects of the water supply of the town laid clearly before them, in a long letter to the press, by Mr. Edward Wood, the Chairman of the Water Committee. Alluding to the scheme for obtaining a supply from the Rivers Derwent and Ashop, he says: "Here we have extensive moors forming the south of Yorkshire and the north of Derbyshire, with admirable gathering-ground, with no cultivation and practically no population, and no mining; the rocks are sandstone, and the water of great purity and softness, as shown by analyses. . . . The gathering-ground of this watershed is about 31,000 acres in extent; and the rainfall during the past dry years has averaged over the whole district about 40 inches per year. This is compared with about 24 inches of rainfall in Leicestershire during the same period. The volume of water to be obtained from this district is so large that, after making ample calculation for the compensation water that would have to be sent down the river, it is estimated that if Leicester obtained one-third of this supply, we should have enough water to provide the growing population of the town, calculated on the basis I have referred to, up to the year 1950. As to the cost, it is impossible to estimate what that would be; it depends largely upon the number of partners we should have in the scheme, and also upon the extent of the share of water we obtain. I may here state that up to the present time the water undertaking of the town (since it became the property of the Corporation) has never been any burden to the ratepayers; but in addition to paying its own working expenses, interest on capital, provision for sinking fund to pay off capital debt, it has handed over the handsome sum of £96,996 in reduction of the rates of the borough. If we obtain from Parliament a share of this North Derbyshire water, we should commence to expend capital about the year 1905, and to such an extent as would give us an additional water supply of 4 million gallons per day (or nearly as much as our present consumption), and which would last without further expenditure to 1923. In 1923 we should have to commence to expend a further amount of capital to provide a still further 4 million gallons a day, to be ready for use after the year 1927; and the last capital expenditure would commence about 1937. So that if the town did not grow in population as has been estimated, further additional outlays beyond the first 4 million gallons could be abandoned or regulated according to the needs of the population. The growth of the profits of our Water Department have averaged in the past something like £2000 a year; and there is no reason why they should not continue to increase."

**American Water-Pipes for Hull.**—The Hull Corporation Water-Works Committee have accepted the tender of an American firm for cast-iron pipes, with faced flanges, at £5 2s. per ton, which is 1s. 3d. per ton cheaper than the next lowest tender, while the pipes are 3 feet longer.

**Heavy Waste of Water at Ormskirk.**—A special meeting of the Ormskirk District Council was held last Tuesday to consider a report by the Surveyor respecting the waste of water in the town. It was stated that the waste was above 40 per cent. of the total quantity pumped, but that this was less than it was five years ago. It was resolved that legal proceedings be taken where cases of wilful waste were detected.

## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I have received from Mr. James Fleming, the Treasurer to the Glasgow Corporation Gas and Electricity Departments, copies of the carefully prepared accounts of the undertakings for the year ending May this year. I have already given a sufficiently full account of them, and have nothing to add. With reference to the increased revenue from residuals, I find that the increased quantity of coal which was carbonized almost accounts for it; so that the circumstances are not peculiar to Glasgow. There is another point which it may be of interest to bring out. That is an expenditure of £537, stated as "miscellaneous charges and accidental damages." It is not possible, on account of the wages not being given separately in the distribution department, to say accurately what the total outlay in wages to workmen was; but in the manufacturing department they are stated to have amounted to £86,330. The whole £537 was not expended in respect of accidents. If we take £500 as the sum—which is probably too high—it is found that accidental damages cost the Corporation at the rate of about 12s. per cent. of the wages paid in the gas-making department. This, I know, is over the mark; it was most probably under 10s. per cent. Even though the Workmen's Compensation Act should double the amount payable by the Corporation for accidents, it would not amount to 20s. per cent. of the wages. This lets light in upon the claims of the Insurance Companies. They, I suppose, did not estimate for gas-works alone in their quotations, but put the whole liabilities under all occupations together, and then averaged them; thus making owners of gas-works, in which the accident roll is light, pay for claims in more dangerous occupations.

I can give more accurate figures from the Edinburgh and Leith Gas Commissioners' accounts. The wages paid there to men in the works and to workmen in the distribution departments amounted last year to £48,038; and the amount paid as damages for accidents was £170. This works out at 7s. per cent. of wages. It cannot be expected that the sum paid every year would be so low as £170; but the rate compares very favourably with the 25s. per cent. asked by the Insurance Companies.

The following is the report of Mr. W. Foulis, of Glasgow, to the Perth Gas Commissioners, upon their new works: "It would appear from the statements supplied to me that the total amount you are authorized to borrow for the construction of your new works is £52,500, of which sum there has already been spent £17,007 6s. 1d., and contracts have been entered into amounting to £13,879 19s. 3d.; so that there remains a sum of £21,612 14s. 8d. available for the completion of the works. It is to be regretted that complete plans of the works were not prepared before any contracts were entered into, as the cost of construction would thereby have been considerably reduced. Plans have now been prepared of the completed works. These have, of necessity, been designed to utilize the material already contracted for. The only alteration is in the contract for the retort-bench and mountings, &c.; the original contract being for a much more extensive plant than I consider is necessary. The works as designed are of the following capacity: The retort-house is of sufficient

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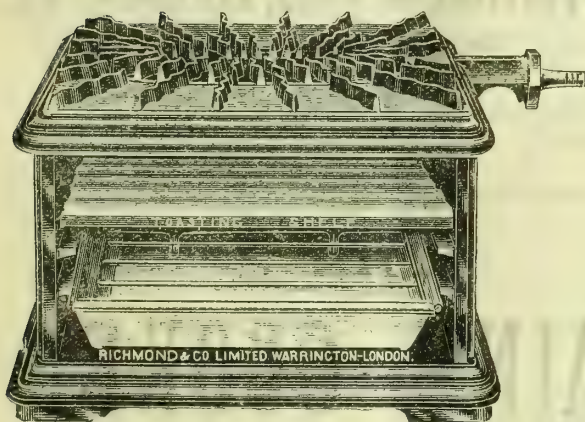
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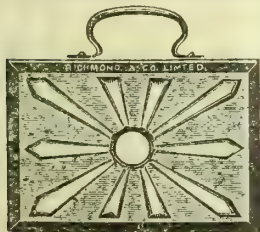
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dimensions to contain 240 retorts, each of which, if the settings are properly constructed, should be capable of producing 8500 cubic feet in 24 hours, giving a total manufacturing power of 2,000,000 cubic feet per day. It is proposed to erect only 128 retorts at present, which will be capable of making 1,100,000 cubic feet in 24 hours, or about 36 per cent. more than the greatest quantity made at the existing works last winter. The rest of the apparatus will be more than sufficient for dealing with this quantity of gas, and is so arranged that the different parts may be extended from time to time, as required, at a minimum cost. The railway sidings are arranged so that the coal will be delivered into the coal-stores at a height considerably above the floor level. This will facilitate storing, and will enable the coal to be filled into a hopper, from which it will fall by gravitation into the coal-breaker, so that only the coal which it is necessary to store will require handling a second time. These plans have been placed in the hands of a measurer, who has made an estimate of the probable cost of the buildings, &c.; and having carefully gone over the various items, I am fully convinced that the cost of completing the work would not exceed £21,000. Permit me to point out to you that this will exhaust your borrowing powers, and that further extensions will have to be provided for, either from any sum which may be obtained from the sale of the existing works or by obtaining additional borrowing powers. Seeing much of the plant to be erected at the new works is in reality in substitution for the plant at present in use at the existing works, but which will become practically valueless when the new works are completed, might I be allowed to suggest for your consideration whether it is advisable to charge the whole cost of the new plant to capital, or only a proportion of the cost, which would represent the additional capacity and efficiency of the new plant, based, of course, on the depreciated value of the old works. I enclose tracing showing ground plan of proposed works. Should this meet with your approval, specifications and schedules of quantities should at once be prepared, and estimates obtained for the execution of the works." The report was read to the Commissioners at a meeting on Thursday night; and consideration of it was held over. An account has been lodged by Mr. G. P. K. Young, architect, claiming payment for the preparation of plans for part of the new works. There seems to be some doubt as to who employed Mr. Young; and the Commissioners have appointed a Committee to consider the matter, and also the whole question of the employment of tradesmen at the gas-works.

The municipal barometer at Forfar has been at "stormy" all the week. The annual gas accounts have been a bone of contention for some time—indeed, for some years. This year the violence (in language, of course) has been more pronounced than ever. On Monday night, when the Gas Committee met to consider the accounts, Mr. Christie, who is the leader of the opposition, at once drew attention to an alleged discrepancy between the recently published statement of accounts and the copy which had been laid before them as audited and certified to be correct. Provost McDougall admitted that there was something wrong with the first copy. Bailie Patullo, the Convener of the Gas Committee, made a long explanation with reference to the accounts, which I cannot understand, but which seemed to point to the fact that the Commissioners have a contingent fund handy, out of which they

can, if they choose, defray any extra outlay which may occur. Thus, in the course of the past year, a sum of £300 was expended upon a new boiler and other plant; and this sum has been taken from the contingent fund. But the Committee's proposal was to charge it out of revenue; and in this way there was a deficit on the year's working. The deficit first brought out amounted to £200. When the Corporation met on Monday, however, it had been reduced to £130. Something had been omitted from the first balance-sheet, and was now inserted. According to the Convener, the accounts of the Corporation have not, at least for the past eight years, been prepared according to form; the full statutory contributions to the sinking and other funds not having been made. This has now been attended to, apparently, though it was not stated definitely. Arrears which have been accumulating for years have been wiped off, to the amount of £124. When all this has been done, there is a deficit; but the Convener argued that upon the year's working, had the accounts been stated in the old way, there would have been a surplus of £700. Defalcations are not alleged, and are not entertained; and it is a satisfaction to know that an effort is being made to place the gas finances of the town on a proper footing. Such things are easier attempted than effected. When once methods which are not strictly accurate creep in, it is difficult to eradicate them. Mr. Forbes Waddell, during the five years he has been Manager at Forfar, has been striving to consolidate the undertaking; and now he seems to be nearer the goal than ever. In Bailie Patullo he has got a new Convener, who is evidently of the same mind as himself. This being so, the natural expectation would have been that they would have received all the assistance possible from every member of the Corporation. But they do things differently in Forfar. There is Mr. Doig, who was Provost of the town for years, Mr. Christie, and Mr. Craik. It suited their book to take up the attitude that the accounts had been juggled; and they pressed for the calling in of an accountant to examine the books of the undertaking. Their motion to this effect was only supported by themselves; and the accounts were adopted. Two evenings, however, were spent over the process; and there was a good deal of heated discussion—such expressions being used as "deliberate untruths," "not true," and "hold your tongue, sir." Mr. Waddell has had much to endure since he went to Forfar; and I can well imagine that he must feel it to be the unkindest of all the treatment he has received, that when he and the Convener are endeavouring to make matters straight, they should be met with contumely and invective. The incident would appear to be not yet over, for Mr. Christie has given notice of motion to the effect that an accountant be appointed to examine the books. It is surely a melancholy exhibition of incapacity on the part of public men, that they cannot examine them for themselves.

Delusions die hard. What appears to be the expiration of one took place at Stirling this week. For some time, under the guidance of an ex-Provost of the burgh, a portion of the community have been deluded into the notion that they could light the town with electricity generated by the overflow water in the town reservoirs. A local civil engineer encouraged the idea; but when cold reasoning was turned upon it by Mr. James Wilson, Engineer to the Edinburgh and District Water Trust, the fancied merits of the scheme vanished. At a meeting of the Committee

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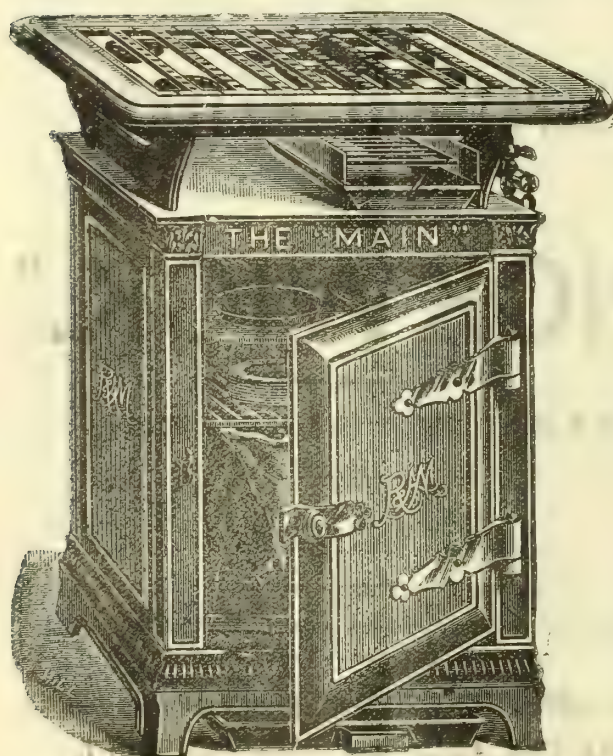
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in charge of the proposal, held on Tuesday, it was resolved to proceed no further with the matter. The ex-Provost was absent. Probably the suggestion was never intended to be proceeded with, but to be used as a depreciation of the gas industry in the town at the time when the Stirling Gas Company were in Parliament. Now that they have obtained their Act, the electricity proposal is dropped.

The Town Council of Aberdeen this week received a report by the Committee which opposed the Great North of Scotland Railway Bill in Parliament, giving a narration of their opposition, and of its results. Very significantly, the report was adopted without comment. The Corporation were not successful in their opposition.

I learn that the Greenock Corporation Gas Department have closed a year which has been more than usually successful. The Corporation act on the pernicious principle of plundering the gas profits for the benefit of the Municipality; and this year they have so abstracted £1000, to be applied to police purposes. In addition, it is reported, they have a surplus in the gas funds to the amount of several hundreds of pounds. Greenock has been badly hit in recent years by the depression in the sugar industry; consequently these figures are welcome, as they point to returning prosperity to the town.

The West Kilbride Gas Company have paid a dividend of 4 per cent., and reduced the price of gas by 5d. per 1000 cubic feet.

At the annual meeting of the Penicuik Gas Company, on Wednesday, the report of the Directors, which was adopted, stated that after provision for the usual 5 per cent. dividend to the preference shareholders, the surplus at the credit of profit and loss account amounted to £470. They recommended that the dividend for the year be one of 6 per cent.; leaving a balance of £110. In consequence of the large expenditure in 1896-97 for renewal of pipes, met out of revenue, the Directors had not considered it expedient on this occasion to increase the depreciation account. They hoped, however, at the end of the current year to resume the practice adopted in former years, of setting aside a proportion of such profits as might be earned as a depreciation fund.

The water supply provided by the Edinburgh and District Water Trust has been so seriously affected by the exceptionally dry weather which has prevailed, it may be said since last summer, that the Trust are advertising an urgent request to the community to be sparing in the use of water. They cannot, they say, maintain the present consumption. In connection with the subject of what they consider to be waste of water, the Trustees have discovered that the Burgh Engineer's Department, which has charge of the drainage of the City of Edinburgh, have been using a spray of water in manholes leading to the main sewers, for the purpose of preventing noxious gases from rising. From the terms of a report by their Superintendent, which the Trust had before them at a meeting last Thursday week, it would seem that in this matter the Sanitary Authorities rather took advantage of the Water Trust officials. The application, according to the Superintendent, was for three experimental stations to be tried; but it had been found that as many as 54 had been started, and that, instead of a small quantity of water being used, each of these deodorizers was consuming water at the rate of 470 gallons per hour, or about 610,000 gallons per day in all. The Trustees at once

ordered the practice to be stopped. The accounts for the year ending May 15 were before the Trustees. Ex-Provost Wood, Portobello, in moving their adoption, said that the estimated expenditure for the past year was £101,241, and the actual expenditure £104,300, being an excess of £3059. This was accounted for by outlays for alterations on pipes, occasioned by the tramway cabling operations, and had been in part repaid. The revenue from water-rates was estimated at £95,741, while the actual receipts amounted to £97,151—an excess of £1410—equal to 1·47 per cent. This percentage would have been very much increased could all the consumers by meter have had a full supply during some parts of the year. The revenue derived from alterations to piping due to the tramway cabling operations, from rents, pipe joinings, and miscellaneous receipts was £7002, which, added to the revenue from water-rates of £97,151, made the total receipts for the year £104,153. Comparing the receipts from water-rates for the year 1897-98 with those of the previous year, while the estimated increase was 1·11 per cent., the actual increase amounted to £2468, or 2·60 per cent., and this notwithstanding the occasional restricted supply through meters. Regarding the collection of water-rates for the year 1897-98, on the charge of £97,353 there was actually collected £96,982; the abatements and irrecoverables amounted to £263; and the arrears carried forward to this year's account, to £108. Deducting the abatements, amounting to £191, the percentage collected was 99·81. The irrecoverable water-rate for the year was £72. On the year's working, the estimated excess of expenditure over income was £2110, while the actual expenditure exceeded the revenue only by £147, notwithstanding there was extra expenditure under the heading of distribution pipe renewals. There had been a large expenditure during the year on account of new works, the total sum paid being £118,310, of which £99,369 was applicable to the Talla scheme. The total amount paid on account of the Talla works to Whitsunday last was £194,497. During the year loans on mortgage to the amount of £95,749 were renewed for periods of three, five, or seven years, at 2½ per cent.; and to meet loans on mortgages falling due and for additional borrowing, the sum of £167,928 was raised at 2½ and 2¾ per cent. for the three different periods. The sum required at Whitsunday was not raised in whole; but to meet payments due then £70,000 was borrowed from the bank on short loan. Notwithstanding the increased expenditure, the Treasurer did not anticipate any rise of the present domestic rate of 5d. per £1 in the immediate future, as the balance at the credit of the revenue account, which had accumulated from year to year, amounted to £27,020—affording a margin for any excess of expenditure over income for some time to come. The accounts were adopted.

**Pontypridd Water Company's Dividend.**—On the recommendation of the Directors, the shareholders of the Pontypridd Water Company have declared a dividend of 8 per cent. on the ordinary shares for the past half year, and 5½ per cent. on the new ordinary shares. This is a reduction on the previous half year of 1 per cent. on the ordinary and ½ per cent. on the new ordinary shares; the falling off being attributed to the protracted strike in the coal trade.

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## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Aug. 6.

**Sulphate of Ammonia.**—The week having been broken by holidays, the market has been quiet. But prices have been maintained; and the parcels offered have found a ready sale at full values. The position in general remains sound. A fair portion of the small August production being already sold, a restricted quantity only will be available to fill uncovered contracts, and to supply any fresh requirements. Already a rather better inquiry has sprung up during the last few days from consumers direct; and at the close there is more disposition generally to operate. Quotations are £9 10s. f.o.b. Leith, £9 7s. 6d. to £9 8s. 9d. f.o.b. Hull, and £9 11s. 3d. f.o.b. Liverpool. Business in forward delivery is not reported; and quotations are unchanged.

**Nitrate of Soda.**—Market firm, at 7s. 6d. to 7s. 9d. per cwt., according to quality.

LONDON, Aug. 6.

**Tar Products.**—The slump in benzols continues; and business is reported to have been done in both 90's and 50's at 9d. per gallon by urgent sellers. The large makers will not sell at this price; and it is not impossible that, in the case of the sale mentioned, the quality may have had something to do with the low price. Anthracene shares with benzol and some of the other products the extreme depression now prevailing. A good business is reported in pitch; and the quotation marked below has been realized for high qualities, while for poorer grades, and less convenient ports, lower figures have been taken. Creosote is not quite so firm; but makers' stocks were never lower than they are to-day. Carbolic acid is steady, with a fair business doing; while there is again more inquiry for naphthalene, which is somewhat scarcer.

The week's values may be taken as follows: Tar, 12s. to 15s. Pitch, east coast, 23s. 6d.; west coast, 19s. Benzols, 90's and 50's, 9½d. Toluol, 1s. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 1d. Crude, 30 per cent., naphtha, 1s. 2d. Creosote, 2½d. Heavy oils, 42s. 6d. Carbolic acid, 60's, 2s. Naphthalene, pressed, 55s.; salts, 30s. Anthracene, "A," 4½d.; "B," 3½d.

**Sulphate of Ammonia** has enjoyed a brisk market during the past week; and large sales have been effected at good prices. There is a distinct firmness both for prompt and futures. Stocks are low, and nitrate producers are firmer; and it may be that sulphate will yet see higher quotations. The business of the week may be marked at £9 8s. 9d. to £9 11s. 3d., less 3½ per cent., at all ports.

## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—Business moves on steadily in the coal trade of this district, without any really material change to notice as regards the position last reported. The better qualities of round coal suitable for house-fire purposes, though just now in exceedingly slow request, are maintaining their price, with a probability that when the demand for the

ensuing winter sets in there may be some upward move. All other classes of fuel are in brisk request for steam, forge, and general manufacturing purposes; and prices for these are very firm, with a hardening tendency, especially on contracts for forward delivery. At the pit mouth quoted prices average 10s. to 10s. 6d. per ton; Pemberton four-foot and seconds Arley, 8s. 6d. to 9s.; common house coal, 7s. 6d.; and steam and forge qualities, about 7s. Engine classes of fuel are moving away readily, with supplies about equal to requirements, although some collieries are rather short; and here and there advances of 8d. per ton are being got upon last month's prices. At the pit mouth common slack averages 3s. 6d. to 3s. 9d. per ton; medium, 4s. to 4s. 3d.; and best sorts, 4s. 6d. to 5s. For shipment, there is an active inquiry with slightly better prices being got. Good qualities of steam coal range from 8s. 9d. to 9s. 3d. at the pit mouth. It is only in special cases where under these figures is being taken.

**Northern Coal Trade.**—There is a very strong demand for steam coals, and a good inquiry for gas coals; while prices are irregularly advancing under the influence of the increased consumption and the rather reduced production. A series of local holidays have reduced the production of coal, and thus tended to produce a higher range of prices. Best Northumbrian steam coals have varied from 14s. to 16s. per ton f.o.b.; second class coal is about 12s. 6d.; and steam smalls are 7s. In the gas coal trade, the tendency is towards higher prices. For occasional cargoes 10s. per ton f.o.b. is quoted; while one or two contracts are believed to have been settled for next year at about 9s. Some of the large companies are now pressing for delivery of the quantities contracted for; so that they are apparently beginning to stock while the freight is moderate by sea. Other kinds of coals show no alteration. Gas coke is steady; prices being unaltered, and stocks low at works near navigable waters, as the exports are fairly large.

**Scotch Coal Trade.**—Trade conditions have returned to their normal, after the holiday season. The output has also gone up with a bound. With the present demand, there will be little likelihood of stocking at pitheads. The consequence is that, for the present, prices are tending to firmness; and the prospect is that rates will rather go up than down. The settlement of the Welsh dispute might, however, be followed by a decline in prices. The prices quoted are: Main, 9s. 6d. per ton f.o.b. Glasgow; ell, 10s. to 10s. 6d.; splint, 9s. 9d. The shipments for the week were very large; there being increases of nearly 20,000 tons in the Clyde district, and of 11,000 tons in the Forth district. In the Fife district, there was a decrease of 1500 tons. For the week, the total shipments were 190,228 tons—an increase of 30,144 tons upon the previous week, and of 7581 tons upon the corresponding week of last year. For the year to date, the shipments have been 5,362,164 tons—an increase upon the same period of last year of 950,775 tons.

**Manchester Corporation Water Supply.**—The abstracts of accounts of the City Treasurer of Manchester for the financial year ending March 31, 1898, show a profit of £6342, whereas for the preceding year there was a loss of £157; the difference in the two years being therefore £6499, the result of increased rentals, &c.

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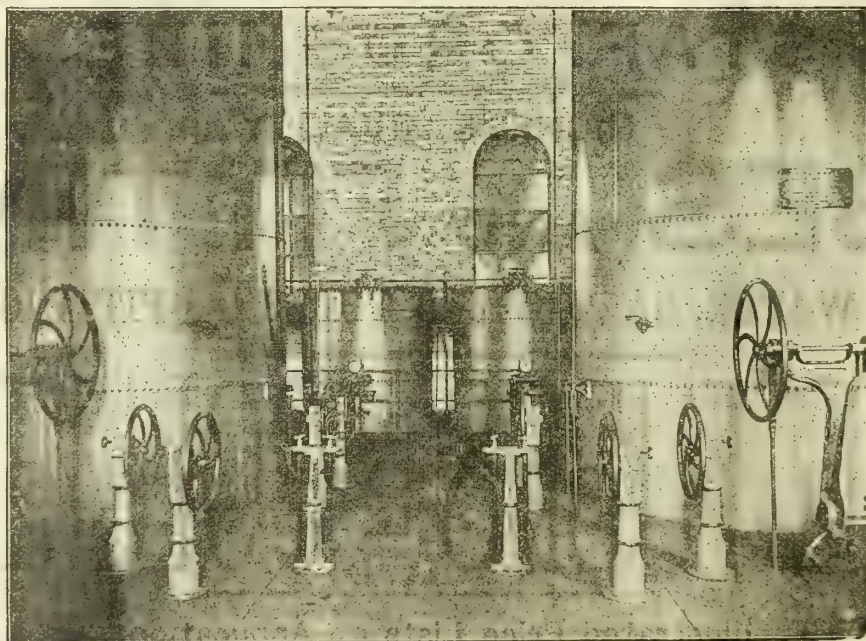
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## EFFICIENCY.

Working Floor of Generator House. One Quarter Section of Birmingham Plant, Windsor Street Station.  
The Maximum Daily Capacity of the Birmingham Corporation's Plant, which was erected by this Company, is 10 MILLION CUBIC FEET.



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## EDITORIAL NOTES.

## The South Metropolitan Meeting—Mr. George Livesey's Jubilee.

THE ordinary general meeting of the South Metropolitan Gas Company on Wednesday last was well attended. Mr. George Livesey, the Chairman of the Company, presided; and the proceedings, both at the ordinary meeting and at the special one which followed, were of the nature of a triumphal procession for himself and his policy. To dispose of the most exceptional part of the business first, it must be recorded that the proposed Workman-Director scheme was carried with two dissentients, after a single speech in opposition which did not advance any new objections to the now familiar idea. An interesting piece of personal confidence was imparted to the meeting by the Chairman at the close of the business. He told his audience that he had just completed his fifty years with the Company, and recognized the triumph of his new labour policy as the crown of this long service. Our readers as a whole will unite with us in tendering sincere congratulations to Mr. Livesey upon his Jubilee in the gas industry, and in the hope that he may yet be spared for many years to continue those services by which he has built up his great reputation.

With regard to the business before the ordinary meeting, the chief point of interest in the Chairman's speech was the skilfully marshalled argument in support of the proposition that a low price and conciliatory treatment of the consumers tells beneficially on the consumption of gas. This proof, of course, rested upon a comparison of the recent history of The Gaslight and Coke and South Metropolitan Companies' dealings with their respective consumers. It is impossible to get away from these comparisons. The Governor of The Gaslight and Coke Company makes them when it suits his purpose to do so; and Mr. Livesey is never slack in "carrying the war into the enemy's country." Whatever may be the nature and outcome of the individual differences between Colonel Makins and Mr. Livesey—and they are neither few nor obscure—the difference between the moral atmosphere (to use a questionable word for the want of a better) of a Chartered and a South Metropolitan general meeting is most noticeable to those who make a practice of attending both. It may be said that shareholders are pretty much alike everywhere in thinking chiefly of their dividends; but the South Metropolitan meetings give a disinterested observer the impression of being sympathetic to other considerations besides the dividend. It is a curious, and from our point of view a deplorable fact, that the possibility, or the actuality, of a rise in the price of gas is often, through force of circumstances, talked about by the Governor of The Gaslight and Coke Company; and the idea always evokes an expression of approval from somebody in the meeting. On the other side of the water, a similar suggestion would be treated as calamitous.

On the present occasion, Mr. Livesey had the upper hand of his brother Chairman in almost every comparative statement. He had a positively larger dividend to recommend. The increase was small, it is true; but it was nevertheless an increase. It was earned by the sale of gas at the lowest price in the history of the gas supply in London; and there was no fear that the dividend or the low selling price would suffer as the result of recent disturbances of the coal trade. There has been plenty of money to spare out of revenue for repairs and renewals; and the Company are able to provide for their extensions at a capital outlay of £255 per million cubic feet of gas sold. The Chartered do it at a cost of £1011 per million. It is, of course, very unkind for those in the gas industry to mention these things. It would be so much nicer for the people immediately concerned if everybody would only hold his tongue, and refrain from remarking unpleasant contrasts! But, unhappily, the day of the sayer of smooth things regardless of the cruel truth is short; and the end thereof is part of the discipline of the world.

We must not pass over Mr. Livesey's argument about the slowness of the increase of the gas consumption in the district of The Gaslight and Coke Company since 1889, without drawing attention to the circumstance, which may or may not be material, that he omitted all mention of the progress of electric lighting, which has been most conspicuous of late years in the best parts of the City and



West-end. We say that this omission may or may not be material, because Colonel Makins once devoted some pains to convincing his proprietary that the progress of electric lighting in "the Bond Street quadrilateral" had not injuriously affected the business of the Company. These observations were made at the Chartered meeting in February, 1892. Since then, it is true, the Governor has complained of the inroad of electric lighting in the central region of London. How does the matter stand now? What are the facts? If the Electric Lighting Companies can be shown to have cut into the Chartered preserves, Mr. Livesey would probably remark that it is largely the fault of the Gas Company. If the Company will not propitiate the large consumers by allowing them a cash discount, while the Electric Light Companies are only too anxious to oblige, may not this have something to do with the loss of trade? If the Administration of the Gas Company permit it to be publicly understood that the favour of the public is nothing to them—that if they cannot make both ends meet they will put up the price of gas without the slightest hesitation, is not this enough to drive the large consumers into the other's arms? Of course, as we have already admitted, these queries are most inconsiderate. The Chartered directorate, however, are not the only public characters who do not shrink from making themselves disagreeable (as the Governor proudly claimed for them at his last meeting), when the occasion appears to demand the sacrifice.

Concerning the extraordinary general meeting of the South Metropolitan Company there is not much to be said. The opposition to the Chairman's proposal, though he did not profess to speak for a united Board, was insignificant. The Workman-Director is now to be tried; and the world will see what comes of it. He can hardly be worse than the nice "clean, tame guinea-pig," of whom something has been heard of late in connection with Company scandals. We do not expect that the South Metropolitan Workmen-Directors will effect much in the way of improving the administration of the Company, or hastening the advent of the industrial millennium when the lion of Capital will quietly lie down with the Labour lamb. The wheels of the progress of humanity go slowly, and are not to be speeded up in this way. But it is possible to do much good without disturbing the stars in their courses. The very fact that a workman is willingly admitted to the Board of a great statutory and industrial undertaking will be acknowledged as a proof of good faith on the part of the magnates of capital who have hitherto monopolized these Olympian heights. No classical legends were more popular than those which described Jupiter, king of gods and men, as willing to admit to the occasional exercise of his power some mortal who fancied himself able to wield the thunderbolts to advantage. The Workman-Director will see how business is done, even when he may feel incapable of controlling it himself. He will be a living refutation of many scandalous myths concerning the ways of Capital that the socialistic prints put into circulation; and, above all, he will see for himself that it is not Labour that is the source of all the wealth of the universe. Certainly, an experiment fraught with such possibilities of interest is worth trying, especially as, under the conditions, it can do no harm.

#### The North of Ireland Association Meeting.

THAT the North of Ireland Association of Gas Managers has passed through the troubles and weaknesses incident to the earlier years of life, and is now entering upon what, it may be hoped, will be a period of vigorous manhood, is the feeling aroused by the highly successful meeting which was held under the presidency of Mr. J. Nisbet, of Portadown, in that town last Tuesday. The rise of the Association during the past few years has been very rapid. In spite of geographical and other difficulties, the membership has risen to about fifty; and while there are yet many managers in Ireland who, with profit to themselves, might join the ranks, the advance has been so well maintained that there is ground for the belief that, in a few years, all will have been brought in who it would be reasonable to expect should come. Of course, the widening of the sphere of influence has led to an improvement in the quality of the annual gatherings. This year's is acknowledged to have been the best meeting yet held under the auspices of the Association. The policy—a wise one, in the circumstances—is not to aim at high things. The mysteries and subtleties of chemical action, and numerous other subjects which

appeal to the engineer of a large works, where a trifling saving per ton amounts to a large sum at the end of the year, need not harass the manager of small works, where the putting in practice of many scientific processes of dealing with the materials handled, would result, not in gain, but in loss. The problems which present themselves in every-day working are more to the point. These are the subjects which create the best discussions in the Association; and they are also the subjects which are most popular with the writers of papers. The President's address, and the papers by Mr. Ross and Mr. Gibb, are examples of how much may be made of the common occurrences of a gas manager's every-day life, without attempting to grapple with heroic questions. It would be incorrect to say that the members of the Association are indifferent to the higher branches of their profession, or have not a thirst for knowledge for its own sake; for one of their customs is to provide a lecture upon a scientific subject, at their annual meetings. No part of the programme is more popular than this; and it was therefore a matter of great regret that this year Professor Iverson Macadam, of Edinburgh, their fastest friend, was unable to be present on account of official duties connected with the Volunteer force, in which he holds the office of Brigade Major. The success of the Association being now, so far as can be foreseen, quite secured, it was fitting that the members should turn their eyes backwards, and, seeing how much has been accomplished, should resolve to recognize the services of their Hon. Secretary, Mr. James Whimster, of Armagh, but for whose devotion to the Association, and energy in promoting its interests, it could not have been expected to stand in the favourable position it now occupies. The experience of the Association in the matter of giving awards for competition papers seems to emphasize the truth that genius cannot be bought or sold. A man who has a subject on his mind will usually bring it forward without the offer of a gold medal. Mr. P. Egan, of Tralee, worked for his medal, and deserves it; but, as the policy has not been a success—and, indeed, does not now seem to be required, there having been actually a plethora of papers at this year's meeting—it might be worth the while of the Association to consider whether they should not, as in some other Associations, present a medal to the President on his retiring from office. Such honours are highly prized in other bodies.

#### The Portsea Island Gas Company and its Management.

PERHAPS the strangest point in connection with the half-yearly meeting of the Portsea Island Gas Company last Saturday (a report of which appears in another column) was the absence of the least allusion to the strong competition that is now carried on by the Corporation with the electric light. The matter, in fact, was utterly ignored; the shareholders being apparently satisfied with the Company earning continuously sufficient money not only to pay the full statutory dividends, but to carry forward a good round sum. The chief expectation of a protest at the almost compulsory resignation of Mr. S. B. Darwin, after a service as Engineer extending over a long period, was doomed to collapse, after an explanation from the Chairman, who was clear in his statement as to the dissatisfaction of the Directors at the management of the works. Whether Mr. Darwin or the Directors were right in the matter, we do not pretend to determine; but though the Chairman sarcastically hinted at a possible "catastrophe" which had been escaped, it would be interesting to learn whether, by any parsimony, the hands of Mr. Darwin had been tied in any suggested introduction, either in the way of improvements or new machinery. The fact is patent that, after consultation with Mr. Alfred Colson and with Mr. Ashworth—the latter having now been installed as the Company's Engineer—the report bears witness that, in order to put the works into a thorough state of efficiency, some £2000 will have to be spent. Let the fault lie where it may, we feel the utmost sympathy with Mr. Darwin, who has spent the chief years of his life in a service which has at length turned upon him; and though, as the Chairman said, he might have been taking a liberal salary, we cannot help feeling that so wealthy a Company might have behaved generously in the way of granting a parting bonus or a continued pension.

#### An Important Definition of the Law of Main Laying.

An important appeal case dealing with a common question concerning gas and water mains was decided on Monday



of last week, as reported in our "Legal Intelligence." It was an action brought by the Southwark and Vauxhall Water Company against the Wandsworth District Board of Works, in the first instance in the form of a motion before Mr. Justice Kekewich for an interim injunction to restrain the defendants from so lowering their streets and footways as to leave the plaintiffs' mains without sufficient covering to protect them from injury, unless they (the defendants) first lowered such mains to the same depth as before at their own expense. His Lordship was of opinion that there was reason for the issue of an injunction to restrain the defendants from injuriously altering the position of the mains relatively to the road surface, rather than leave the plaintiffs to sue for damages in the event of any actual injury being sustained.

The case as presented to the Court turned upon the construction to be put upon section 98 of the Metropolis Local Management Act, 1855, which says that it shall be lawful for a Highway Authority to raise or lower the ground of any street, or to alter the position of any mains, subject to the approval of the Engineer of the Company to whom the mains belong. In this instance, the latter part of the clause does not apply, inasmuch as the Authorities did not disturb the plaintiffs' pipes. This circumstance is held by the Court of Appeal to distinguish the case from that of *The Gaslight and Coke Company v. Vestry of St. Mary Abbotts*—the leading steam-roller and gas-pipe case. The great case of *Geddis v. Proprietors of the Bann Reservoir* is also held not to apply. The Master of the Rolls pointed out in his judgment that the section of the Act already mentioned must be shown to put upon the defendants the duty of lowering the plaintiffs' pipes, though they did not want to do so for their own purposes. The assumption underlying the plaintiffs' action is that they are entitled to have a certain depth of soil covering them. For this assumption there is no legal warrant. It is admitted that the wording of the Metropolis Management Act is not clear; but the Master of the Rolls had no difficulty in reversing the judgment of the Court below upon the main issue. Lord Justice Chitty concurred; observing that the real question was who was to pay for altering the position of gas or water pipes when the level of any street is changed for public reasons. This is for the owners of the pipes, who are responsible for placing them at a proper depth. Lord Justice Collins took the same view. It is satisfactory to have the law of this important question defined so clearly and strongly. The decision leaves open the other question, which did not arise in this instance, of whether, supposing the Highway Authorities to have desired to alter the actual position of the pipes, they would have had to do it at their own expense as well as submit the new location to the Company's Engineer.

#### Tenders Wanted!

A CORRESPONDENT has drawn our attention to the terms of an advertisement published in a provincial newspaper, which runs as follows: "Wanted; Manager for — Gas-Light Company.—The Directors will at an early date consider Tenders for the position of Manager of Gas-Works. Salary not to exceed £50 per annum; free house, gas, and coal; lowest or any tender not necessarily accepted.—Tenders to be addressed, the Secretary." This is certainly the finest example of the kind of thing that has ever come under our notice. Many branches of trade go to the supplying of gas-works necessities; but who keeps "managers" in stock ready for placing out by "tender"? What a magnificent position is here offered for competitive applications! The idea of naming a maximum salary, with the suggestion that those who are willing to accept the post for less will have the better chance, although the "lowest or any tender" will "not necessarily be accepted," is distinctly new. There ought not to be any difficulty in procuring recruits for the noble army of gas managers in a land where the profession is so well paid. Manager! Who or what is the gentleman to manage for this splendid *solatium*? Does the works staff consist of a boy, with perhaps a yard dog? Many a man would hesitate to undertake to "manage" himself alone, to say nothing of his household, for this amount. Truly, it takes all sorts of people to make a world. What with Hooleyism in the high places of the industrial community, and gas managing at something less than £50 a year at the bottom, who shall contend any further that the present organization of the community upon an individualistic basis is in need of justification?

#### The Cost of the Engineering Strike.

IN the "Daily News" of last Friday there appeared a critical notice of the official report of the Executive of the Amalgamated Society of Engineers, and the balance-sheet of the great engineers' strike of last year. Of course, the statement is not complete. The expenses of the Society in connection with the strike are spread over two years, and the total cost of the dispute to other Trade Unions must be sought in their respective accounts. This particular balance-sheet embraces only the funds subscribed by the "public" to aid the strikers, the term meaning all sources outside the A.S.E. and allied trade organizations. The total amount was £181,000, of which £52,800 was raised by local Strike Committees, and the remainder was sent direct to headquarters. Considerably more than half of this, or £69,380, came from "Trade and Labour Councils and Trade Societies and Parliamentary Committee," and can hardly be styled a contribution from the "public." The same remark applies to £28,399 entered as "subscriptions from abroad"—mostly from foreigners profiting by the interruption of British trade. There is a great drop to the next entry—"Newspaper readers, £4795;" which may be taken as a true indication of the intensity with which the "great heart of the public" beat in sympathy with the strikers. "Shop and job collections" only turned in £1182—not a strong testimony to the popularity of the movement even among professed Trade Unionist workmen. It is remarked that this total sum of £115,872 "is a record in public contributions to a labour struggle." The claim is misleading. The public support of the strikers properly so-called did not translate itself into £10,000 of hard cash, all told; and there has never been a strike of colliers which did not attract more public money to the help of the men and their families. These figures really show that sympathy for the engineering strikers did not exist outside Trade Union circles, and was not of much value there.

Even with the additional figures, the "Daily News" confesses that "it is impossible to arrive at the precise cost of the dispute to the men engaged." Such inquiry as is possible, however, brings out at £4,680,000 the approximate financial cost of the struggle to the men. And what was it all about? It appears that the Secretary of the A.S.E., Mr. Barnes, finding himself quite as strong as ever in his official position, ventures to play the part of Old Kaspar in the ballad in discussing the "famous victory." He admits that the immediate cause of the outbreak of hostilities was the demand for an eight-hour day for the London trade; but this was only the precipitation of trouble that had long been in preparation. The Trade Unions had been growing in strength, and were conscious of it. To those well-meaning amateurs of Trade Unionism, in Parliament and elsewhere, who have accepted the now very familiar claim of professional labour leaders that strong Unions make for industrial peace, we commend Mr. Barnes's candid confessions in this regard. While naturally declining to agree that trade organization in itself constitutes a danger, or contributes to the rupture of peace, he declares that "there was unfortunately a desire on the part of many to use the weapons thus forged as means whereby complete mastery might be obtained." This gives away the whole case, as against the employers. But Mr. Barnes says even more. He, being very busy at headquarters, of course had nothing whatever to do with the sporadic shop disputes that troubled the engineering trade all over the kingdom. But he is willing to confess, now it is all over, that, "under cover of membership and even officership of the Unions, many frivolous claims had been made." It took months of trouble and the squandering of vast sums of money to teach the A.S.E. that they were on the wrong tack in allowing Trade Unionism to be identified with this irritating behaviour on the part of the Society men, and in accepting battle with the employers on a particular ground—the demand for eight hours—where other Trade Societies would not support them. Mr. Barnes is very outspoken also respecting the way in which this latter discovery was made. When the strength of the A.S.E. was found to be failing before the stubborn resistance of the employers, the London Trades Council convened a meeting, which took place in the Farringdon Street Memorial Hall, and was attended by the representatives of more than 112 Trade Unions and Councils. "The meeting was one of great enthusiasm; and much was expected from it. But the outcome was disappointing, as, instead of increased support, there was



"a decided falling off in voluntary subscription." Nothing could be more damnable of the egregious pretensions of the wirepullers of the London Trades Council than this simple story of an anti-climax. Mr. Barnes' statement confirms the prevailing impression that the great engineering strike was like a thunderstorm—clearing the air of the workaday world of much oppressive vapour and unendurable sultriness.

It may be worth mentioning that the questions of the expediency of the strike, and the justification for its support by other trade organizations, are to be mooted at the forthcoming Trade Union Congress, which is this year to be held at Bristol. It is impossible to say whether the discussion will really come to anything—probably not, as these congresses are mainly gatherings where people indulge in a great deal of purposeless talk. But if the raising of these questions at the Congress means that the rank and file of Trade Unionists are dissatisfied with the system of autocratic society management, under which the strike was ordered and subsidized by officials who could not suffer by it in any event, the sign may be a hopeful one.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 391.)

BUSINESS in the Stock Exchange was very quiet last week, as might be expected at this time of year, and in fine hot weather. The general course of movements was rather irregular; flatness and firmness alternating, and being pretty evenly matched in the tug of war over prices. Affairs in the Far East were, of course, depressing enough as they went from bad to worse; while the progress of Spanish peace negotiations exercised an opposite influence. The American market had the best of it; being very firm. The settlement went through without any disturbing element. The requirements had no effect on the enormous supplies in the Money Market; and discount rates have fallen easier during the week. Business in the Gas Market was at a very low ebb; and transactions were wholly devoid of interest. Quotations remained quite unaffected until the close of the account, when a large number were quoted *ex div.* Almost all these changes were more or less in the upward direction; evidencing a favourable tendency, if there were only sufficient business to bring it into action. Gaslight "A" was not a gainer in this respect, being lowered 7 points for an actual loss of 6½; but the excess is only fractional. Business done in it was very steady all the week. The secured issues profited considerably by the *ex div.* changes—especially "B" and "G." Very little business was done in them. South Metropolitan was fairly brisk considering; and the price was good, while the debenture advanced a point. Commercial were steady and unchanged. The Suburban and Provincial Companies were as quiet as they well could be; but several of them are better on *ex div.* changes. The Continental undertakings were extremely inactive, and made no sign of a move. Among the rest, San Paulo and Oriental receded; the latter owing to a larger number of shares having suddenly come on the market in the quiet season than could be readily absorbed. Dealings in Water were very limited. Kent had a big rise, in consequence of the higher dividend.

The daily operations were: The Gas Market opened very inanimate on Monday. The only change was a fall of ½ in San Paulo. Things were just as restricted on Tuesday, and nothing moved. Wednesday was a repetition of the preceding day. Thursday was a little improvement in point of activity. Oriental, £1 paid, fell ¼. Friday was a busier day; and a large number of quotations were marked *ex div.*, as detailed in our list. Oriental fully paid fell ¼. In Water, East London receded 2. Business was quite quiet on Saturday, and quotations closed unchanged.

### ELECTRIC LIGHTING MEMORANDA.

#### A Presumed Master-Patent for the Alternating System—The Prospect of Litigation—The Warning of Hastings.

MENTION was made in our "Electric Lighting Notes" last week of certain threatened litigation which was supposed to be seriously disturbing the owners of electricity works employing the system of alternating currents. The very mention of the term "master-patent" is enough to send cold shivers down the back of many a works manager; and the presumption that the whole business of alternating current electricity supply is controlled by such a patent, is one that must arrest attention outside electric lighting circles. This is the presumption raised by the reported action of Mr. Martin Rucker, in serving notices upon a number of municipal electric lighting authorities using the alternating system, to the effect that such user is an infringement of the Zipernowski-Deri patent owned by him, and claiming damages therefor. It may be considered a remarkable

thing that the existence of this pretended master-patent is only now being made known; but there is nothing in this to invalidate the patent, supposing it to be of any validity at all. The only consideration worth discussing in this connection is as to the character of the *prima facie* case set up by Mr. Rucker.

The Zipernowski-Deri patent in question is one which was granted in 1885 to a Patent Agent, Mr. W. P. Thompson, on a communication from the inventors, at Buda-Pesth, relating to "improvements in the method of distributing electricity." The names of the patentees are familiar in the electrical world; but nothing seems to have been done with this particular patent, until it came in November last into the possession of Mr. Rucker. Then steps were taken to amend the final specification; and, this being done, notices alleging infringement followed. Claims were made for past unauthorized usage of the invention, and it was also intimated that the user must be discontinued until a licence had been obtained. In one or two cases, it is reported, arrangements have been concluded for the unrestricted use of the patent—which is just what the holder wanted, to give his claims the appearance of actuality. It is also stated that an action has been commenced against the London Electric Supply Corporation—this being the test case. The recipients of Mr. Rucker's notices have, however, joined forces and appointed a Defence Committee, who will contest the claims to the last. It is not for us to say whether or not Mr. Rucker's proceedings are justified in law. It is obvious that if he only acquired last November property in a patent which expires next year—assuming that it has been kept alive—he could not possibly recover much, even in the event of the Courts deciding in his favour. Probably the whole affair was only meant to flutter the electric lighting share market.

The perfervid advocates of the municipalization of electricity supply for the sake of the "principle" have numerous very awkward examples to deal with before they can claim that what they assert to be the right way of supplying electricity is always expedient also. One could understand a "Progressive" local politician upholding the principle of municipalization without regard to the sordid consideration of profit and loss. That is one view of the subject; and it is a respectable opinion for which there is a good deal to be said. Unfortunately for themselves, however, those who maintain the principle invariably commit themselves to the further proposition that it is expedient for electricity supply to be municipalized in the ratepayers' interest; and this is where their case breaks down. There are not half-a-dozen municipal electric lighting undertakings in the country which truly benefit the ratepayers as such; but a highly instructive illustration of how the ratepayers of a town may suffer from their representatives' dabbling in electric lighting is supplied by the Hastings Corporation. The Hastings and St. Leonard's Electric Light Company have always enjoyed the favour of the Corporation; but they could never get their share capital subscribed. They built their works and carried on their business with borrowed money, like other concerns of the kind that could be named. Under this depressing condition, the Company did a certain amount of private lighting, and obtained a contract for lighting the sea-front of the two towns with arc lamps at £25 each per annum, by which they lost £800 a year. Then it occurred to someone that the Corporation ought to buy up the undertaking by agreement—a suggestion with which the Company cordially agreed. A bargain was made between the Town Council and the Company to purchase the property for £54,200; but an agitation arose in the town, and at the next municipal elections the party of purchase were defeated. Still, the new Council found themselves tied by the provisional arrangement made by their predecessors; and it was only possible to obtain a revision of the terms when the matter came before the Local Government Board. At the inquiry, a strong, and successful, effort was made to have an independent valuation by a really competent engineer; and Professor Henry Robinson was appointed to do the work for the Corporation, with the net result that he finds the property to be worth at most £40,000. His report is published in full in the "Hastings and St. Leonards Weekly Mail" for the 6th inst.

**A New Griffin Gas-Engine.**—The progress of the competition of gas-power isolated electric lighting with the central station supplies is illustrated by a contract recently fulfilled by the Griffin Engineering Company. As described in "Engineering," this warehouse plant consists of two pairs of gas-engines of entirely novel construction, driving dynamos connected interchangeably. The cost for gas and lubrication is stated to be less than 1½d. per unit; and the owners find that the arrangement is much more economical than taking their supply from the mains. The motors depart very far from the usual design of a gas-engine. The most striking peculiarity is that the motor is vertical; the cylinders being supported on four massive steel pillars. Small vertical gas-engines have been made before; but those under notice are claimed to be the largest yet constructed of this type—each engine giving 40 brake horse power. The cylinders are in pairs, with a single connecting-rod; and the engine works on the four-stroke cycle, there being an explosion for each stroke in one or other of the cylinders. The engines are constructed under the patents of Mr. S. Griffin. The gas consumption is stated to be 215 cubic feet per brake horse power per hour.



### "NEWBIGGING'S HANDBOOK." \*

THE publication of another edition of Newbigging's Handbook is an event for English-speaking gas engineers, works' managers, and students of the industry of gas manufacture. It would be difficult to overrate the service rendered to members of the gas engineering profession at large by Mr. Newbigging in providing what, without flattery, may be described as one of the very best technical handbooks that ever issued from the press. From the appearance of the first edition of this manual, it was recognized as being just the book needed by practical gas managers to help them to systematize their work according to sound rules vouched for by competent authority. Every succeeding edition has been a new book, prepared as a labour of love by the painstaking author, who has spared no effort to keep his work abreast of modern practice, and has always put into it the best that he had of technical knowledge and the fruits of long and deep experience. The relations that have existed for so long between Mr. Newbigging and the "JOURNAL," must not prevent us from treating the new edition of the famous "Handbook" precisely as we should treat a work of similar character and importance by a strange writer; and we accordingly propose to inform our readers of the nature of the contents of the book, although few followers of the industry will need our recommendation to procure a copy of this indispensable manual.

As the title-page informs us, the present is the "Centenary Edition" of the "Handbook." A good deal has been said within the last year or two of the Murdoch Centenary; and quite enough has been done by way of keeping green the memory of the originator of gas lighting. Mr. Newbigging has rounded off this celebration by giving a fine steel portrait of William Murdoch as a frontispiece to his new edition, and laying stress, in his "Introduction," upon the fact that the first actual gas lighting on record was effected by Murdoch in 1797-8. The "Introduction" itself is a succinct account of the development of what the author styles "the art of coal-gas manufacture" from its origin to the newest phases. Immediately after this essay occurs the first notable alteration in the scheme of the "Handbook." Most of the records of coal tests that filled several pages of former editions have been left out to make room for other and fresher matter. Enough, however, is left to satisfy ordinary requirements. The storing and testing of gas coals are fully discussed with reference to practical considerations. Under the heading, "Gas Production," the student is prepared to appreciate the importance of the work of the retort-house by the emphatic warning that "any want of economy here (and the word 'economy' implies efficient apparatus, proper conditions of working, and good management generally), cannot be compensated for in any of the subsequent processes or stages to which the gas has to be subjected, or through which it has to pass before it reaches the consumer."

In describing the design of the retort-house, the author states that "the ground-floor house is the most usual form." While this statement is strictly true, having regard to the total number of retort-houses, old and new, existing in the country, it is likely to mislead if read as meaning that "most usual" is tantamount in this connection to "most suitable for general use." Later on the author commends semi-stage, and stage retort-houses; but it might be objected that hardly enough stress is laid upon the tendency of contemporary practice in this regard. The expediency of reducing the amount of hand labour in carbonizing is, of course, the key to modern retort-house construction; but this is left to be inferred from the detailed descriptions of different types of retort-houses given, and is not laid down as a guiding principle. It is noteworthy that Mr. Newbigging commits himself to the observation that "the advantages of the inclined or sloping retorts are so manifest and great that their universal adoption is only a question of time." He is to be congratulated upon the candour of this judgment.

Curiously enough, the author, while describing retort-settings and giving valuable hints upon the subject, does not explain a setting of retorts with regard to the distribution of the heat from the furnace by means of flues, chambers, or radiation. This is a point of which old gas managers used to make a great deal; but it is now commonly left to the specialists in gaseous firing and regenerative retort-setting construction. It is difficult for the writer of a technical manual to handle a branch of his subject which has been so highly specialized as this, without appearing to slight somebody or to lend undue advertisement to somebody else. Mr. Newbigging has elected to run the former risk; and he is not to be blamed for this exercise of caution, though he would have been thanked by some inquirers if he had told where more particular information respecting the most popular systems of retort-settings might be sought for.

Mr. Newbigging writes in favour of "through" horizontal retorts, as compared with either single retorts or long retorts with a central partition. If his prophecy respecting the eventual triumph of inclined retorts is justified, this point will become of merely historical interest. For the time being, however, it possesses considerable practical importance in the estimation of numbers of gas managers. Whatever may be the advantages of the through retort with open ends—and these

can be reduced to facility of scurving and perhaps of drawing—they certainly have the drawbacks that it is not easy to ensure the deposit of a proper depth of charge in the middle, where the scoops meet, nor that the two ascension-pipes shall function equally. Mr. Newbigging goes into an interesting discussion of the latter question, in connection with the determination of the temperature of the gas as it leaves the coal. We may be sure that he would be the last man in the profession to pose as capable of saying the final word upon any moot question of gas-works practice; and some of his statements respecting this and other debatable topics are obviously meant to be suggestive, and stimulating of further research, rather than dogmatic.

The condensing of gas is described; and this leads up to the study of the exhauster and its motive power. It is the author's plan to go through the works stage by stage, dealing with all the plant and accessories as he finds them by the way. Thus, in connection with condensation, we learn about the conversion of the degrees of one thermometric scale into another. Similarly, under the heading of "The Exhauster," we find data concerning the power and performance of steam-engines and boilers. The capacity of water for absorbing gases occurs in the chapter on washing and scrubbing. By the way, has anybody ever distinguished authoritatively between what is meant by "scrubbing" and "washing" gas? It is hardly necessary to remark that "Purification" is seriously treated.

Gasholders and their tanks have always received particular attention from Mr. Newbigging; and they occupy many pages of the present edition of the "Handbook." It is difficult to conceive that any engineer contemplating the design of a works of this kind should wish for any fuller information respecting executed examples than is to be found here. The same remark applies to the author's treatment of gas-distributing appliances. Mr. Newbigging has a liking for turned and bored cast-iron gas-mains, with a recess in front for filling with lead or cement; this form of joint being in his opinion the most perfect possible. Very pertinently, he objects to coating gas-mains internally with any material soluble in a fluid hydrocarbon. It may, however, be doubted whether it is altogether wise to lay uncoated gas-pipes in any soil, as the sourness and dirt that mark the ancient gas-pipe give rise to serious nuisance when the main is uncovered for any purpose. The author's treatment of the subject of service-pipes and meters is as thorough as anything in the book. To show how completely the new edition has been brought up to date, it may be mentioned that Mr. A. Vernon Harcourt's new 10-candle standard pentane lamp is described and illustrated.

The part of the book in which the master-hand of the Consulting Engineer is most conspicuously shown is that in which the gas industry is discussed with reference to the elements of undertakings. Anybody can put together a "text-book" by the simple, if laborious, method of copying data and tables from various sources of information previously open to the curious inquirer. This is also the way in which many of the so-called "technical journals" are got up by painstaking newspaper men who know no more about technical matters than the man in the moon, but are dab-hands at scribbling small personalities, and using scissors and paste. Mr. Newbigging, however, does know all that is worth setting down in regard to the elements of the business of gas supply. He knows it all at first hand; and he tells what he knows without reserve—pouring out with the utmost candour the resources of a well-stored mind and the gains of a great experience. One would look in vain elsewhere for such information as he is able to give here concerning coefficients of cost, capacity, and so forth, of gas-works plant.

It would be easier, however, to say what is not in this new edition of the "Handbook" than to state what is to be found in it—with reference, that is, to the requirements of the gas engineer and the works' manager. There is, at any rate, no "padding" in it, from cover to cover. The book is provided with an excellent index; and it can be easily believed that nothing at the author's command has been spared to make it as complete and trustworthy as possible in every particular. We could, of course, pick out of it some expressions of opinion on points of practice in regard to which half-a-dozen gas managers might betray as many different minds; but this only goes to prove that the eminent author has not been afraid to stamp his individuality upon his book. On the other hand, he has deliberately refrained from expressing his own predilections where a little criticism might have been instructive, but might also have been open to misconstruction. He is no "quack," with a cut-and-dried remedy for all the troubles of the gas manager at home or abroad. The "Handbook" is not meant for a "crib" to help students to cram for the examination in "Gas Manufacture" of the City and Guilds of London Institute; nor will it be found of much comfort to the interloper who takes on the management of a small gas-works to the exclusion of the properly trained professional. But to the busy engineer or manager, or the honest student, it will prove a friend to remind him of facts and figures which are apt to escape the memory when they are most wanted.

Mr. GEORGE SMITH, the Chairman of the Kent Water Company, died very suddenly from heart failure on the 9th inst., as he was preparing for the half-yearly meeting of the Company. He had been a Director for more than fifty years.

\* "Handbook for Gas Engineers and Managers." By Thomas Newbigging. Sixth (and Centenary) Edition, Illustrated. London: Walter King; 1898.



## THE ACETYLENE EXHIBITS AT THE IMPERIAL INSTITUTE.

(Concluded from p. 301.)

THE Abingdon Acetylene Illuminating Company, Limited, make acetylene generators according to the scheme devised by Mr. R. J. Moss, and protected under letters patent No. 1254 of 1897. The abstract of this patent specification, given with an illustration in our "Register of Patents," Vol. LXX., p. 1346, provides a good description of the "Abingdon" generator. The vendors point out that the apparatus—which is of the dip type—is free from bent tubes, manholes, and screw-down valves. The gas is well cooled before it passes out of the burners; and if the after-make is sufficiently under control—a troublesome matter with generators of the dip type—the apparatus seems to be well adapted to fulfil its purpose properly.

The Acetylite Syndicate make an apparatus of the automatic class, in which granulated carbide drops from a reservoir placed in the crown of the bell of a gasholder into the water in the tank of the holder. The rate of feed of the carbide is controlled by a conical distributing valve at the narrowed base of the reservoir. When the bell descends, the valve is lifted by means of a weighted vertical rod which strikes a plate placed in the tank. The apparatus is almost the only representative at the exhibition of a class of which much was expected at one time, but which has signally failed to come to the front. Theoretical considerations lead to the conclusion that it is preferable to add carbide to water than water to carbide; but great difficulties supervene when it is attempted to make the addition of carbide to water an automatic process controlled by the rate of consumption of the gas. The carbide must be powdered or granulated, in order that it may pass through a comparatively small orifice without risk of jamming therein. If the carbide is not thus prepared, very complicated feeding-devices are required, and considerable gas-storage space is necessary. The complications alone, or the jamming of the carbide in a valve, sooner or later almost invariably are the undoing of well-conceived generators of this class. We understand that the Acetylite Syndicate have found it convenient to adopt several modifications of their original apparatus; but they have adhered to the principle of adding the carbide to the water. We wish them every success in their laudable attempts to perfect a generator working automatically on these lines, especially as many inventors who at one time made similar efforts have desisted in despair. The generators of the pattern exhibited by the Syndicate have been freely adopted in France; and therefore there have been many opportunities for ascertaining from actual experience the most necessary improvements.

Other exhibits of much interest are those of Pintsch's Patent Lighting Company and of Messrs. Ehrich and Graetz. Messrs. Pintsch have a generator of very different appearance outwardly from the Pictet generator already described (*ante*, p. 251), but in principle resembling it. The acetylene made by this firm is employed in a number of railway carriage lamps of the customary pattern for the consumption of oil gas. At the time of our last visit to this exhibit, the burners were suffering badly from the deposited carbon; and we are convinced that no traveller would prefer acetylene consumed under such conditions to the usually well-behaved oil gas, for the illumination of the carriage in which he journeyed. Improved burners of small size must be forthcoming before undiluted acetylene can compete successfully with oil gas for the lighting of railway trains. Messrs. Ehrich and Graetz have a generator from which they serve two cluster lamps enclosed by globes of the arc-light pattern. These lamps are in a draughty position, but seem little affected by the air-currents. They have a pleasing effect.

We have now reviewed the more important features of characteristic exhibits. It has been our unpleasant duty in many cases to find fault with the generators on which some inventors have pinned their faith; and our criticisms of their schemes may occasionally have appeared to be unnecessarily severe. But throughout we have kept in view the advantage of the industry at large. The acetylene industry bids fair to become of considerable importance; and nothing is so likely to nip its growth in the bud as the sale of defective generators and the dissemination of erroneous ideas concerning acetylene. We have it on very good authority that the manufacturers who are exhibiting at the Imperial Institute have now at their command, ready to be devoted to the production of acetylene generators, between three and four millions sterling. This sum is exclusive of the capital invested in the carbide industry. Its amount indicates that many capitalists are sanguine that acetylene has considerable scope as an illuminant. We have held this view since the period when the production of acetylene on a large scale became a possibility; and we have from time to time repeated it when indicating the most hopeful outlets for the new gas. It may not be inopportune, however, to point out now the spheres in which acetylene is most likely to find application; and the effect which its adoption will probably have on the use of other illuminants.

The largest field of employment for acetylene gas would undoubtedly have been as an agent for the enrichment of coal gas and water gas; and it was only after Professor Vivian B. Lewes and Dr. Love had published the results of their careful experi-

ments on the enriching value of acetylene,\* that manufacturers of calcium carbide and of acetylene generators gave up hopes of supplying gas undertakings with their goods, and began to concentrate their attention on other applications of acetylene. An enrichment of about 1 candle for every 1 per cent. of acetylene added to coal gas was too poor a return to induce gas engineers to employ it as an enriching agent, when at the lowest estimate it would cost 25s. per 1000 cubic feet merely for the carbide required. Though there is no immediate prospect of carbide being obtainable at much lower prices than hitherto, it is rumoured that quite recently some researches have been undertaken at a large gas-works, with a view to ascertaining if the earlier results of enrichment with acetylene are confirmed when the trials are made on a larger scale. There seems little doubt, however, that there will be no extensive employment of acetylene for enriching ordinary gas supplies.

A more promising opening for acetylene lies in its utilization for increasing the illuminating value of oil gas or even of coal gas for the lighting of railway carriages. The richer the gas to which the acetylene is added, the greater—broadly speaking—will be its enriching value, and therefore the more economical will its employment prove. Moreover, acetylene does not, like oil gas, deteriorate on compression; and so that portion of the illuminating value of a mixture of oil gas and acetylene which is due to the acetylene, is absolutely unaffected when the gas is subjected to compression for storage on railway trains. It has been shown by the exhaustive experiments carried out at Messrs. Pintsch's works at Berlin, by Herr Gerdes and others † that mixtures of oil gas or coal gas and acetylene of which the acetylene does not form more than 30 per cent. of the total volume, may be safely compressed and employed for railway carriage lighting. We understand that extensive developments in the utilization of such mixtures for this purpose are even now in progress.

The use of acetylene which the majority of the makers of generators now regard as the mainstay of their trade, is the lighting of isolated buildings and villages. In very few cases would an installation for lighting by acetylene be required for country mansions not already lighted by electricity. The difference in the initial expense of installing electric light and of installing acetylene apparatus, would not weigh with the owner of a magnificent country residence; and if he decided to adopt either of these modern illuminants, his choice would certainly be electricity, which just at present is the pet of the wealthy classes. The country houses at which acetylene may be employed are those smaller ones which cannot properly be termed mansions, and of which the owners would consider electric lighting an expensive luxury. If such houses be remote from a supply of coal gas, acetylene may prove an acceptable substitute for oil. In the same manner, villages and institutions which cannot obtain a cheap supply of coal or oil for the manufacture of illuminating gas may find acetylene a convenient illuminant. Wherever the means of transport are difficult and costly, acetylene lighting should succeed; since, weight for weight or bulk for bulk, carbide is probably the most compact store of illuminating power at present known to us, though petroleum would not appear much more bulky were it credited with its maximum illuminating value. The freight on carbide in this country is, however, at present excessively high, owing to the fact that carriers insist on regarding it as an explosive. We understand that about £5 per ton is charged by the railway companies for the carriage of carbide from Foyers to London. This heavy charge lays an immense burden on the acetylene industry; but its mitigation may be looked for at an early date. As a competitor with coal gas, where a supply of the latter is to hand, we think there is virtually no scope for acetylene. Even if carbide were delivered at 2d. per lb.—at present small quantities fetch double this price—it would only apparently be on equal terms with 16-candle coal gas at 3s. 6d. per 1000 cubic feet, if the latter were burnt in open-flame burners. We have taken no account of the cost of generating the acetylene, though most people would gladly pay one-third more for gas in order that the manufacture, with its attendant worries and responsibilities, might be carried out on premises other than their own. The cost of manufacturing acetylene from carbide must not actually be regarded as negligible.

We think therefore that acetylene will not affect the better class of work which now comes into the hands of contractors for electric lighting installations in country places. Still less will it affect the gas industry. Where a coal gas supply is established, no rival can at present hope to offer illumination at an equally low price, provided the gas consumer is prevailed upon to adopt burners of modern type. The incandescent burners of Bandsept and Kern give a duty of at least 25 candles per cubic foot of gas consumed, which is very little short of the illuminating power which is in practice obtained from a cubic foot of acetylene. And if it is urged that incandescent gas-burners need attention, and entail expense for the renewal of mantles, it may *per contra* be said that acetylene burners need cleaning and renewing at intervals. With regard also to contamination of the atmosphere, acetylene has nothing in its favour when compared with rationally consumed coal gas. The coal gas will, indeed, give less carbonic acid and less heat per unit of light

\* See "JOURNAL," Vol. LXV., p. 1067; and Vol. LXVI., p. 339.

† *Ibid.*, Vol. LXIX., pp. 652, 1247.



developed; and any harmful effects from sulphur compounds in coal gas will be more than counterbalanced by the products of combustion of the phosphuretted hydrogen and the other impurities in acetylene. Briefly the case for acetylene as a competitor with coal gas at (say) 5s. per 1000 cubic feet is that its cost delivered into the consumer's services must not exceed 7s. 6d. per 1000 cubic feet. Therefore acetylene will not at present prejudicially affect the gas industry. The illuminant which acetylene will replace, in most instances where it is adopted, is mineral oil. It is unnecessary to refer here to the low cost of illumination by means of petroleum oils; for gas engineers are only too familiar with the severity of the competition which their cheapness produces. Probably most manufacturers of acetylene plant will admit forthwith that they do not hope to displace petroleum lamps by offering a cheaper illumination. It is thus a question whether the greater convenience and cleanliness of acetylene will be sufficient inducement to the owners of country houses and the managers of institutions to give up mineral oil lamps in its favour. We think the advantages which acetylene has, in common with coal gas, over oil lighting will cause it to be preferred to oil in very many cases. The extent to which it is adopted will, however, affect but little the amount of oil consumed in this country. In a few instances, also, acetylene may reduce the number of candles used for lighting. If the employment of mixtures of acetylene and oil gas for the lighting of railway carriages, buoys, &c., in place of simple oil gas becomes as extensive as many authorities anticipate, there is no doubt the amount of oil gas made for compression will be considerably reduced.

In houses, therefore, which cannot easily be supplied with coal gas, and for which electricity is too expensive a luxury, there is a fair field for the use of acetylene; and we are glad to observe that in a large number of cases it has already been adopted. Many of the exhibitors at the Imperial Institute testify that they have numerous orders in hand for the supplying of generators to country houses. The exhibition would thus appear to have served well one of its chief objects; but we are disposed to consider that both the exhibitors and the public have received more benefit from it indirectly than directly. There is scarcely one manufacturer of generators who will not have modified his apparatus in some respect owing to the lessons the exhibition will have taught him. Many of the generators which have been examined by the Inspecting Committee, and allowed to be exhibited, are comparatively crude and inefficient appliances; but their makers are now able to produce much more satisfactory machines. It may, therefore, appear a hardship to many of the exhibitors that the report on the tests made under the supervision of Professor Vivian B. Lewes and Mr. Boverton Redwood should embody results relating to apparatus such as they no longer purpose manufacturing. We hope, however, that the authorities will see their way to issue a full and complete report of the tests, even at the risk of inflicting an occasional hardship. The invaluable information collected must not be withheld from publication for the sake of the business interests of a few. The interests of the industry at large demand that the report which the authorities have promised shall give every possible information concerning the working of the various generators. We shall be grievously disappointed—and we believe that the acetylene industry will suffer—if the report is less complete than it might be. We are led to make these remarks because we learn that some of the exhibitors are very anxious that details should be omitted from the report. If the Managing Committee give way to the representations of these exhibitors, suspicion will be cast forthwith on the authority of the report. Moreover, it will be difficult to prevent some details being made known by exhibitors; and it would be far better therefore that everything should be officially published than that unreliable and imperfect data should appear from other sources.

There is still time for those who have not yet visited the exhibition to see it before it closes, on or about the 15th of next month. But we recommend an early visit, as interest in the exhibits seems on the wane; and many exhibitors would like to see the termination on a date earlier than that officially fixed.

**The Conductivity of Glass.**—Considerable attention has been given by Professor Ch. Gray to the determination of the circumstances which affect the conductivity and specific conductive capacity of glass. Various specimens were obtained from manufacturers in London and Jena, and they were all richer in lead and more free from soda than glasses formerly available. The Jena glass had low resistance from its high percentage of soda and complex composition.

**Unproductive Municipal Undertakings.**—Sir H. Fowler having, as mentioned in the "JOURNAL" last week, obtained his return relating to the reproductive undertakings of municipal corporations, Sir J. W. Maclure has given notice of his intention to move, early next session, for a return as to the water, gas, tramway, electric lighting, and "other unproductive undertakings," carried on by these bodies. He asks that the return shall set out the date at which the corporation commenced working, the amount of the capital provided by the corporation, and the amount borrowed, the amount paid off and now outstanding, the average annual income and working expenses for the last five years, the annual net loss, the amount set apart for depreciation, and the mode in which the annual net loss is provided for.

## PERSONAL.

The position of Manager of the Uppingham Gas-Works has been obtained by Mr. W. B. PALMER, of the Stamford and St. Martin's Gas-Works.

Mr. T. DANN, who was for many years Assistant-Manager of the Bedford Gas-Works, under Mr. W. H. Smith (who has now resigned through ill-health), has been appointed Acting-Manager under Messrs. Paul W. Wyatt and Joseph Miller, who are named as joint Managing-Directors.

## COMMUNICATED ARTICLE.

### THE LOCAL GOVERNMENT BOARD AND THE PROTECTION OF WATER SUPPLIES FROM POLLUTION.

By PERCY GRIFFITH, Assoc.M.Inst.C.E., F.G.S., M.Inst.M.E.

(Continued from p. 306.)

I propose first to summarize the powers and responsibilities of local authorities and water companies with regard to the purity of the water supplied by them, as laid down in existing Acts of Parliament.

#### COMPANIES.

As is indicated in the Local Government Board clauses now under review, the clause which most definitely states the responsibility of water companies as regards the purity of the water supplied is section 35 of the Water-Works Clauses Act, 1847 (which see), which requires the undertakers to "keep in the pipes laid down by them a supply of pure and wholesome water." It must be observed, however, that the exception which is made in the ensuing section, "unless prevented by frost, unusual drought, or other unavoidable causes or accident," and which is adopted by the Local Government Board in relation to the purity of the water, does not in this Act have any reference whatever to this point, but refers merely to the compulsion to supply water to all the inhabitants of the company's district upon certain terms. It is not at all clear whether any direct relationship exists between frost or unusual drought and the purity of the water, although there is no doubt an indirect relationship, which may sometimes prove of great importance, and which, in fact, did so in the case of Maidstone.

*Sec. 35.*—The undertakers shall provide and keep in the pipes to be laid down by them a supply of pure and wholesome water, sufficient for the domestic use of all the inhabitants of the town or district within the limits of the Special Act, who, as hereinafter provided, shall be entitled to demand a supply and shall be willing to pay water-rate for the same, and such supply shall be constantly laid on at such a pressure as will make the water reach the top storey of the highest houses within the said limits, unless it be provided by the Special Act that the water to be supplied by the undertakers need not be constantly laid on under pressure, and the undertakers shall cause pipes to be laid down and water to be brought to every part of the town or district within the limits of the Special Act, whereunto they shall be required by so many owners or occupiers of houses in that part of the town or district, as that the aggregate amount of water-rate payable by them annually at the rates specified in the Special Act shall be not less than one-tenth part of the expense of providing and laying down such pipes, provided that no such requisition shall be binding on the undertakers unless such owners or occupiers shall severally execute an agreement binding themselves to take such supply of water for three successive years at least.

Sections 61 to 67 of the same Act (which see) provide water-works companies with very stringent powers in regard to the penalties incurred by persons causing or allowing the water to be fouled either before or after its collection and distribution, special mention being made of pollution caused by leakage of gas or by waste liquors, &c., from gas-works.

*Sec. 61.*—Every person who shall commit any of the offences next hereinafter enumerated shall for every such offence forfeit to the undertakers a sum not exceeding £5; that is to say—

Every person who shall bathe in any stream, reservoir, aqueduct, or other water-works belonging to the undertakers, or wash, throw, or cause to enter therein, any dog or other animal;

Every person who shall throw any rubbish, dirt, filth, or other noisome thing into any such stream, reservoir, aqueduct, or other water-works as aforesaid, or wash or cleanse therein any cloth, wool, leather, or skin of any animal, or any clothes or other thing;

Every person who shall cause the water of any sink, sewer, or drain, steam-engine boiler, or other filthy water belonging to him or under his control, to run or be brought into any stream, reservoir, aqueduct, or other water-works belonging to the undertakers, or shall do any other act whereby the water of the undertakers shall be fouled;

And every such person shall forfeit a further sum of twenty shillings for each day (if more than one) that such last-mentioned offence shall be continued.

*Sec. 62.*—Every person making or supplying gas within the limits of the Special Act who shall at any time cause or suffer to be brought or to flow into any stream, reservoir, aqueduct, or water-works belonging to the undertakers, or into any drain communicating therewith, any washing or other substance which shall be produced in making or supplying gas, or who shall wilfully do any act connected with the making or supplying of gas whereby the water in any such stream, reservoir, aqueduct, or water-works shall be fouled, shall forfeit to the undertakers for every such offence the sum of two hundred pounds; and such penalty shall be recovered with full costs of suit, in any of the Superior Courts; but such penalty shall not be recoverable unless it be sued for during the continuance of the offence, or within six months after it has ceased.



Sec. 63.—In addition to the said penalty of two hundred pounds, and whether such penalty have been recovered or not, the person making or supplying gas as aforesaid shall forfeit to the undertakers the sum of twenty pounds to be recovered in like manner for each day during which such washing or substance shall be brought or shall flow as aforesaid, or during which the act shall continue by which such water is fouled, after the expiration in either case of twenty-four hours from the time when notice of the offence has been served on such person by the undertakers.

Sec. 64.—Whenever the water supplied by the undertakers shall be fouled by the gas of any person making or supplying gas within the limits of the Special Act, such person shall forfeit to the undertakers for every such offence a sum not exceeding twenty pounds, and a further sum not exceeding ten pounds for each day during which the offence shall continue after the expiration of twenty-four hours from the service of notice of such offence.

Sec. 65.—For the purpose of ascertaining whether the water of the undertakers be fouled by the gas of any person making or supplying gas within the limits of the Special Act, the undertakers may dig up the ground and examine the pipes, conduits, and works of the persons making or supplying gas; provided that before proceeding so to dig and examine the undertakers shall give twenty-four hours' notice in writing to the person so making or supplying gas of the time at which such digging and examination is intended to take place, and they shall give the like notice to the persons having the control or management of the pavements or place where such digging shall take place, and they shall be subject to the like obligation of reinstating the road and pavement and to the same penalties for delay or any nonfeasance or misfeasance therein, as hereinbefore provided with respect to roads and pavements broken up by them for laying their pipes.

Sec. 66.—If upon such examination it appear that such water has been fouled by any gas belonging to such person, the expenses of the digging, examination, and repair of the street or place disturbed in any such examination shall be paid by the person making or supplying gas; but if upon such examination it appear that the water has not been fouled by the gas of such person, then the undertakers shall pay all the expenses of the examination and repair, and also make good to the said person any injury which may be occasioned to his works by such examination.

Sec. 67.—The amount of the expenses of every such examination and repair and any injury done to the undertakers shall in the case of any dispute about the same, together with the cost of ascertaining and recovering the same, be ascertained and recovered in the same manner as damages for the ascertaining and recovery whereof no special provision is made are directed to be ascertained and recovered.

These clauses do not, however, suggest any penalty being incurred by water companies, who, whether by oversight or neglect, allow their water to become fouled; and it is a difficult matter to say whether any penalty could under this Act be enforced against a company for this, and, if so, what the penalty is. Upon this point, therefore, it is very desirable to have some more definite provision, if only to give practical effect to the stipulation in the 35th clause that the water shall be "pure and wholesome."

#### LOCAL AUTHORITIES.

It is evident from the tenor of the various Public Health and Local Government Acts dealing with this subject, that Parliament has always considered it to be specially within the province of local authorities to see that the water supplied in their district is pure and abundant; and I believe that if the duties of local authorities could be more clearly defined and made compulsory, instead of being left optional, very little further legislation would be required.

Clause 55 of the Public Health Act, 1875, requires local authorities owning water-works to keep thereon "a supply of pure and wholesome water" equally with water companies, although it is curious fact that the proviso with respect to the sufficiency of the supply found in the Water-Works Clauses Act, 1847, is neither repeated nor incorporated in this Act.

Sec. 55.—A local authority shall provide and keep in any water-works constructed or purchased by them a supply of pure and wholesome water; and where a local authority lay any pipes for the supply of any of the inhabitants of their district, the water may be constantly laid on at such pressure as will carry the same to the top storey of the highest dwelling-house within the district or part of the district supplied.

Section 68 of this Act prescribes the penalties incurred by gas undertakings which cause "any stream, reservoir, pond, or place for water" to be fouled, on the same lines as section 62 to 67 of the Water-Works Clauses Act, 1847, in regard to companies. Section 69 also empowers local authorities to take legal steps to prevent the fouling of streams by sewage. Section 70, which is usually taken to apply to the closing of private wells when reported to be "polluted so as to be injurious to health," is expressly worded so as to include "any well, tank, or cistern, public or private;" and it would appear to be in itself ample authority for the closing of any water-works or part of a water-works which might be shown to contain polluted water. It is evident that some such procedure as this would be a far more effectual protection from disease than the inflicting of a penalty only, as it would involve quite sufficient expense upon the water-works authorities to act as a deterrent against neglect, and would at the same time prevent the supply of polluted water to consumers—which, after all, is the vital point to be aimed at.

Sec. 68.—Any person engaged in the manufacture of gas who (1) causes or suffers to be brought or to flow into any stream, reservoir, aqueduct, pond, or place for water, or into any drain or pipe communicating therewith, any washing or other substance produced in the making or supplying of gas; or (2) wilfully does any act connected with the making or supplying of gas whereby the water in any such stream, reservoir, aqueduct, pond,

or place for water is fouled, shall forfeit for every such offence the sum of two hundred pounds and, after the expiration of twenty-four hours' notice from the local authority or the person to whom the water belongs in that behalf, a further sum of twenty pounds for every day during which the offence is continued or during the continuance of the act whereby the water is fouled.

Every such penalty may be recovered with full costs of suit in any of the Superior Courts, in the case of water belonging to, or under the control of, the local authority by the local authority; and in any other case by the person into whose water such washing or other substance is conveyed or flows or whose water is fouled by any such act as aforesaid, or in default of proceedings by such person after notice to him from the local authority of their intention to proceed for such penalty by the local authority. But such penalty shall not be recoverable unless it be sued for during the continuance of the offence, or within six months after it has ceased.

Sec. 70.—On the representation of any person to any local authority that within their district the water in any well, tank, or cistern, public or private, or supplied from any public pump, and used or likely to be used by man for drinking or domestic purposes or for manufacturing drinks for the use of man, is so polluted as to be injurious to health, such authority may apply to a Court of Summary Jurisdiction for an order to remedy the same, and thereupon such Court shall summon the owner or occupier of the premises to which the well, tank, or cistern belongs, if it be private, and in the case of a public well, tank, cistern, or pump, any person alleged in the application to be interested in the same, and may either dismiss the application or may make an order directing the well, tank, cistern, or pump to be permanently or temporarily closed, or the water to be used for certain purposes only, or such other order as may appear to them to be requisite to prevent injury to the health of persons drinking the water.

The Court may, if they see fit, cause the water complained of to be analyzed at the cost of the local authority applying to them under this section.

If the person on whom an order under this section is made fails to comply with the same, the Court may, on the application of the local authority, authorize them to do whatever may be necessary in the execution of the order; and any expenses incurred by them may be recovered in a summary manner from the person on whom the order is made.

Expenses incurred by any rural authority in the execution of this section and not recovered by them as aforesaid, shall be special expenses.

There is, however, one point in connection with this which is left somewhat vague in existing Acts of Parliament; and that is the power of entry upon the works when these are owned by a company. Clauses 102 and 103 of the Public Health Act, 1875, under the heading of "Nuisances," provide a model for such a definition, though they do not themselves cover the case in question.

Sec. 102.—The local authority, or any of their officers, shall be admitted into any premises for the purpose of examining as to the existence of any nuisance thereon, or of enforcing the provisions of any Act in force within the district requiring fireplaces and furnaces to consume their own smoke, at any time between the hours of nine in the forenoon and six in the afternoon, or in the case of a nuisance arising in respect of any business, then at any hour when such business is in progress or is usually carried on.

Where under this Act a nuisance has been ascertained to exist, or an order of abatement or prohibition has been made, the local authority, or any of their officers, shall be admitted from time to time into the premises between the hours aforesaid, until the nuisance is abated, or the works ordered to be done are completed, as the case may be.

Where an order of abatement or prohibition has not been complied with, or has been infringed, the local authority, or any of their officers, shall be admitted from time to time at all reasonable hours, or at all hours during which business is in progress or is usually carried on, into the premises where the nuisance exists, in order to abate the same.

If admission to premises for any of the purposes of this section is refused, any Justice, on complaint thereof on oath by any officer of the local authority (made after reasonable notice in writing of the intention to make the same has been given to the person having custody of the premises), may, by order under his hand, require the person having custody of the premises to admit the local authority, or their officer, into the premises during the hours aforesaid, and if no person having custody of the premises can be found, the Justice shall, on oath made before him of that fact, by order under his hand authorize the local authority, or any of their officers, to enter such premises during the hours aforesaid. Any order made by a Justice for admission of the local authority, or any of their officers, on premises shall continue in force until the nuisance has been abated, or the work for which the entry was necessary has been done.

Sec. 103.—Any person who refuses to obey an order of a Justice for admission of the local authority, or any of their officers, on the premises shall be liable to a penalty not exceeding five pounds.

Clauses 305 and 306 of the Act might almost be held to be sufficient for the purpose as they stand; and at any rate a very slight modification would render them more suitable to the case in question than clause 102, inasmuch as an order of the Court would be required before forcible entry could be made—a very necessary protection to companies, if local authorities are to be given such large powers as have been proposed by the Local Government Board.

Sec. 306.—Any person who wilfully obstructs any member of the local authority or any person duly employed in the execution of this Act, or who destroys, pulls down, injures, or defaces any board on which any bye-law notice or other matter is inscribed, shall, if the same was put up by authority of the Local Government Board or of the local authority, be liable for every such offence to a penalty not exceeding five pounds.

Where the occupier of any premises prevents the owner thereof from obeying or carrying into effect any provisions of this Act, any Justice to whom application is made in this behalf shall, by order in writing, require such occupier to permit the execution of any works required to be



executed, provided that the same appear to such Justice to be necessary for the purpose of obeying or carrying into effect the provisions of this Act; and if within twenty-four hours after the making of the order such occupier fails to comply therewith, he shall be liable to a penalty not exceeding five pounds for every day during the continuance of such non-compliance.

If the occupier of any premises when requested by, or on behalf of, the local authority to state the name of the owner of the premises occupied by him, refuses or wilfully omits to disclose or wilfully mis-states the same, he shall (unless he shows cause to the satisfaction of the Court for his refusal) be liable to a penalty not exceeding five pounds.

The Public Health (Water) Act, 1878, goes much nearer to the point than the Act of 1875, as the following section (7) will show:—

It shall be the duty of every rural sanitary authority from time to time to take such steps as may be necessary to ascertain the condition of the water supply within their district; and the authority may pay all reasonable costs and expenses incurred by them for the purpose of taking such steps. The authority, or any of their officers, or any person duly authorized in writing for that purpose by the authority, if they or he have or has reasonable ground for believing that any occupied dwelling-house in the district is without a proper supply of wholesome water, sufficient for the consumption and use for domestic purposes for the inmates of such house, shall be admitted into the premises for which such supply is required, or from which the water supply may be derived, for the purpose of ascertaining whether or not such house has such a supply within a reasonable distance; and for the purposes of any such admission, sections 102 and 103 of the Public Health Act, 1875, shall apply in the same manner as if such admission were necessary for the purpose of examining as to the existence of any nuisance on the premises, and the person so authorized as aforesaid were an officer of the rural sanitary authority.

It should be observed that this is a compulsory, and not an optional, clause; and the expression "or from which the water supply may be derived," might reasonably be held to include any existing water-works. A very slight amendment, such as "from which the supply may be or is derived," would meet the case, and would, in my opinion, cover all that is involved in the clauses as they were recently proposed by the Local Government Board.

Referring again to the general responsibility of local authorities with regard to the purity of the supply, the Public Health (Water) Act, 1878, is very distinct upon this point, making the duty a compulsory one, and not optional.

Section 3 reads: "It shall be the duty of every rural sanitary authority, regard being had to the provisions in this Act contained, to see that every occupied dwelling-house within their district has within a reasonable distance an available supply of wholesome water sufficient for the consumption and use for domestic purposes of the inmates of the house;" and though this refers more directly to individual houses, still it clearly states the duty of the local authority to see that every house has a supply of wholesome water.

(To be continued.)

**Coal Testing by the Röntgen Rays.**—According to M. Couriot, carbon in all its forms is very transparent to the Röntgen rays, while silica and silicates are opaque. By placing a lump of coal between a Crookes tube and a fluorescent screen, all the slag and clinker forming parts of the fuel can be detected. In this manner M. Couriot has tested anthracite and bituminous coal, lignite, coke, and block fuel. The conglomerate character of the latter is clearly shown; and in coke the particles of iron sulphide show as black spots on the screen. Rough lumps of coal,  $\frac{1}{8}$  to 2 inches thick, may be used, with an exposure of five minutes, and with a coil having a 10-inch spark.

**The Specific Heats of Gases.**—Professors Lummer and Pringsheim have communicated to "Wiedemann's Annalen" the results of their determinations of the ratio of the specific heats of certain gases. These results were obtained from the relationship between temperature and pressure in an adiabatic expansion of the gas, a new form of bolometer being employed in the measurement of temperature. The final values obtained for the ratio in question are: Air, 1.4025; oxygen, 1.3977; carbonic acid, 1.2995; and hydrogen, 1.4084. These values are rather greater than those obtained by the same writers as far back as the year 1887, when a silver wire 0.04 mm. thick was used in the bolometer.

**The Flow of Water in Pipes.**—The problem of the flow of water in uniform pipes and channels, said by Saint Venant to constitute a hopeless enigma, forms the subject of a comprehensive paper by Mr. G. H. Knibbs in the "Journal and Proceedings of the Royal Society of New South Wales," a brief notice of which appears in "Nature." The formulæ used by engineers in general are shown by the author to be systematically defective, even in respect of their mathematical form; and the main object of the paper is to indicate a scheme of empirical analysis of, and to develop a type of formula for, the flow of water in pipes and channels. By means of tables, the general expression supplied can be rendered easy of manipulation for the purposes of practical calculation. Mr. Knibbs concludes that the law of velocity as related to temperature with at least two (or better three) pipes of very different roughness, requires further experimental investigation. The variation of the velocity with respect to the radius of pipes also needs investigation.

## NOTES.

### The Preservation of Timber by Tar and Tar Oils.

A method of treating coal tar for rendering it more serviceable for the protection of timber from decay is mentioned in a recent circular of the United States Division of Forestry. After describing the best means of seasoning woods in the log and cut, the circular proceeds to utter a warning against applying paint or other coating to green or unseasoned timber. If the wood is not well dried or seasoned, the coating will only hasten decay. For coating timber which has been properly treated by seasoning and drying, coal tar with or without sand or plaster added, and pitch—especially if mixed with oil of turpentine and applied hot—is the best preservative. A mixture of three parts of coal tar and one part of clean, unsalted grease (the latter to prevent drying until the tar has had time to fill the minute pores of the timber) is recommended. Both tar and oil paint share the drawback of being mere coverings. If the wood has any chance of getting moist before they are laid on, these coatings do more harm than good. Heavy tar oils, freed by distillation both from their volatile and tarry companion products, are preferable to both paint and tar. These oils penetrate timber and act as disinfectants. They are preferably applied hot, either with a brush or as a bath. The appearance of the treated wood is against it. Charring the ends of posts intended to be buried in the ground is not recommended in preference to tarring, as it merely insulates the wood from the ground, but develops large cracks through which the interior is in time attacked.

### Ventilation Tests.

At a meeting of the American Society of Heating and Ventilating Engineers, Mr. J. C. Northcott read a paper on some accepted tests of ventilation, the reliability of which he questioned. The author admitted that the practice of testing the efficiency of the ventilation of interiors is of recent growth, which accounts for the crudity of the methods employed. To test the degree of impurity of air in occupied rooms, it is usual to determine the proportion of carbonic acid present; but Mr. Northcott argues that for two reasons this test is only approximate. Carbonic acid is not the only or the worst poison discharged into the air of an occupied room. Animal exudations are far more objectionable; but they can only be detected in a general way by the sense of smell. Mr. Northcott objects to the test for carbonic acid being regarded as an indication of the degree of what he calls "crowd poisoning," except when due regard is paid to the limitations of the test. The use of the anemometer is commended as offering the best of all known tests of ventilation, which is, after all, nothing more than dilution. Yet, unless used intelligently and with care, even this method may yield misleading results. The author's general conclusion is that ventilation tests which are recognized as being defective must continue in use, because there are no better. They must be employed, however, with full knowledge of their shortcomings, and with a disposition to carefully watch for every affecting circumstance. It was testified in the discussion on the paper that the anemometer is generally preferred to the chemical test for ventilation.

### Sampling and Testing Oils.

A useful article on sampling and testing lubricating oils and fats in the workshop appeared in the "Engineer" for the 22nd ult. It described certain ready, yet accurate, means of sampling lubricating oils and fats with a view to ascertaining their commercial purity and suitability for the uses to which they are put in workshop practice. These processes comprise the determination of specific gravity; the action of alkalies; the action of sulphuric acid; testing for the presence of free acid; testing viscosity; testing rate of evaporation. For testing the specific gravity, the use of a 1000-grain bottle is recommended. The common form of hydrometer, called oleometer when adapted to determine the specific gravity of oils, is objected to as being seldom accurate. It is remarked that the specific gravity of different oils, if pure, is never the same; but, on the other hand, that of different lubricating oils is so nearly equal as to necessitate great care in making the determination. The alkali test is intended to distinguish a fatty oil from a mineral oil by causing saponification of the former, whether it is sampled alone or in a mixture. With mineral oils, which do not contain oxygen, the alkali forms an emulsion. The test with sulphuric acid is intended to differentiate oils in two ways—one by means of the colour imparted to the mixture of oil and acid, and the other by the temperature of the mixture. The several other tests of oil are described with great clearness, but so as to convey the impression that the complete series of operations is not to be performed without considerable pains, and the observance of multitudinous minute precautions to secure reliability.

### The Comparative Economy of Different Sources of Power.

Mr. Charles Weiss has abstracted for "Engineering" a learned article by Herr Chr. Eberle, of Duisburg, on the comparative economy of different sources of power. The author remarks that the only practical sources of energy available for industrial uses are water, steam, and gas. The cost of water power is made up chiefly of the charges for interest and redemption of the capital outlay, and is so dependent on local considerations



as not to come into a general inquiry. Steam and gas are the real rivals; and their comparative merits have to be determined with reference to the size of the installation, the kind of work required of it, and the cost of fuel. The author investigates the cost of the production of steam power for different sized units, taking interest on capital at the uniform rate of  $4\frac{1}{2}$  per cent., and depreciation on machinery at 7 per cent., and on buildings at  $2\frac{1}{2}$  per cent. It is impossible to give the author's conclusions in a summarized form. They will be found as condensed as is consistent with intelligibility in the issue of our contemporary for the 8th ult. With regard to gas-power plant, it is admitted that gas-engines have hitherto not been constructed for very high powers. The largest unit mentioned by the author is a two-cylinder engine of 200-horse power, made by the Gasmotoren Fabrik-Deutz for a cement-works in Switzerland. Using coke in the gas producer, the German rule is to take the consumption of fuel at 1.654 lbs. per brake horse-power. The general result of the comparison is to show that, in places where fuel is expensive, gas power offers material advantages as against steam power. It is anticipated that there will shortly be a very large increase of gas-power installations for industrial undertakings.

#### A New Welding Process.

A remarkable new process for the production of high temperatures, capable of use in metal working, has been suggested by Herr Goldschmidt. It depends upon the extremely violent action which takes place when aluminium unites with oxygen. So high is the temperature thus produced, estimated at  $3000^{\circ}\text{C}$ ., that the chief difficulty is so to moderate and control the reaction that it will do useful work. The process is capable of two main applications. In the first place, the heat given off by the combustion of a mixture of aluminium with any convenient oxide may be utilized for heating purposes only, as in welding; or the reducing power of aluminium at a high temperature may be applied to the preparation of pure metals or alloys. If a moderate heat is required, the reacting mass is diluted by the addition of some inert substance, which, at the same time, prevents the whole mass from melting. The following experiment illustrates the character of the process: A large iron rivet is surrounded by a mixture of oxide of iron, sand, and powdered aluminium, and almost wholly embedded in sand contained in a wooden box. On the top of the exposed portion of the aluminium mixture is laid a small ball prepared by mixing aluminium powder with a more easily reducible oxide, into which is inserted a short length of magnesium ribbon. The reaction is started by setting fire to the ribbon; and as soon as this is done, more sand is placed on the top in order to keep in the heat. After a short time, the rivet may be taken out white hot. Similarly wrought-iron pipes, &c., may be welded, or fused together, very cheaply; the process being regarded as more efficient than electric welding, owing to the greater uniformity of the heat produced.

#### The Lecomte Low-Pressure Incandescent Burner.

Some short time since it was mentioned in the "JOURNAL" that the Société Technique du Gaz en France had awarded a prize of 500 frs. to M. Lecomte for his low-pressure incandescent gas-burner, which in the opinion of the Committee of the Society possesses a marked superiority over existing burners of this class. This opinion was formed after a series of tests carried out by the Committee, whose report thereon is given in the last number of the "Journal des Usines à Gaz." Six burners were submitted, divisible into two groups—burners working at a pressure of 4-10ths to 1 inch; and those requiring greater pressure than this. M. Lecomte considers that burners constructed to work at the pressure (usually tolerably high) required by the ordinary incandescent system should give more light for the same consumption of gas, or consume less gas for the same yield of light. The Committee's experiments do not lead to the conclusion that this ideal has been realized. They show that M. Lecomte's burners of the second group are neither inferior nor superior to other well-made incandescent gas-burners—for example, those of the Welsbach Company. His economic low-pressure burner, however, possesses this advantage over the Auer burner, that it furnishes the same results at considerably lower pressures. The sample submitted to the Committee gave the light of 8 to 9 carrels (about 76 to 86 candles) with a consumption of 12 to 14 litres (0.42 to 0.50 cubic foot) per carcel-hour, at a pressure of 6-10ths. It was then regulated for a No. 4 Welsbach mantle, with the following results:—

| Pressure. | ILLUMINATING POWER. |          |    | CONSUMPTION OF GAS.     |             |
|-----------|---------------------|----------|----|-------------------------|-------------|
|           | Carrels.            | Candles. |    | Litres per Carcel-Hour. | Cubic Foot. |
| 7-10ths   | 10.80               | = 103.6  | .. | 12.0                    | = 0.423     |
| 10-10ths  | 12.50               | = 120.0  | .. | 12.4                    | = 0.437     |

The following results were obtained with a Welsbach burner, using the same mantle:—

| Pressure. | ILLUMINATING POWER. |          |    | CONSUMPTION OF GAS.     |             |
|-----------|---------------------|----------|----|-------------------------|-------------|
|           | Carrels.            | Candles. |    | Litres per Carcel-Hour. | Cubic Foot. |
| 12-10ths  | 10.30               | = 99.0   | .. | 12.7                    | = 0.448     |
| 16-10ths  | 12.27               | = 117.8  | .. | 12.4                    | = 0.437     |

These results show that the Lecomte burner possesses the merit of yielding, at the lowest pressures now generally used in the distribution of gas, the same results as the best incandescent burners upon the market; and, moreover, the results are not appreciably affected by ordinary variations of pressure.

## TECHNICAL RECORD.

### NORTH OF IRELAND ASSOCIATION OF GAS MANAGERS.

Annual Meeting at Portadown.

The Annual Meeting of the North of Ireland Association of Gas Managers was held in the Young Men's Institute, Portadown, Co. Armagh, last Tuesday, under the presidency of Mr. J. NISBET, Manager of the Portadown Gas-Works, the President for the year. The members, of whom there was a larger attendance than ever, assembled in the forenoon, and most of them paid a visit to the gas-works, which were found in a very trim condition—in fact, it was in some places difficult to say where the works ended and the garden began, the two were so much mixed up together. In the retort-house, there are at present two benches, face to face, in which there are on one side three settings of fives, and on the other two settings of fours and two of threes, all fired on the direct system. At the end of the former bench, Mr. Hamilton, of Hamilton (Scotland), is about to erect three settings of sixes on the generator principle; but they are not expected to be ready for the coming winter. At the foot of the garden, embowered among fruit trees, are two gasholders—one being on the Gadd and Mason principle of guiding, which was an object of interest to the members.

The business commenced shortly after eleven o'clock.

The PRESIDENT said Mr. Thornton, the Chairman of the Gas Company, intended to have been there at that time to welcome the members to the town, and to invite them to luncheon in the afternoon; but, unfortunately, it turned out that, this being a general holiday in Portadown, his assistants were away, some business had come in, and he could not make it convenient to attend the meeting, but he would be present at the luncheon.

#### REPORT AND ACCOUNTS.

The HON. SECRETARY (Mr. James Whimster, of Armagh) read the report of the Committee. It commenced by expressing regret at the loss sustained by the Association through the removal by death of two of the oldest members—Mr. M. Martin, of Drogheda, and Mr. D. McCallum, of Omagh—who, though both advanced in years, were regular attendants at the annual gatherings. The subjects of standardizing meter-unions and the Workmen's Compensation Act, 1897, had been brought under the notice of the Committee by the North British and North of England Associations respectively, and would be discussed at the meeting. The Committee regretted that the offer of medals for competition papers had borne so little fruit—only one paper having been sent in last year, and none this. It was suggested that the meeting should decide as to the advisability of continuing the offer. The accounts accompanying the report showed a balance in hand of £20 17s. 7d. The membership stands as follows: Ordinary members, 54; extraordinary members, 20; honorary members, 2—total, 76.

Mr. T. FRIZELLE (Holywood) moved, and Mr. A. GIBB (Newry) seconded, the adoption of the report and accounts.

Mr. D. WILLIAMSON (Clones) suggested that the Secretary might be instructed to formally express the sympathy of the members with the relatives of the two deceased members.

The SECRETARY explained that he attended the funerals of both members as the representative of the Association.

Several members having testified their appreciation of the valuable services rendered by the two deceased members, it was resolved that the minutes of the day's meeting should contain a formal expression of the deep sense of loss which the members felt by the death of their colleagues.

The report and accounts were adopted.

The HON. SECRETARY said he received a telegram from Professor Macadam on the previous day, expressing his regret that he could not be with them; and he had since had a letter confirming the telegram. [Mr. Whimster read the letter, in which Professor Macadam explained that he had just returned from Aldershot, and was under orders to report on the Camp in person on the day of the meeting.] They were all very sorry Professor Macadam could not be with them; but it was a matter which could not be avoided.

#### NEW MEMBERS.

The following were admitted to the Association:—

**Ordinary Members.**—Mr. R. Campbell, of Carrickfergus; Mr. John G. Toombs, of Carrick-on-Suir; Mr. R. Bruce Anderson, of Westminster and Kilkenny; Mr. W. Barnett, of Roscommon; Mr. P. Maguire, of Cavan; Mr. M. Morgan, of Navan; and Mr. G. W. Young, of Carlow.

**Extraordinary Members.**—Mr. H. Allender, of London; Mr. Thomas J. Cotton, Inspector of Lighting, Dublin; Mr. J. Clark, of Meters Limited, Glasgow; Mr. J. T. Harvey, of Belfast; Mr. A. W. Lyon, of London; Mr. J. Slight, of Glasgow; and Mr. S. W. Tamplin, of Manchester.



## ELECTION OF OFFICE-BEARERS.

Office-bearers were next elected, as follows:—

*President.*—Mr. J. Auchterlonie, of Mullingar.

*Vice-President.*—Mr. G. R. Love, of Dundalk.

*Hon. Secretary and Treasurer.*—Mr. J. Whimster, of Armagh.

*Committee.*—Mr. A. Gibb, of Newry; Mr. C. B. Tully, of Sligo; and Mr. S. B. Langlands, of Coleraine.

## PROPOSED PRESENTATION TO MR. WHIMSTER.

Mr. T. LLEWELLYN (Newbridge) said he would crave permission to remark that Mr. Whimster had now served them for eleven or twelve years, and it was, he thought, time the members rendered him some token of their appreciation of his services to the Association. He moved that steps should be taken to this end.

Mr. T. FRIZELLE (Holywood) expressed his great pleasure in seconding the motion. He said Mr. Whimster was the originator of the Association, and had been the life and soul of it. He had kept the members together, and during the twelve years had done a great amount of work for them; and he (Mr. Frizelle) thought the least the Association could do would be to recognize his services in some tangible form.

Mr. WHIMSTER said he had to thank the members very much for so cordially appreciating his services, and for again appointing him Secretary. He would have been glad, after twelve years' service, and seeing that the Association was, as he might say, pretty successfully floated, if they had relieved him of the office, and appointed a younger man to take up the burden. It was not, however, that he had any wish to throw it off. He liked the work and the Association; and he was glad to see it prospering. With reference to their gold medal competition, he wished to say that the offer of a gold medal had put him in a fix, because it was left till the 1st of July to send in competition papers, and until then he could not tell whether there were to be any or not. Therefore the time was too short between then and the second Tuesday in August for him to provide anything else, if no papers came forward. With reference to the proposal to recognize his services, he would much rather that they would not say anything about it.

Mr. P. HURLL (Glasgow) thought it would be only fair that they should do something to show their appreciation of Mr. Whimster's services; and he suggested that a small Committee should be appointed to put the matter into form. He was quite sure that any appeal from such a Committee would meet with a hearty response.

The proposal was adopted, and a Committee appointed, consisting of the President-elect (Mr. Auchterlonie), Mr. Llewellyn, Mr. Gibb, and Mr. A. Mackenzie, of Edinburgh.

## THE PRESIDENT'S ADDRESS.

The PRESIDENT then delivered the following

## INAUGURAL ADDRESS.

In addressing you for the second time as your President, I do so with mingled feelings of pleasure and regret; pleasure at meeting once more with so many brother managers and friends, and regret at the loss of two of our oldest members—I refer to the late Mr. D. McCallum, of Omagh, and Mr. M. Martin, of Drogheda. Both of them were with us at our meeting in Omagh last year, and both have been taken away from among us by death. Those of us who knew those members best know the deep interest they both took in the affairs of the Association from its very first formation.

I am glad to be able to say that, both numerically and financially, our Association is in a very healthy and flourishing condition. Our membership is steadily increasing; and I have reason to believe that our meetings and discussions from time to time have drawn us together in a closer bond of brotherhood, and have been beneficial to us one and all.

One circumstance which shows that managers are beginning to understand the advantages of joining our Association is that there are now a considerable number of our members from the South and West—from as far South as Bandon and Skibbereen, and as far West as Galway and Tralee. Still there are a good number outside yet, who would I believe find it to their advantage to join us. Let no one think he has already learned as much of his business as he will require; for in this progressive age something new is turning up almost every day, and anyone who has a desire and ambition to better his position in life must study hard, and work hard, to keep himself acquainted with all improvements as they come out. If he does not, he will not succeed; for I can assure you there is a great deal more required from a gas manager now than there was a few years ago. If we take a glance back, say fifteen or twenty years (in small works, more especially), we see that, if the manager made the gas and distributed it in sufficiently large sized pipes to the various parts of the town, he had done nearly all that was expected from him. But now, if he is going to compete successfully with the electric light and with cheap oil, he must know and do a great deal more. He must know how to work generator and regenerative furnaces, so that he may get the best results both as to the quantity and the quality of his gas. He must know how to make the very best of his residuals. He should know how to make sulphate of ammonia. And within the past few years another new branch has come upon us—that is the supplying and fitting-up of gas cooking-

stoves, fires, laundry irons, &c. The manager must also know and be able to explain to consumers about the great variety of burners that are now competing one against another. To be able to do these and a great number of other things which I have not mentioned, but which must be dealt with as they arise, I know of no better method than to join our Association, and take as active a part as possible in its business. I would, therefore, for your own benefit ask you all to take a still greater interest in the affairs of our Association.

The gas industry, in the face of all opposition, still holds its place in the forefront of all competitors for the supply of artificial light. And every week as we receive our technical journals we read of some new departure in the apparatus for manufacturing, distributing, or consuming gas. And as I presume you all get these journals, it makes it difficult for me to bring anything before you that you have not already read or heard about; for although ours is the only Gas Managers' Association in Ireland, there are no less than seven kindred Associations in England, and three in Scotland, where papers are read and discussed on every subject connected with the manufacture and distribution of gas. In a great majority of cases these papers are contributed by managers of large works, who have long experience, better apparatus for experimenting with, and last, but not least, more time at their disposal than most of us have, who personally must superintend every detail from the retort-house to the burner.

Coal has been comparatively cheap for the past two or three years; and as the selling price of every manufactured article mainly depends upon the cost of the raw material, and, as we all know, the cheaper an article can be sold the greater the consumption, therefore gas companies, like other manufacturers being always anxious to extend their business, have from time to time reduced the price of gas, until now I think I may safely say gas is sold all over the three kingdoms cheaper than it has ever been before.

But, unfortunately, this season there is another miners' strike—this time in Wales; and the coalowners have higher wages to pay. Besides, like all other employers of labour, gas companies included, since the coming into force last month of the Workmen's Compensation Act, they have to take into account, and provide for, the extra liabilities they are now under. To meet this extra expense, coal has gone up in price from 6d. to 1s. per ton.

There is also this year a considerable advance in the price of retorts, bricks, and all fire-clay goods. Those increased prices will tell heavily, especially against small works, where the price of gas is now as low as can be, consistent with the proper maintenance of the works, and the payment of the ordinary dividends to the shareholders.

It is a pleasure to us when we can announce a reduction in price. When we do so, our consumers are pleased, although not perfectly satisfied; for if the reduction is 5d. per 1000 cubic feet they will tell you it should have been 10d. But when coal, fire-clay goods, wages, &c., rise in price, and the price of gas must be raised to enable us to get ends to meet, then something like a rebellion arises, and our consumers economize in every way they can. Some will take to electric light, if they can get it, although it would cost them a great deal more money, and some will take to oil, with all its trouble and bad smell, rather than pay the increased price for gas.

Well, that is a state of things we must do our very utmost to avoid. There are a number of ways which we can take to do so. And first, I will say let us do our utmost to make gas as popular as we can, not only for lighting purposes, but let us push the sale and hire of cooking-stoves, fires, laundry irons, &c. I have a good number in Portadown; and I find that where a gas cooking-stove has been introduced into a house, it is very seldom returned. To push this business a good deal of time and tact are required. One must be able to show the people how to use them, and how to use them economically. It takes time and patience—more, indeed, than sometimes we can well spare; but in the end it pays. When fitting up a cooking-stove, be careful to let the good lady of the house know that it is a stove for cooking with. I well recollect the very first cooking-stove I fitted up in Portadown. There was a meter for it independent of the house lights; the object being to ascertain exactly what the cost of cooking would be. The first account was very large. I was sent for, and heard the usual tale of how little had been cooked with it, and that the stove must be wrong, or the meter, or both. They had read in the papers about a dinner being cooked for 2d., and theirs was a long way beyond that; they must quit the stove, &c., &c. But after a bit of manœuvring and questioning, I discovered that not only had all the cooking been done upon the stove, but water had been boiled on it for the family washing and washing of floors also. I had to explain that the stove would do all that, but that was not cooking. Needless to say, the next account was not so heavy.

Another thing we can do is to introduce prepayment meters. There is a very wide field for them, because they are suited, I may say, to an almost entirely new class of consumers, and can be fitted with advantage to very small houses or shops. I have a considerable number in Portadown, and am adding to them. Most of my prepayment consumers were burners of oil, and now they tell me that they would not like to go back to oil again. We are to have a paper from Mr. Ross, of Dungannon, on prepayment meters; and I am certain we shall benefit by his



experience, which he will freely give us. So, therefore, I will say no more about them, only this—fit up as many of them as you possibly can in houses and shops where oil is at present used.

And as we try to extend our business by supplying cooking-stoves, prepayment meters, &c., we must not overlook the apparatus inside the works gate. Get the best apparatus you can, and when you have got it do not neglect it, but keep it always in thorough repair and working order. I hold that if a works will not pay to be kept in thorough working order, you need not expect it to do so if you neglect it.

And do not overlook the distributing plant; for it will not pay to make gas, and let it escape through badly laid main and service pipes. One great enemy—I might say the greatest we have to mains and services—is the traction engine. No doubt it is a great convenience in a large number of ways; but when we see it passing along our streets dragging a huge steam-boiler, or a string of heavily-loaded trucks, how we tremble for the safety of our pipes which it is passing over. Not only have we the trouble and expense of repairing them when broken, but there is the risk of escaping gas getting into drains, and doing great damage, even to the loss of life, as was the case in Drogheda about two years ago. To prevent this as far as possible, mains and services should be laid as deep as can be, so that there is a fall to the water traps. It cannot always be done; but where possible mains should not be less than 2 feet from the surface.

We all know that, however careful and painstaking we may be to give our consumers the very best and purest gas we can make, our efforts are often frustrated by the way consumers use it, or rather, I should say, misuse it, after it has passed the meter, and is beyond our control. If meter-rents are charged, they will, to save the extra rent, insist upon a 2-light meter, when it would require a 3-light to pass the quantity of gas sufficient to properly light the house or shop. And in the same way they insist on a 3-light meter when it should be a 5-light, and a 5-light when it should be a 10-light, and so on in proportion. Of course, the meter cannot do it; and they blame the gas. Another cause is small pipes badly laid. Houses and shops are nearly always gas-fitted by contract—the lowest estimate taken. Pipes are laid in the quickest and easiest way. All may do well for a short time, but soon water gathers, and the lights begin to jump; or a few more lights may be put upon the already too small pipes and overtaxed meter. No consumer ever thinks of blaming himself for having taken the lowest estimate, nor the gas-fitter for not doing his work properly. But again the cry is "Bad gas." It has often been said that gas companies should take gas-fitting into their own hands. If they did so, I believe it would be for the benefit of the consumer as well as the gas company. But I for one would not like to incur the risk; for now under the Workmen's Compensation Act I am afraid they would be accountable for a very great deal more than they will be if every consumer fits his premises by his own gas-fitter. This is a new Act; and as yet we have no experience of its working. Mr. Gibb, of Newry, has been studying it, and will open a discussion upon it, when we shall better understand its provisions. If gas consumers could be got to pay more attention to their pipes and fittings, and to use the best lamps and burners, we would soon cease to hear the oft-repeated cry of "Bad gas," and the consumer would have a better light for his money.

We very often hear the phrase used—"Educate the people, educate the people." I perfectly agree with that. Yes, educate the people. More especially would I rejoice if we could educate gas consumers, whether they be town commissioners or private individuals, to understand that gas companies are always willing to supply them with any quantity of gas they require, provided always they pay for it. And if their houses and shops are not properly lit, the fault is their own, and not the gas company's. The same applies to the lighting of our public streets. Let the ratepayers understand that the efficient or the inefficient lighting of the streets does not lie with the gas company, but with themselves, through their representatives, the town commissioners.

I observe that inclined retorts are being adopted in quite a number of large works in England, and are giving great satisfaction. They, however, are not suitable for small works such as ours. I believe the generator or regenerative system is better suited for our works. I have lately seen some settings on the generator system with a sunk chamber of only 3 ft. 3 in.; the retorts being kept at a splendid heat with four-hour charges on a fuel consumption of 30 per cent. of the coke made.

At present I am building a new bench of three ovens, with six retorts in each, on the generator system. The sunk chambers are 5 feet deep. I would have been pleased if the work had been far enough advanced for you to have seen the plan of the flues, combustion chamber, &c.; but it is not so. I hope that at some future meeting I may be able to tell you of the results obtained by this setting.

One thing you will see at our works, which will be new to some of you, is a columnless spiral-guided gasholder on Gadd and Mason's principle. It is 60 feet in diameter, by 20 feet deep, with a hydraulic cup for telescoping when required. It was erected in 1893. It rises and falls very steadily, even in the heaviest gales of wind. I have had no trouble with it, except once during the extra severe frost of the winter of 1894. The ice had frozen very hard on the water in the tank, and round

about the inlet and outlet pipes. When the holder went down with the spiral motion it pulled the pipes with it; the joints at the ducks-foot bends gave way, and the pipes filled with water. I had to empty the tank, and get all set up again; but it has worked well ever since. Another thing which will be new to most of you is a Weck's centre-valve for a set of four 12-foot square purifiers, with 12-inch connections, which I erected two years ago.

At present I am cutting out an old gasholder, and converting the tank into a tar and ammoniacal liquor tank, or rather into two tanks—one for tar and one for liquor. If any of you are contemplating doing anything in that way, you can see the plan I am doing mine on, and it may be useful to you.

There has been a good deal of discussion lately about the standardizing of meter-unions; and I hope that there will be some practical result from it. Mr. Auchterlonie, of Mullingar, is to open a discussion on this subject; and I hope the result will be that the various meter makers will agree to make unions all to one pattern and pitch of thread.

Another thing I may mention, and I think it would be as useful as the unions—that is the standardizing of retorts. If this could be done retort makers could always have a stock on hand, the same as they have of bricks. Then we would be saved the waiting, sometimes of months, before our orders can be supplied.

And now, as you will be anxious to hear the papers read, I will not detain you any longer. I trust the meeting to-day will be for our mutual benefit.

Mr. E. STEARS (Lisburn) proposed a hearty vote of thanks to the President for his address. He said it was very difficult to get anything new to say in an address to an Association like theirs; but he was sure Mr. Nisbet had acquitted himself to the satisfaction of everyone.

Mr. G. R. LOVE (Dundalk) said they had all listened with pleasure to the very interesting address they had had from the President. It was, perhaps, not full of elaborate phrases, nor yet of finely turned points; but Mr. Nisbet had given them his own practical experience, which was backed up by a great deal of reserve power. He (Mr. Love) might just say, in passing, that in one point at least he thought the President had been napping, for neither generator nor regenerative retorts had anything to do with inclined retorts. He had, however, much pleasure in seconding the vote of thanks to the President.

THE PRESIDENT expressed his thanks for the kind remarks made.

#### PRESENTATION OF THE GOLD MEDAL.

THE PRESIDENT said that the next item of business was the very interesting and pleasant one of presenting the first gold medal which had been won by any member of the Association. There was only one matter for regret in connection with the subject, and that was that there were no papers presented for competition this year. He hoped the presentation of this medal to Mr. Patrick Egan, of Tralee, for his paper on "A Difference in Hydraulic Mains," would be an incentive to other members, and that next year the Secretary would be inundated with papers. Addressing Mr. Egan, he said it gave him very great pleasure indeed, as President of the Association, to present him with the medal, which he hoped would be held in his family as an heirloom. He was glad, in a number of ways, that it was going to a member in the South, because he had always a great leaning to that quarter; and he hoped it would be the means of bringing members to the Association therefrom.

MR. EGAN thanked the President for his remarks, and the members of the Association for having decided to award the medal to him. He felt that it should have fallen into more worthy hands than his. He could assure them that it would be a source of great pleasure to him. He would treasure it as long as he lived, and would do so more especially because it was presented by an Association like the North of Ireland Association of Gas Managers.

The medal is of chaste design, cruciform in shape, highly ornamented. It bears on one side the inscription: "Presented to Mr. Pat. Egan, Tralee, for a paper on 'Hydraulic Mains,' August, 1897;" on the reverse side, the inscription: "North of Ireland Association of Gas Managers."

#### PLACE OF NEXT MEETING.

THE HON. SECRETARY stated that in Committee Mr. Llewellyn had spoken, in the name of Mr. C. A. Spear, of Dublin, one of their extraordinary members, who was proprietor of several gas-works in Ireland and the lessee of several Government gas-works, with regard to the place for their next meeting. Mr. Llewellyn and Mr. Auchterlonie had both the pleasure of working under Mr. Spear, and who had sent a request by Mr. Llewellyn, that the Association might hold their meeting next year in some town with which he was connected; and that, if they did so, he would give them a hearty reception, and entertain them royally.

MR. LLEWELLYN said the works with which Mr. Spear was connected, and which he authorized him to mention, were Mullingar and Athlone.

THE HON. SECRETARY said they had been talking of Dublin.

MR. LLEWELLYN said that he had no authority to mention Dublin.

MR. T. HANDS (Enniskillen) thought they should go to Athlone.



Mr. R. ROSS (Dungannon) seconded Mr. Hands' proposal. Mr. FRIZELLE proposed Dublin, and the proposition was seconded by Mr. J. O'GRADY (Mountmellick). A show of hands was taken; and it was decided, by 19 votes to 10, to meet in Dublin.

#### THE GOLD MEDAL COMPETITION.

THE PRESIDENT asked whether the members thought they should offer a gold medal for competition next year.

Mr. A. GIBB (Newry) proposed that they should offer one for another year; and, in order to give the Hon. Secretary time to know what to do, they should make the time for sending in papers the 1st of May next.

Mr. AUCHTERLONIE seconded the proposal; and it was agreed to.

#### PAPERS AND DISCUSSIONS.

Mr. R. ROSS (Dungannon) read the first paper, entitled—  
EXPERIENCE WITH PREPAYMENT METERS.

As some of the members may be contemplating the desirability of introducing prepayment gas-meters, perhaps I may be allowed to give my experience with them. In doing so, I would mention that, as far as it has been possible to obtain information, I claim to have as many—if not more—of these meters in use as there are in any works in Ireland. Up to date, I have over one hundred fixed, and more wanted.

We entertained the idea of introducing prepayment meters in the summer of 1896, and obtained samples from about five firms. We determined on using nothing less than 3-light meters. On testing them, we found there were only two firms whose meters we could depend on. Having decided as to the meters, we issued circulars among those whom we expected would respond; and we had applications coming in faster than we expected, or than we could attend to. In our circular, we proposed to put in a service, fix a meter, and put up one, two, or three brackets free of charge; the meter and fixtures remaining the property of the Company, and removable at any time.

We commenced about August to fix the meters; and before the end of the year, we had about sixty at work. From March, 1897, to March, 1898, the gas consumed in these meters amounted to between 300,000 and 400,000 cubic feet. This is not a large quantity; but still it has increased our revenue.

In other places where prepayment meters have been introduced, they charge a small percentage over and above the price to ordinary consumers; but in our case we did not do so. Quite the reverse, as on calculating the gas to be supplied for a penny at the same amount as ordinary consumers paid, there was half a cubic foot over; and we gave this half foot to the consumers. Therefore the prepayment meter consumers have gas this much cheaper than the ordinary consumers.

The cost of fitting up the houses, including compo. pipe, brackets, fitters' time, and service, amounts, on an average, to about 30s., exclusive of meter. In kitchens or halls, we gave a strong wing or mantelpiece joint; and in bedrooms, a neat bronzed bracket, with gallery, but no globes. The smallest compo. pipe used is not less than  $\frac{3}{8}$ -inch; and, unless asked for, we supply nothing larger than a No. 3 burner. The greater portion of the consumers have invested in an economizer, slipped over the burner. This certainly increases the light; but it does not reduce the consumption of gas.

At first, I had a lot of trouble with the consumers as to the number of hours the pennyworth of gas would last; and one party would say that theirs burned for 6 hours, another 6½, and so on. I was also told by some of the consumers that, unless they got a meter the same as so-and-so, which gave light for two hours longer than theirs, they would abandon prepayment meters. But I found there were two or three of the consumers who were circulating false reports as to the number of hours their meters gave light, in order to annoy those who were discontented; and on this being explained, the trouble ceased. The pennyworth of gas lasts with a No. 3 burner about 4 hours; and with a No. 2 burner, 5 hours.

I had some trouble also with consumers owing to the fact that they would only put in one penny and allow the gas to burn out. Of course, as the valve closes gradually, they were thus, at the latter part of the time, with very little light. But I advised them to put in sixpence or a shilling in coppers; and showed them how to ascertain at any time how much gas was still due to them. Now each consumer knows what he burns weekly, and puts in the box as many coppers on a Saturday as will give him light during the week.

At first I was much troubled with crooked pennies; some nights as many as six of the consumers sending complaints that they had put in a penny, but that the handle would not turn, and they had no light. Of course, I had to go and get the pennies out; and sometimes this was rather troublesome. But the beaten-out penny is worse, as I had to uncouple the meter, turn it upside down, and insert the blade of a knife to get the coin out. However, the consumers are now getting more cautious, and examine the penny before putting it in the meter.

Another trouble I found was that in some of the meters the money-box was not tight up to the sides of the case, and one copper got jammed between the box and the case; another followed, and so on, until the mechanism became jammed, and the box had to be opened to relieve the coppers. But I splayed out the top of the boxes of those that thus troubled us; and made

them fit tight to the side of the cases, and thus prevented the coppers jamming.

We have up to the present time removed the coppers quarterly; but in the quarters ending December and March, a good many of the boxes are full. I have got as much as 30s. from some of them; and there are a few where I have had to go and take out some coppers and replace with silver, as the pennies have no fall. I believe it would be better to remove the coppers monthly, at least in winter.

I was asked to call on one consumer, who informed me he had put in a half-crown by mistake, and the meter was stuck. I had to disconnect and turn the meter upside down before I could get the coin out. In two other instances, I got a two-shilling piece among the coppers. These had been put in by mistake for pennies; and of course I returned them.

Now that the consumers are getting used to the meters, and taking care about the crooked and beaten-out pennies, there is very little trouble with them; and we have a class of consumers who would not be secured in any other way. They appreciate gas, and not one has given up his supply. With the exception of two or three, they are all new consumers. These two or three were parties who were rather dilatory in paying their gas bills; and they requested to be provided with a prepayment meter. I asked why they wanted them; and they told me that in their case, when the quarter came round, they had some trouble in finding the money for the gas. But they would never miss a penny now and again with the prepayment meter; and when the quarter expired, the money was there in the box for the gas. It is really surprising the number of pennies that are obtained from some boxes, in the houses of the poorer classes. In some instances, they are rather astonished when the money is being counted out of the boxes.

I shall have some more of the meters to fix, as there are more applicants, but not to any great extent. All who have adopted the system are well pleased; and although it adds to the duties of the manager, and leads to him being called out at untimely hours—in some cases to unfix a crooked or beaten-out penny—he is thanked for his trouble. We have added somewhat to our consumption, and are well pleased with the results.

We find no trouble in disposing of the coppers, as between the mill, the factory, and the bank we get quit of them all. But £34 of coppers is no joke to get removed from the boxes, counted, and put away in lots. It takes some time, and involves some trouble.

Since writing the above, I have seen that at the annual meeting of the North British Association of Gas Managers, held on July 28, Mr. Andrew Wilson, of Perth, said there were 1100 penny-in-the-slot meters in working-class houses and lodging-houses in Perth, and that these meters gave the best pecuniary return. Mr. Ballantyne, of Rothesay, said this type of meter had a great future before it; and Mr. T. Wilson, of Coatbridge, said there were 1400 of these meters in use in his town, and that they now gave 28 cubic feet of gas for 1d. Very few of us, at least in inland towns, can give that amount of gas for the penny; but in Coatbridge they can well afford to do so, as I saw not very long ago that they can get coal laid inside the works at 6s. 6d. per ton. Some of us pay that amount per ton as freight from Belfast. The meter is seemingly going ahead in Scotland, as I also see that they are going to introduce it in Paisley. But think of the enormous number of these meters in use belonging to the great London Gas Companies—the Gaslight and Coke Company with 90,000, and the South Metropolitan Company with 72,000, and to each of which is attached a small gas cooker. At one collection they lift over 12 tons of coppers in lorries.

#### Discussion.

THE PRESIDENT said they had heard Mr. Ross's statement as to how he had succeeded with penny-in-the-slot meters. If any gentlemen present were contemplating introducing them, he was sure Mr. Ross would give them any information he could. He (the President) himself had a few of these meters in Portadown; though not so many as Mr. Ross—he wished he had. However, he had somewhere about forty, and he found that the people were very well pleased with them. They gave a little more trouble than other meters, but they paid.

Mr. T. HANDS (Enniskillen) asked the number of feet of gas Mr. Ross gave for 1d., and the cost of putting the meters in.

Mr. ROSS: About 30s. each.

Mr. HANDS said he had tried every maker's meter, and had a number of prepayment meters giving satisfaction. He remembered putting one in for a shoemaker, who would say to his customers: "Just put a penny in this slot, and you will see a bird come up and sing." A good many pennies were got by him in this way, and so he had his gas for nothing. He (Mr. Hands) had had a great deal of trouble with the meters; but he now thought that they were the backbone of the gas industry. The money was in them, and they secured consumers whom they could not get before, because they had not the money wherewith to pay a quarter's bill.

Mr. G. R. LOVE (Dundalk) remarked that Mr. Ross was much more go-ahead than he would be. He found that he had about a hundred meters fixed, and that he supplied compo. pipe, bracket, time, &c., at a cost of something like 30s. each. The Company Mr. Ross represented spent about £150 of capital upon these meters for the sake of getting a few additional consumers. This



might be of little consequence where the population was settled; but if they had a shifty population, it would be a considerable loss, because they might have to remove the brackets. Mr. Ross pointed out that consumers often got half a cubic foot of gas cheaper than consumers with ordinary meters. This was an unusual thing, because nearly all gas companies charged something extra to prepayment meter consumers. He thought Mr. Ross's Company were dealing exceptionally liberally with these consumers; and he did not think that anything that was supplied in this way for nothing was appreciated so much as it would be if they charged a little for it. He did not consider that he would go so far as Mr. Ross in this respect. Like Mr. Hands, he would be glad to know the quantity of gas Mr. Ross gave for 1d. As for his troubles, these also added to his expenses. He had more collections; he had the coppers to take up, which he had not with ordinary meters; and he had the coppers to dispose of. This entailed a good deal of trouble and expense beyond the £150. He thought it was unprofitable thing to go on on the lines laid down by Mr. Ross; and he (Mr. Love) certainly should not like to submit such a scheme to his Directors.

Mr. T. FRIZELLE (Holywood) said Mr. Ross's experience had been a very instructive and interesting one. Anything which tended to increase the consumption of gas would be hailed by every gas manager. The prepayment meter had been a great boon to them, as well as to consumers who were not in a position to pay quarterly accounts. In the first place, it removed the cause of accident in the matter of oil lighting, which had led to so many deaths; and it furnished a light on easy terms. The Company he had the honour to serve introduced prepayment meters about twelve months ago. They also held an exhibition of gas-stoves. The result had been very satisfactory. They had eighty slot meters in use; and almost all the consumers who used them were new, having been previously oil burners. The consumption of gas with each of these meters had been about 7000 cubic feet, and they had not been working for a full year. The price was the same as was charged by Mr. Ross; and they gave 20 cubic feet of gas for 1d. His Directors had also resolved to pay for the brackets, as well as the service-pipes put into all houses the valuation of which did not exceed £8. He could assure the members that these meters were the means of bringing gas within the reach of consumers they would not otherwise have. They, as managers, liked augmented consumption; and so did their Directors, for the reason that the profits were increased, which was a sign of progress. From the 80 meters he (Mr. Frizelle) had, they had lifted £110 5s. Mr. Ross did not lift so much with his. He had no reason to regret putting in prepayment meters; and his Company were recovering any expenses they incurred in connection with them.

The HON. SECRETARY said he felt the members were very deeply indebted to Mr. Ross for bringing the subject of prepayment meters before the Association. He would very much like some of those who had not had experience with prepayment meters to ask questions of Mr. Ross, because he was sure they had been thinking about these meters, and there might have been difficulties in the way which prevented their adopting them, and things might have occurred to them which Mr. Ross, or some others who had had experience, might be able to clear away. His own experience agreed to a large extent with that of Mr. Ross, though he had not pushed the thing as that gentleman had done. He had had too much to do, for one thing; and for another, he had often been uncertain in regard to the policy, which had been disputed, of fitting up houses for prepayment consumers. He had not attempted anything of the sort. He treated these consumers just as he treated ordinary ones. The Company put in the service-pipe through the wall, and supplied them with a slot meter. The people themselves connected this with the service, and laid what pipes and fittings they wanted, and had the gas at the same price as the other consumers—22½ cubic feet for 1d. They had experienced some of the troubles about which Mr. Ross had spoken. The crooked penny was an awful nuisance. Sometimes he had to send a meter back to the maker because he could not get the penny out. He had never found a paper disc in a prepayment meter; but he had had soda-water capsules beaten out. The finding of one of these things led to a row or a threat that the meter would be taken away. A prepayment meter was not in the same position as an automatic machine at a railway station, because, in the case of the meter, they knew who put in the bad coin. He had only about 45 penny-in-the-slot meters in use; and the average return from them was 30s. or 32s. a year. Last year, he had £78 out of 44 meters. He found that the average number of these meters in use kept about the same. After they had had a customer for some time with a slot meter, and found he was doing right, they occasionally gave him an ordinary meter; but then somebody else would possibly be applying for a slot meter. People did not go to the expense of fitting up their houses for the use of gas without having made up their minds to burn it; and when once they had incurred the expense, they would think twice before they gave it up. In getting a number of new consumers, they had not to look at the £150 they expended to secure them, but to the million or so cubic feet more gas which they would sell in a year. Beyond this, there were staff expenses which did not increase with the quantity of gas produced. The cost of the extra gas made was little more than the price of the coal. They could therefore well afford to supply the gas cheaper, even in the first instance,

because they were bringing in a new set of customers. He thought there were two ways of looking at this question. While Mr. Love might be very clear in his opinion, there was plenty to be said on Mr. Ross's side too; and he believed that if the latter gentleman found it pay him, he would not care very much what others might say.

Mr. E. STEARS (Lisburn) said he had found it to be a very great drawback that he could not furnish a supply of gas without a deposit; but prepayment meters obviated this. He gave 20 cubic feet for 1d., and sold gas by ordinary meters at 3s. 6d. per 1000 cubic feet, which was practically the same. But the great advantage of the prepayment system was that, if there were fittings in the house, the consumer had a slot meter put in free. He did not go past the meter. These meters gave him no trouble. One or two pennies might stick; but this was a trifling matter.

Mr. LOVE said he forgot to mention that he had a great number of prepayment meters attached to cooking-stoves, in the use of which they were a great help. He supplied gas for cooking, heating, and motive power at 7½d. per 1000 cubic feet less than for lighting; and he had separate services.

Mr. A. GIBB (Newry) thought prepayment meters were a very useful adjunct to gas-works. By them a manager could get at a class of consumers who never could be reached otherwise. As had already been said, there was a difficulty in getting 5s., 10s., or 15s. at the end of a quarter; but they could obtain far more than this by the prepayment meter. People were in the habit of buying a pennyworth of oil, and never thought of the penny—it was the come-at-ableness of the thing they thought of. It was not so with 5s. or 10s.; but people dropped a penny into a prepayment meter now and again, and the consequence was that, in small greengrocery and the like establishments, they would now go in for a very large supply, and by this means they considerably increased their consumption. He had only had prepayment meters for two years and a half; and he had never canvassed anybody to take them in. The first half year he sold 47,409 cubic feet by two or three of them; the next year it was 121,767 cubic feet; and last year, with 32 meters, he sold 1,085,395 cubic feet. So that they were going quietly along, and were substantially increasing their consumption. Moreover, they were not asking anyone for a deposit. They connected the meter, and the consumers did all the inside fitting themselves. He thought that if gas managers were to try to cultivate the introduction of penny-in-the-slot meters, they would find that they would lead to a large additional consumption of gas. He had, on two occasions, found a two-shilling piece instead of a penny. He had very great satisfaction in testifying to the worth of the paper Mr. Ross had brought before them.

Mr. STEARS mentioned that the man he sent out to collect the money took with him a bag for every meter, into which he put the money, and did not count it before the consumer. He thought this was a very good plan, because they might think they were consuming too much gas if they saw how much money there was.

The HON. SECRETARY, Mr. GIBB, the PRESIDENT, and Mr. HANDS remarked that this was their plan.

Mr. Ross, in reply, said Mr. Love complained about giving half a cubic foot of gas by way of abatement; but his object was to increase his consumption. About six tenants who had prepayment meters in his place had shifted; and the houses they left had been more readily taken because the gas-fittings were all in. He did not charge meter-rents, for either prepayment or ordinary meters. He gave 15 cubic feet of gas for 1d., which came out at about 5s. 6½d. per 1000 cubic feet. It was a point in his favour that in some houses, where they would not give perhaps 10s. for all that was in the place, they might now get 15s. for gas. He was perfectly satisfied. He had increased his consumption, and expected to increase it more. He had one cooker attached to a prepayment meter, and possibly by next year he might be able to tell them something about the application of prepayment meters to cookers.

The PRESIDENT expressed his pleasure at the interesting discussion they had had. He pointed out that one thing which they had all forgotten to mention was that if they had a consumer using an ordinary meter, and had any difficulty in getting money from him, they could simply put in a prepayment meter, and then they would get their money down. He gave 20 cubic feet of gas for 1d. It should really be 22 feet; but the meters cost a good deal more, and they had to charge accordingly.

Mr. A. GIBB (Newry) read the following paper:—

#### THE WORKMEN'S COMPENSATION ACT, 1897.

The 1st of July, 1898, will be long remembered by those who are engaged in the manufacturing and mechanical industries of the three kingdoms as the day on which the Workmen's Compensation Act of 1897 came into operation. Its framers cannot be blamed for loquacity or want of incision in every detail of the measure. It has only ten sections, with their sub-divisions; and, leaving out the two schedules, it occupies only six pages. Yet within this small compass great issues are comprised. How the Act will operate on the various industries of this country is a subject of pure speculation. If employer and employed work in friendly agreement, much heart-burning and jealousy will be avoided, and freedom of action will ensue; and the sound of the hammer and the shuttle, and the roar of steam, will make



glad the inhabitants of the land. In introducing this subject to your notice, my object is to elicit your opinions on this important measure, the scope of which I will briefly indicate.

Section 1 states that compensation must be given for any accident causing personal injury, if of more than two weeks' duration. The only disallowance that can be claimed by the employer is where "serious and wilful misconduct" on the part of the workman can be substantiated. But here a difficulty arises. What constitutes an accident? And what is contributory misconduct? Sir R. T. Reid, Q.C., M.P., in the case of the Lancashire and Cheshire and North Wales Miners' Relief Societies, defines an accident as "an occurrence out of the ordinary which produces death or disablement from work." There must be some casualty or special occurrence. Death or disablement not produced by a particular occurrence to which one can point, is not a case of "accident" within the rules which have been framed under the Act. And even if a particular occurrence can be indicated as a cause, there is no accident if it is "something which comes in the ordinary course in the work the man undertakes." In most cases, an "accident" is accompanied by something in the nature of violence—a fall, a blow, or an explosion. However nicely one may adjust the definition of the word "accident," there will always be cases on the borderland.

Sub-section 2 (c) sets forth that if it is proved that the injury to a workman is attributable to the "serious and wilful misconduct of that workman," any compensation claimed in respect of the injury is to be disallowed. This sub-section will form the framework of all litigation under the Act, as the difficulty will be to define "serious and wilful misconduct."

Section 2 specifies the time of notice, and explains how one is to proceed in different cases. There is a limit to the time of recovery under the Act. Notice is to be given as soon as practicable, and before the workman voluntarily leaves his employment; and the claim for compensation must be made *within* six months—in the case of death six months from the time of death. "Months" here means calendar months.

Section 3 indicates the duties of registrarship. Where the employer wishes to contract out of the Act, the scheme is to be laid before the Registrar of Friendly Societies for his approval or rejection, according as the terms are better or worse than the provision of the Act. While the Bill was passing through the House, great stress was laid upon a scheme of mutual agreement between the employer and the workmen.

Section 4 deals with sub-contracting, where the undertaker becomes liable for all accidents. It is enacted by sub-section 3 that the section "shall not apply to any contract with any person for the execution by or under such contractor of any work which is merely ancillary or incidental to, and is no part of, or process in, the trade or business carried on by such undertakers respectively"—to wit, the erection of gasholders or other appliances connected with gas making.

Section 5 stipulates that compensation to a workman is not to be affected by bankruptcy, but is to be a first charge on the estate.

Section 6 provides that, in cases where legal liability may rest on some other person than the employer, the workman may elect to proceed against that person; but two actions cannot be taken on the one case. If the employer should have to pay compensation under the Act, he is to be entitled to indemnification by the other party.

Section 7 sets forth the employments to which this Act applies; gas-works being included in the section.

Section 8 exonerates persons engaged in the naval or military service of the Crown.

Section 9 declares contracting out of compensation existing at the commencement of the Act to be void.

Section 10 specifies that the Act may be cited as the Workmen's Compensation Act, 1897.

The foregoing is a bare outline of this important Act. Why the conductors of gas-works, with which we are immediately concerned, should be called upon to pay the increased rates of insurance for their workpeople demanded by the various Insurance Companies is a puzzle to me. If we take the accidents which have happened in connection with gas-works, and compare them with other industries, there is a very clean sheet presented on their behalf. Of course, the Insurance Companies wish to protect themselves; and they are perfectly right in doing so. But their demands at the present time are exorbitant, and out of proportion to the risk; some of them quoting 25s., and others different rates down to 7s. 6d. per £100 of wages paid. Those of you who read the technical papers will have seen the various insurance plans proposed; and therefore I need not take up your time in dealing with them. Mr. Chamberlain says the object to be attained by the first clause of section 3, where reference to registrarship is introduced, is that "we do not wish to prevent a workman doing better for himself, by the consent and with the goodwill of his employer, than legislation can do for him." If you will refer to Vol. LXXI., p. 1328, of the "JOURNAL OF GAS LIGHTING," you will find the report on the first six months' working of the accident fund of the South Metropolitan Gas Company, where full details are given. I have no doubt that, after the Act has been in operation a year or two, Insurance Companies will have obtained data to enable them to reconsider and greatly reduce their present high charges.

And now, in conclusion, I have only to express the hope that

it may be a long time ere the company or the corporation of any gas manager will be brought within the grip of the Workmen's Compensation Act of 1897.

#### Discussion.

The PRESIDENT said that none of them had had any experience of the Workmen's Compensation Act; and it was to be hoped it would be a long time before they had any. Had the members anything to say upon it.

Mr. G. R. LOVE (Dundalk) was sure they were all indebted to Mr. Gibb for bringing the subject before them. It was one which interested every gas manager. He had no doubt but that a great many of them had been considering the question—they had been forced to do so, owing to their position under the new Act. Previous to the last meeting of The Gas Institute, his Directors had been considering the matter; and they had asked him to keep his ears open, in order that he might be able to give them guidance upon it. The discussion which took place at The Gas Institute meeting, upon the paper by Mr. Ellery, to his mind, fully opened up the subject. It gave him one or two good hints in the matter. One gentleman—he forgot his name—advised them not to insure under the whole Act, and said he considered that if they covered themselves against risk from fatal accidents only, for twelve months, by that time the Insurance Companies would have settled down, and it would be better known what the amount of their charges should be. After he got home, he turned up the file of the "JOURNAL OF GAS LIGHTING;" and he had made a list of all the accidents reported for the year 1892. He found that the number of deaths which occurred during the twelve months from accidents in gas-works that were reported was 18; the number of serious injuries was 8; and of slight injuries 10. He could give the details, if they were asked for. Considering the number of men employed in gas-works, this was a very slight list; and the gentleman who advised them to cover against deaths only, gave them good advice. He therefore recommended his Directors to insure only against fatal accidents. They effected an insurance of this sort, for a premium of 5s. per £100 of wages paid. Down till this year, they had been insured under the Employers' Liability Act and at common law, at a cost of 2s. per £100 of wages. His Directors thought it would be a wise thing to continue the old policy; and so they were now insured under all forms of liability. He had been seven years in Dundalk; and he had never had an accident of any kind. He supposed that nearly everyone present could say the same of accidents. He had asked himself why it was that the Insurance Companies were seeking such a high premium as 25s. per cent. Some Companies reduced this to 12s. per cent.; but they reserved certain things which might have made almost inoperative any policy at that rate.

Mr. T. HANDS (Enniskillen) said that it might be well for them to ascertain, first, whether the Act applied to them. He believed that men who were employed laying mains, and the like, did not come under the Act. He had been seven years in Enniskillen, and had had no accident; though, of course, he could not say how soon he might have one. But why should they be compelled to pay exorbitant rates? Owners of gas-works should combine, and should set aside a small percentage upon the wages they paid; thereby letting the Insurance Companies see that they could do without them. He believed then that in a few months the rates would be reduced, and they would be able to insure their workmen without paying unreasonable rates.

The HON. SECRETARY said that Mr. Hands had just struck the question which was in his mind. He did not know, one way or the other; but suppose they were not under the Act. It was, he thought, important that they should have some information upon this; and he had been waiting for the meeting to see if any would be forthcoming. The Act said that whatever works it applied to must be works where steam, water, or other mechanical power was used. He could understand, with reference to large gas-works, where mechanical power was used for the handling of coal, coke, and the like, that they should come under the Act. But there were many small gas-works, in which there was no mechanical power, not even an exhauster; and the question was whether these were not entirely outside the Act. Then there were gas-works in which the exhauster was often idle during the summer. Would these works be within the Act when the exhauster was working, and outside when it was idle? But there were, in addition, many gas-works in which manual labour only was used. It was a question whether they were, or were not, within the limits of the Act. The position of his works was such that they suffered severely in storms. Almost every storm damaged their roofs. If a slate were to fall upon a man and hurt him, what would that have to do with mechanical power? and why should it bring them within the limits of an Act of Parliament like the one in question? It was quite right that they should pay for the protection of their workmen; but it seemed to him to be hard that they should be called upon to pay such an exorbitant sum as the Act stipulated. It said that they should pay nothing less than £150, or three years' wages when they went over that. The accidents at his works were very trifling. He had been fifteen years at Armagh; and he had never had an accident which would come under the Act. He brought the matter before his Directors; and they told him to do what he could. He informed them that the Gas Associations were looking into the matter, and wanted to see whether something could be done, by mutual



insurance or otherwise. Before he sat down, he wished to remind them of the communication from the North of England Gas Managers' Association. They might pass a resolution upon this communication; and he thought they could not do better than work in harmony with other Associations.

Mr. P. HURLL (Glasgow) said that this was a subject which had given the people in his trade a great deal of trouble. The wages which they paid amounted to about £16,000 a year. They commenced to make inquiries as to what the rates of insurance on this sum would be; and they found that it would be 30s., or at least 25s., per cent. They discovered that there was a combination among some Insurance Companies. They held out for a little, and found that there were some other Companies, outside the ring, who were trying to secure the business at much lower rates. At a meeting of the trade which was held they considered whether they should not join together and run a small mutual insurance company. Then they had an offer from a firm of accountants in Glasgow, offering a rate of only 10s. per cent. They held another meeting, which was attended by eight or ten firms, paying a good round sum of wages; and they said "No; we will form a mutual society rather than pay these rates." So the matter was really left in his hands, to do the best he could for the whole of the firms in the trade. He thereupon obtained a quotation of 7s. per cent. for all their above-ground workers, and of 9s. per cent. for underground workers. They considered these very moderate rates indeed; and they closed for about eight or ten different concerns, on these terms. Their previous rates were about 3s. 6d. per cent.; so that they were now about double what they previously paid. It was the Ocean Insurance Company they insured with; and the accountants who were acting for them said it was only experimental, and that possibly at the end of the year the rates would be reconsidered, perhaps reduced. He did not think that because in gas-works mechanical power was not employed, their owners were relieved of responsibility. If they considered the case of a quarry, where there might be no mechanical power, but where the stone was being carried out in a hand-barrow, the owner was liable.

The HON. SECRETARY: But a quarry is specifically mentioned in the Act.

Mr. HURLL said if they took the case of a builder, if a scaffold gave way, and a man fell with it, the builder would be liable. He thought that, if gas-works owners were depending on getting clear of any claims under the Act, on the ground that they had no machinery, they would find they were making a mistake.

Mr. J. W. AUCHTERLONIE (Mullingar) said he believed that the only occupations which were left out would be agricultural labourers, seamen, workshop workers, and builders under 30 feet high. He approved of the mutual insurance system, because, if premiums were found to be too high, they would be reduced next year. He thought they, as an Association, certainly ought to support the North of England Association. He moved that they support the idea of mutual insurance, unless they were offered more favourable terms.

Mr. T. FRIZELLE (Holywood) supposed that, as managers of gas-works, they had no authority, as delegates to the Association, to speak for the owners of the works. The Company he represented had insured at 12s. 6d. per £100 of wages. They thought it was better to do this in the meantime, and to see how the Act would work.

Mr. T. LLEWELLYN (Newbridge) thought that the question of gas-works proprietors coming within the operation of the Act or otherwise, was one which was a little beyond their debating powers, as gas managers. It was purely a legal question, which would have to be fought out in a Court of Law, if an accident occurred in their works. Then they would probably learn, with some practical and unpleasant results, that gas undertakings were liable for any injury which might be sustained by the men in the works. Personally they were not much interested in this responsibility, because they were servants of the gas company, and not proprietors of the works; but really, he thought, it would be an erroneous idea to go forth from the meeting, that they considered there was no liability for injuries in gas-works, or that they had no cause to regard the Act as binding upon them.

Mr. LOVE said he was not certain, from memory; but he thought that at The Gas Institute meeting it was stated that legal opinion had been obtained, to the effect that they were under the Act.

Mr. S. B. LANGLANDS (Coleraine) said that immediately after he learnt what The Gas Institute had to say in the matter, he brought the subject before his Committee; and they thought it wise to insure. They had done so, at the rate of 20s. per £100. They obtained Counsel's opinion in the matter, and were advised that they were liable under the Act, for any person in the works—even the employee of a sub-contractor.

Mr. LOVE suggested that, as they had not any authority from their companies, they should, in the meantime, thank the North of England Association for their communication, and inform them that, while they had discussed the subject, they were not at present in a position to come to any decision upon it.

This was agreed to.

Mr. GIBB, in closing the discussion, said he had made an effort to explain and define the penal wording of section 1. Compensation for injury sustained by a workman might be viewed under three heads—first, as it stood in common law; secondly, as the Employers' Liability Act of 1880 affected the common law rights

(43 & 44 Vict., cap. 42); and, thirdly, as it stood on a new basis by the Workmen's Compensation Act, 1897. Legislation had been progressive since the reign of George III. The Mines Regulation Act, 1872, the Factory Act, 1878, and the Employers' Liability Act, 1880, culminated in the Workmen's Compensation Act, 1897. The Act of 1880 implied more generous treatment and conditions of employment; while the Act of 1897 compelled their adoption, and imposed new duties and obligations on the employer. "Personal injury" meant physical injury to person, and also injuries to the health. But, surely, where disease was caused by the action of a known natural agent it could not give rise to compensation. The word "accident" had already been defined. Thomas Bevan, B.L., afforded another as follows: "An occurrence which could not have been avoided by the use of the kind and degree of care necessary to the exigency, and in the consequence." He also gave two tests applicable in ascertaining whether an occurrence were an "accident" or not: "Was the result contemplated?" and "was the result the ordinary and natural sequence of the course of action preceding it?" If an "accident" arose out of the employment, or occurred while the workman was engaged in it, he was entitled to compensation under the Act, even though it was found to be due to the misconduct of a stranger. Section 6 regulated this right of the workmen. The converse of this, surely, ought to be equally applicable, and should constitute a "wilful" act. If the stranger or fellow-worker took the occasion of the workman being engaged in the employer's work to injure him by a wilful act, though the injury should happen while the workman was engaged in the employment, the injury would not "arise out of or be in the course of the employment." The civil liability of the employer was either at common law or under the Employers' Liability Act, 1880. As to "serious and wilful misconduct," contributory negligence could not be set forth as a defence. "Wilful" meant that the person knew what he was doing, and intended to do what he was doing, and was a free agent. "Serious" had not yet been defined or decided by any tribunal; but, in plain terms, it signified that which was grave, weighty, earnest, and important, in opposition to what was trifling and unimportant. Serious misconduct demanded attention, and could not be passed over. That which constituted serious and wilful misconduct was a subject of grave importance and rested to a great extent for the Arbitrator. (See Second Schedule, provision 4.) The Secretary of State might appoint legally qualified medical practitioners, so that any workman receiving weekly compensation, must, if desired, submit himself for examination to the medical practitioner. Should he refuse, the compensation would cease till such examination had taken place. (See First Schedule, Rules 11 and 12.)

#### MR. AUCHTERLONIE ON STANDARDIZING METER-UNIONS.

Mr. J. AUCHTERLONIE (Mullingar) read a paper on "The Standardizing of Meter-Unions," which contained the following passages: In the month of February last our Association (in common with kindred institutions throughout the United Kingdom) was asked by the North British Association of Gas Managers to co-operate in the standardizing of meter-unions. Our Committee unanimously approved of the proposal; and this being our first meeting since the receipt of the communication, I have been asked to introduce the subject for your consideration. But really so much has been said in favour of the proposed standard connections, and so little against them, that it would be almost useless for me to reiterate what has already been advanced by all grades of gas managers. . . . Those of you who were at The Gas Institute meeting will remember that the proposal was very favourably received, and ultimately left to the Council of the Institute to deal with. I have not much more to say, except that personally I approve very strongly of the proposed standard unions. It has been one of the many inconveniences that gas managers have had to contend with, especially managers of small gas-works. Another matter which ought to be taken in hand is the reduction of the infinite variety of retorts that are in use. Meantime, our thanks are due to Mr. Myers, and to the North British Association for what they have done in the matter; and I think that we to-day may safely agree to leave the matter to the Council of The Gas Institute, and heartily support them in carrying the object to a satisfactory termination.

#### Discussion.

The PRESIDENT said this was a very important subject. It would save them a good deal of trouble and annoyance in changing meters, if they had standard sizes for meter unions. He thought it was a matter which might be very easily settled. If the various Gas Associations could make up their minds to agree upon what they wanted, he believed the meter makers would give them meters all with similar couplings.

The HON. SECRETARY said he thought it was of great importance that they should have all gas-meter unions of the same size, especially where they had no gasfitters in their employment, because they would then be able themselves to remove a meter and put on one by another maker.

The PRESIDENT thought that if the matter were in the hands of The Gas Institute, and they intended to take some definite action, their Association should adopt a resolution which would



strengthen the hands of the Institute." They should, he thought, fall in line with the others, and support them in the matter.

Mr. G. CUMMINGS (Ballymoney) said that, like all subjects, this required to be looked at from both sides. It would do good in one way, but it might not in another. He had himself, rather than take out a coupling, altered the meter to suit it; and he had found this to be as useful as altering the coupling.

Mr. T. LLEWELLYN (Newbridge) thought that while they were agreeing to fall in with the standard unions for meters, it would be well that it should go forth from them, as an Association, that they would prefer to have longer linings for the larger sizes. Of course, they all were agreed on the principal idea—having the same sized couplings, so that meters might be interchangeable; but he believed that a little suggestion, such as he had proposed, would not be out of place.

Mr. S. B. LANGLANDS (Coleraine) said he had much pleasure in moving that they, as the North of Ireland Association of Gas Managers, express their gratification at The Gas Institute having taken up the subject of standard unions for gas-meters, and that they agree to support them in it; adding Mr. Llewellyn's suggestion as a rider.

Mr. A. MACKENZIE (Edinburgh) said they would find that, if they went in for finality, the meter makers would be pleased to do what they wanted.

Mr. A. GIBB (Newry), in seconding Mr. Langlands' motion, said that there had been discussions about going to the Board of Trade on the subject. He thought it was a matter which was altogether outside the jurisdiction of the Board of Trade. The Board of Trade had only to deal with capacity to measure. If the various Associations were pleased, the meter makers could adopt the uniform set of unions; and this would facilitate matters very much. He thought, also, that they should thank Mr. Auchterlonie for having laid the matter before them.

The motion was adopted; and Mr. AUCHTERLONIE returned thanks.

#### THE LUNCHEON.

At the conclusion of the discussion on the first paper, the members adjourned to the Town Hall, where they were entertained to an excellent luncheon by the Directors of the Portadown Gas Company. Mr. A. Thornton, the Chairman, presided, and, on behalf of the Company and of the community of Portadown, gave the Association a very hearty welcome, and thanked them for their visit to the town.

#### VOTE OF THANKS TO THE PRESIDENT.

The HON. SECRETARY, at the conclusion of the proceedings, proposed a hearty vote of thanks to the President, for his conduct in the chair.

The PRESIDENT thanked the members for their kind expression and vote. He said he was willing to do anything he could for the Association at any time. One thing he was sorry for, and that was that they had not had the presence of Professor Ivison Macadam. It was a great loss to them that they had not heard his lecture. There was another paper on the *agenda*, by Mr. Fitzsimmons, which they had not been able to take up for want of time.

This concluded the proceedings.

#### EXCURSION TO LOUGH ERNE.

On Wednesday, the members of the Association and lady friends travelled by rail from Portadown to Enniskillen, where they became the guests of Mr. D. D. Macpherson, of Manchester, one of the extraordinary members of the Association. A hurried visit was paid to the Enniskillen Gas Company's works, where they saw some of the astonishing appliances which the Manager (Mr. T. Hands) employs in the production of gas. They then joined the steam yacht *Widgeon*, which, by the way, was built, or rather rebuilt, by Mr. Hands, and is now a remarkably comfortable boat. Upon it the party were conveyed, amid the beauties of the incomparable Irish Lough Erne, to Little Paris Island, one of the gems of the loch, which is owned by Mr. Hands, and which has this year been occupied by Mr. Macpherson for some months as a holiday resort. Mr. and Mrs. Macpherson gave their visitors a hearty reception, and treated them right royally in a spacious and beautifully decorated banqueting hall on the island. Dinner over and a cordial vote of thanks having been accorded to their host and hostess for their hospitality, a cruise of an hour's duration was enjoyed among the islands in the neighbourhood. A return visit was paid to Little Paris Island, where a hasty tea was served. The party returned by the yacht to Enniskillen; Mr. and Mrs. Macpherson travelling with them, and seeing them off by train. As regards the whole gathering, it may safely be said that the North of Ireland Association have reason to be proud of it, whether as regards the quality of the technical matter discussed, the excellence of the feeling which prevailed, or the happiness which characterized the whole. It is beginning to be realized that the North of Ireland Association has surmounted the struggles of its earlier years, and is now a fit colleague of any of the older and more powerful Associations on this side of the Channel. For this, it is acknowledged on all hands, the chief credit is due to the labours of the indefatigable and imperturbable Hon. Secretary, Mr. J. Whimster, of Armagh.

#### THE "COWAN PRESSURE SYSTEM."

By J. HEWORTH, of Edinburgh.

[A Paper read before the North British Association of Gas Managers, July 28, 1898.]

What is known as the "Cowan Pressure System" was introduced a few years since; and, as there may be some who are not acquainted with its objects, the writer, when applied to for a short paper, decided to offer a few notes thereon. The system having already been described in one or more of the technical journals, and having been treated of in a valuable paper on "The Automatic Regulation of Pressure in the Distributing Mains," read before The Gas Institute in 1897,\* any detailed description of the apparatus is probably unnecessary.

The governor for regulating the pressure of gas, as is well known, was devised and first employed by Mr. Clegg, in conjunction with the first gas-meter. Shortly after its introduction (the governor having assumed a more practical form), it was adopted for regulating the pressure at which gas is delivered from the gasholder into the mains supplying the town. The gas-governor, when properly constructed, has been found to answer its purposes so well that it has probably never occurred to many of those using it, that any future addition to it for improving its efficiency would be either necessary or practicable. The "Cowan Pressure System" is not a governor. It is an adjunct to the governor; and by its instrumentality the pressure of gas in the town or in a certain district is perfectly controlled and automatically maintained. It performs a duty which has not yet been performed by any governor.

The gas-governor in common use requires attention whenever an increase or decrease of pressure is necessary. If the governor is to be of any service, the bell must be loaded or unloaded as the consumption of gas increases or decreases at intervals during the twenty-four hours of the day. The necessity for altering the load is due, not to the necessity for any increase of pressure in order to secure the perfect combustion of the gas, but solely to the inadequacy of the carrying capacity of the mains. The mains are always more or less inadequate to convey the requisite quantity of gas during the period of greatest consumption; and they must always be so. Therefore the loading and unloading of the governor is obviously necessary. The operation of loading and unloading is usually effected by hand; and, provided that this operation is always attended to at the right time, and performed to the required degree, the results ought to be fairly satisfactory. But what is the right time is not easily ascertained; nor is it possible always to settle upon the requisite degree. Arrangements were devised more than 20 years since for increasing and decreasing the pressure mechanically. This was effected by the aid of clockwork; and it has been found a successful method up to, and within, the limits of its powers. All the attention required by this system was the winding up of the clock attached to the pressure changer, and the adjustment of this changer once a week, so as to increase or decrease the pressure to whatever extent, and at whatever time, it might be desired.

Whether the load is applied manually or mechanically, the pressure, be it remembered, is fixed and controlled in the governor house. Is this the most satisfactory point from which to regulate the pressure? Are we not all familiar with occasional complaints, perhaps not of bad gas, but of a defective supply of gas or an inadequate pressure in some part of the district supplied? What have we done to remedy the complaints? Probably, in some instances, we have appealed to the pressure register; and, if we have found that the registered pressure at the outlet of the governor was the same as usual, have we not folded our hands and concluded that there was no ground for the complaint? Or, if we have had any doubt in the matter, we may have concluded that a permanent increase in the pressure would prevent future complaints; and we have taken steps to secure this. In either case we may have come to the wrong conclusion; for there may have been an actual deficiency of gas for a time in the district from which the complaint was received—a deficiency arising from some unusual local demand. Such unusual demands do arise, and may be caused by a dense fog, or by a sudden, a temporary, and a somewhat erratic demand for gas, either for lighting, cooking, heating, or industrial purposes. A sudden deficiency in the supply of gas in a remote district is not immediately, and never fully, made known at the gas-works; and as the governor cannot of itself supply the additional load which would enable it to respond to the increased demand, the deficiency is probably never known at all until after the demand has ceased. In such a case, therefore, the complaint of a deficient supply is well founded. But to remove all cause for such a complaint, there is no necessity to increase permanently the pressure of gas at the outlet of the governor. Indeed, this probably would, in its turn, prove as inefficient, as it certainly would prove an undesirable, remedy.

Now, it is at this point that the "Cowan Pressure System" comes in. The principle of this invention consists in "automatically regulating the loading and unloading of gas-governors by the pressure of gas in the main of a district remote from the governor." If this principle is the correct one to apply in the

\* See "JOURNAL," Vol. LXX., p. 26.



distribution of gas, then it follows that the governor is after all not the most satisfactory point from which to regulate pressure; and that, as a matter of fact, it is impossible to regulate the pressure at the governor so as to afford an adequate supply of gas under all the varying circumstances that arise. Whatever form of governor is used in connection with this apparatus, it is more convenient to employ water as the loading medium. The apparatus\* includes: (1) The pressure vessel. This consists of a tank and float-bell or small gasholder balanced by the gas pressure and placed in any convenient building wherever (after examination) it is found that the pressure of gas is lower than in any other part of the district. This pressure vessel is connected with the gas-main by a short length of pipe. (2) An electrical apparatus fixed in the governor house, for operating the valves which load and unload the governor bell. (3) A water-tank constantly supplied with water through a ball tap. (4) The necessary wires connecting the pressure vessel and the electrical apparatus referred to. [A more complete description of the apparatus is added as an appendix.]

The apparatus being fixed and in operation, what occurs? The pressure may be whatever we determine; but we will assume that it has been determined that the minimum pressure of gas should be 12-10ths in the district where the pressure vessel is fixed; and that the apparatus has been adjusted to give this pressure. What occurs when a heavy and sudden demand for gas arises in the district? The pressure of gas is immediately reduced to something below the 12-10ths fixed upon. That, so far, is precisely what would have occurred if there had been no pressure vessel at all; and it is precisely what does occur wherever the pressure system is not in use. But, immediately the bell of the gasholder falls, the valves in the governor house are operated electrically, and the load upon the governor is at once restored so as to give 12-10ths. In the same way should the pressure in the remote district ever exceed 12-10ths, the valves are again operated electrically; but this time with the result of promptly decreasing the pressure again to 12-10ths.

The writer, having had the system in use when he was engaged in the management of gas-works, is able to say from experience that no instrument could act with greater precision and accuracy in effecting the purpose for which it was designed. To an Association whose members are always ready to appreciate whatever methods are introduced for improving either the manufacture or distribution of gas, it can scarcely be necessary to enlarge upon the advantages of the pressure system now briefly referred to. It secures a constant and efficient pressure in the district where the pressure vessel is fixed, and this ensures a sufficient pressure over the whole district supplied. The pressure is obtained without personal attention, and with the certainty that, however irregular the demand for gas may be, the instrument will promptly and satisfactorily meet it. The apparatus will be found to reduce the average pressure at the outlet of the governor; and, when the pressure is increased, it will only be for so long a time as is necessary. The consumer will always get a sufficient quantity of gas, however, and whenever his requirements may vary. A reduction in the unaccounted-for gas will naturally follow. The necessity for a costly expenditure in larger mains may, in many cases, be avoided. No governor known to the writer is able to secure the results obtained by this invention.

It is quite possible that some objections to the system may have arisen in the minds of some persons, and some of these may be anticipated.

*The present system of controlling the pressure from the governor is sufficient.*—It has already been pointed out that, under the present system of controlling the pressure of gas at the governor house, no provision whatever exists for increasing the pressure in response to any unusual and increased demands for gas which may arise in certain parts of the district, and however occasioned—all of which may be unknown at the governor house; or, on the other hand, for the immediate decrease of pressure when this demand ceases. Further, it is found in practice that, where "Cowan's Pressure System" is in use, the pressure is frequently not required until a later time than had been previously supposed, and is, therefore, not put on so early; and also that it is often unnecessary to keep on the pressure as long as had been thought necessary, when it is therefore taken off earlier.

*The results secured by the "Pressure System" could be secured by simpler means.*—No such means are known to the writer.

*Self-loading governors may do the work this system does.*—Those who hold this view overlook the conditions of the problem to be solved, and cannot be acquainted with the principle on which the action of "Cowan's Pressure System" is based. The sympathies of self-loading governors are local, and do not extend far into the district. Consequently, changes of pressure occurring, it may be, miles away from the governor meet with little or no response. As no change of the governor pressure can precede a change of load, and as a change of load can only be ensured by comparatively local influences, it follows that the supply to remote districts is, in the case of self-loading governors, dependent on nearer districts, instead of nearer districts being dependent upon remote districts, as is the case

with the Cowan system. It is simply impossible that any self-loading governor can do the work this system does, because the latter is in constant touch with the necessities of the worst supplied part of the district, and maintains a constant and unvarying pressure there. This pressure may, of course, be of any required degree, and may be changed when required without any difficulty or loss of time. In this way the whole of the district is fully provided for at all times and under all circumstances.

*If a constant pressure be maintained at the lowest level or worst supplied part of a district, the pressure in the high levels during the heavy consumption will be greatly in excess.*—Now, if it be necessary during the heavy consumption to give, say, 12-10ths pressure at the lowest level, and, in giving this 12-10ths, it requires that 30-10ths or 35-10ths pressure be given at the governor, it will at once be admitted that the higher pressure on the higher levels is inevitable if the pressure of 12-10ths is to be maintained in the lower district, and is precisely the same pressure whether put on by hand or by this system; the difference being that, under the "Pressure System," every consumer will get his gas at a sufficient pressure, whereas under the ordinary system this, if not impossible, is, to say the least, doubtful.

The employment of electricity to bridge the distance between the pressure vessel in the district and the governor in the gas-works may be urged as an objection. Electricity is, of course, not the only means of communication that has been and may be employed under this system; but it has been found to be the most convenient as well as the most effective. It may have been supposed that the gas supply under this system depends absolutely on the perfect working of the electrical arrangements; and, on this ground, some fear may have arisen as to the result of employing electricity in connection with the system. The objection, however, has no real foundation. The stoppage of the electrical current would not interfere with the governor load; and, in any case, such an event would leave the governor as free as any other governor to be operated by hand in the usual way. And, with reference to the idea that the interruption of the electrical current might be a thing of frequent occurrence, it should be borne in mind that the whole system of railway signalling is dependent upon electrical agency; and this consideration might surely inspire confidence in the use of electricity in such a case as the system now under discussion, where there is really no risk at all from the employment of the same agent.

One other question may possibly have arisen, though not quite in the nature of an objection—viz., if the pressure is controlled from the lowest part of a district, will it not be necessary to change that given pressure to suit the various consumptions? If the system accomplishes what it proposes, this will not be necessary, and in practice it has been found to be altogether unnecessary. If it were necessary, however, the pressure could be changed very readily as often as might be desired. It requires only a moment's consideration, however, to see that if the minimum pressure of 12-10ths, or any other minimum pressure that may be thought desirable, is maintained in that part of the district which is the worst supplied, every other part of the district must, at all times, be receiving its gas at an ample, but never at an excessive, pressure.

#### APPENDIX.

*A Short Description of the Apparatus Employed in the "Cowan Pressure System."*

[For illustration, see "JOURNAL," Vol. LXX., p. 28.]

The apparatus consists of—

- (1) A governor arranged for water loading.
- (2) A pressure vessel or small gasholder connected to the main in the lowest pressure part of the district.
- (3) A board placed in the governor house on which are fixed two electrically controlled water-valves for loading and unloading the governor.
- (4) A small water cistern fitted with ball-cock for supplying water-load to the governor.
- (5) Connecting wires between the pressure vessel and the electrical apparatus, for operating the water-valves.
- (6) The battery for supplying the electric current, composed of ordinary Leclanché cells or accumulators.

The working of the apparatus is as follows: Immediately the pressure is reduced in the district by an increased consumption, the bell of the pressure vessel falls, and, in so doing, makes an electric contact by means of an arm fixed to the bell coming in contact with another arm attached to the tank. This contact completes an electric circuit between the pressure vessel and the water-supply valve, which then opens and supplies water for loading the governor, until the pressure in the district is brought again to the standard pressure. Immediately this pressure is attained the bell rises, breaks the electric circuit, and allows the water-supply valve to close. As the pressure in the district increases by the consumption decreasing, the bell of the pressure vessel rises; and in rising it closes another electric circuit by means of another set of arms. This opens the syphon valve, and allows water to run off until the pressure is again restored to the standard fixed.

#### Discussion.

The PRESIDENT said they were all very much indebted to Mr. Hepworth for the time and care taken by him in bringing the subject before them. The paper was a very instructive one. He had now come to a stage where he could not do without a governor; and it came to be a question which was best. He had a feeling much the same as that expressed in the last paragraph—namely, was electricity the best agent for changing; but

\* An illustration of the plant required to work the system appeared in our report of the paper by Mr. Chester already alluded to.



Mr. Hepworth got over that by saying that if electricity was used for signalling on railways, they might adopt it too.

Mr. W. FOULIS (Glasgow) did not think there could be any doubt that there was a great deal of ingenuity displayed in the invention. Of course, he had had no experience whatever of it in practice; neither had he given any attention to its working. But he doubted very much if it would be an instrument that would be suitable in all cases. He did not know whether Mr. Hepworth's suggestion was that there should be a number of these pressure vessels, scattered through the town, at different places where the pressures were likely to be low. This would mean, of course, that each of the districts would require a separate main, and a separate governor at the works, to be controlled by the system. There could be no doubt that the point at which the pressure should be maintained was the lowest part of the town—that was to say, they should maintain the pressure sufficiently there, and then, of course, they would be sure that their pressure would be sufficient in all the other districts. In Glasgow they had succeeded fairly well, by having telephonic communication with different offices in various parts of the town; and the pressures were telephoned from there to the works where the station governors were. The instrument before them did automatically what they in Glasgow did by means of telephone messages.

Mr. J. M'GILCHRIST (Dumbarton) said that, with regard to the pressure-changer, he should like to hear how it would operate in a town where the gas-works were at the lowest point of the district. He saw quite well the force of having the pressure-changer if the governor, or the gas-works, were situated at a higher elevation than the lowest part of the town. In his own case he did not see how it would be of any service, because the gas supply was from the lowest part of the town.

Mr. A. WADDELL (Broughty Ferry) said he should like to thank Mr. Hepworth for having brought this matter before them. They all knew of the need they had to have their pressure kept as uniform as possible at all times; and they were all aware of the trouble they had through people in one part of the town saying they had very bad gas, while those in another part declared that it was very good—the gas being the same all the time, and the only difference being (although the people did not know it) in the pressure. In his own case, a complaint recently came from a certain part of the town. He went to the place and took the pressure during the day. It was in an elevated position, and the pipe running through the district was a small one. He found something like 22-10ths pressure during the day time. He went back and took the pressure at night, when the heavy consumption was on, and then he got 12-10ths. Since that time he had relaid the main, and the complaints in the district had ceased. This showed that it was not, as they all knew, uniformity of quality alone that was needed, but uniformity of pressure also was wanted.

Mr. M'GILCHRIST: Perhaps Mr. Hepworth, in considering this matter, will take into account the fact that we go on the principle of having a large main and a low pressure.

Mr. A. BELL, sen. (Dalkeith), said he was sure the members had been very much indebted to Mr. Hepworth for reading the paper. It had been complained that some of the papers read that day had gone over the heads of most of the managers in Scotland. It was well that they should be so; for such papers acted as a sort of ferment, as it were, in the minds of managers. This was very much the case both with Mr. Little's conveyors and Mr. Hepworth's pressure-changer. In all large and well-appointed works, they had district mains, with a governor controlling each; whereas in small works they had just one great supply main for the whole. The instrument before them, therefore, would not be of very much benefit, unless there were great variations in the elevation.

The PRESIDENT said he supposed that, from the description given by Mr. Hepworth, the principal saving or advantage in the pressure-changer was the doing away with the attention of some individual, located in different situations, such as in Glasgow, keeping up telephonic communication. He supposed this was the principal advantage. There were instances where the levels might vary in a town—say, from sea-level to about 250 feet. In his own case there was a variation of 150 feet. He did not know how the pressure-changer would act in such a case. They were supplying a level 150 feet below the gas-works, which would be  $1\frac{1}{2}$  inches of pressure; so that they would have an extraordinary pressure at some of the higher places. He fancied that a district governor in his case would get rid of any difficulty.

Mr. HEPWORTH expressed his obligation to the members for the patience with which they had listened to his paper; and, in reply to the questions which had been put during the discussion, he thought he might say that it would appear that the object of the instrument had been, at all events, understood perfectly well by those who had followed him. As Mr. Foulis had said, it would be necessary to take into account the low districts. He supposed that if they had a large town, supplied by three, six, or thirty governors—as many as they pleased—they would probably have each governor supplying its own district. One governor would not work in with the next. If they had a town districted in this way, it would only be necessary to have one of the pressure vessels in every district, at the lowest part—he meant the worst supplied part—and it would be sufficient to cover all the wants of the other parts of the district. They were

aware that in large towns the inconveniences of sudden local demands had been met by the use of the telephone or the telegraph; but, of course, it was for everyone to judge for himself. Provided the person at the telephone office in the district knew of the want which had arisen, he could go and make his wants known, and they would be at once attended to. But he (Mr. Hepworth) had a case in his mind—and there might probably be a great many others—where for certain industrial purposes gas was used very largely intermittently, and at times which could never be arranged beforehand, no one outside the place knowing that the demand had arisen. Every time this demand arose, the instrument would immediately indicate to the governor at the gas-works that it had arisen; and until the demand was met and supplied it would go on asking for gas to be sent. This, he thought, was perhaps the best way in which the advantages of such a system could be seen to be even greater than those of the telephone or telegraph.

Mr. FOULIS: Would you have the instrument placed outside the works in that case?

Mr. HEPWORTH: Yes.

Mr. FOULIS: It would be rather awkward, would it not?

Mr. HEPWORTH said presumably that would be the worst part of the district. Mr. M'Gilchrist had spoken of his works being in the lowest part of the town. He believed this was the case with most gas-works; but no one who had his works at the lowest level of the town—at least he should think there were few, if any—would say that the pressure he had at that level was one he would be always able to give, or wanted to give, at some other low level in the district he supplied. But, in any case, if there were a deficiency in any part of a district or town which had its gas-works at the lowest level, the deficiency would, by this instrument, be immediately made known at the works, and be promptly supplied. Whether or not there was a man to supply it, the pressure would be put on. It was, as Mr. M'Gilchrist had said, desirable that they should provide large mains rather than have high pressures; and, of course, most engineers managed to do this as soon as they were able. But, as he said in his paper, the mains somehow were always becoming insufficient to convey the gas that was wanted. The consumption went on increasing; so that a main which might be perfect that day would be sure to be a little imperfect that day week, and more so that time next year. Whatever comparison or difference there might be between the wants of a district and the supply arrangements, those wants would be met by the instrument he had described. The President had said that probably its value might consist in dispensing with the attention of a few persons employed in looking after the governors. This might be the result; and it certainly would be, so far as any necessity or demand for gas arose, because no man need look after the governors if he had the pressure system. But he did not think the value of an instrument like this could be computed in that way. The value of it, he thought, was that, while it might do away with the attention of the man in charge of the governor-house, who might not come in just at the right time, it did more, for it enabled the manager to feel quite sure that, whatever might or might not fail him at that or any other point, an extra quantity of gas would be supplied, if needed, at any given place. The instrument brought the intelligence home to the works; and the required supply of gas was afforded.

**New Joint-Stock Companies.**—The Clydesdale Tube Company has been registered with a capital of £150,000, divided into 5000 preference (5 per cent.) and 10,000 ordinary shares of £10 each, to undertake the manufacture of steel and iron, tubes of wrought iron, steel, and other metal, and to carry on the business of ironmasters, engineers, boiler makers, &c. The Compound Hydrocarbon Motor Syndicate, Limited, has been registered, with a capital of £12,000, in £1 shares, to enter into an agreement for the acquisition of a business carried on at Luton, Bedfordshire, and to manufacture, sell and deal in oil, gas, steam, and electric motor cars.

**A Local Government Board Inspector's Recommendation.**—A recommendation and remark made by Major-General Carey during an interview that a deputation from the Shrewsbury Town Council had with him in his capacity of an Inspector of the Local Government Board will no doubt be regarded by consulting water engineers as unfair to them as a body. The interview took place on July 22; and the object of the deputation was to point out to the Board the difficulty in which the Council have been placed in consequence of the opinions of several water engineers whom they had consulted being ignored by the Board. After a full discussion, Major-General Carey recommended that the Council should obtain a report on the whole question of water supply from some eminent engineer, who should be allowed an entirely free hand as to the source of the supply, with the restriction that it must be able to provide 30 gallons per day for each inhabitant of the borough; but the Board objected to a supply from the Severn, even if the water were filtered, if water could be obtained elsewhere at a cost which the town could afford. General Carey suggested that a report should be drawn up by the Engineers who have been employed by the Corporation (Messrs. Taylor, Sons, and Santo Crimp), or the Council, if they wished to employ an Engineer totally unconnected with Shrewsbury and its water supply, might consult Mr. George Hodson, "whose opinion would carry great weight with the Local Government Board." The recommendation, in such terms, of an individual Engineer by a gentleman in the position of Major-General Carey is much to be regretted; seeing that its publication in several provincial papers has resulted in an "advertisement" which will probably prove advantageous on future occasions to the Engineer named, to the detriment of others.



## REGISTER OF PATENTS.

**Manufacture of Illuminating Gas.**—Lewes, Vivian B., of Greenwich.  
No. 17,749; July 28, 1897.

This invention relates to the production of a mixture of carbon monoxide, hydrogen, and methane, and enriching the mixture on its way from the purifying apparatus with acetylene; the arrangement of plant shown in the specification being the same as that illustrated in the "JOURNAL" for June 28, p. 1539, in connection with the closing sentence of Professor Lewes's lecture before The Gas Institute the previous Wednesday in Belfast.

The patentee points out that, as is well known, if acetylene in quantities below 10 per cent. be mixed with hydrogen, carbon monoxide, or water gas, the mixture burns with a practically non-luminous flame; and he has made a long series of experiments in order to ascertain the cause of this phenomenon and the means by which it may be overcome. He finds that, if acetylene be mixed with methane (which is a compound of 12 parts by weight of carbon with 4 parts by weight of hydrogen), even the smallest proportion of acetylene endows the mixture with considerable illuminating value; and if 30 per cent. of methane be mixed with hydrogen, carbon monoxide, or water gas, though the mixture will have no illuminating value, yet, on the addition of acetylene in any proportion, the mixture will develop light.

The generator shown is formed of a gas-tight casing lined with fire-brick, and fitted with fire-bars at the bottom above an ash-pit. It is charged with coke, anthracite, or other carbonaceous fuel, which can be ignited and then raised to incandescence by air-blasts injected into it through openings arranged at various heights in the column of the fuel. In this way, the fuel is quickly raised to incandescence by causing the combustion, in the upper portion of the fuel, of the carbon monoxide formed at or near the bottom of the mass of fuel, by air admitted to the ash-pit through an opening below the fire-bars.

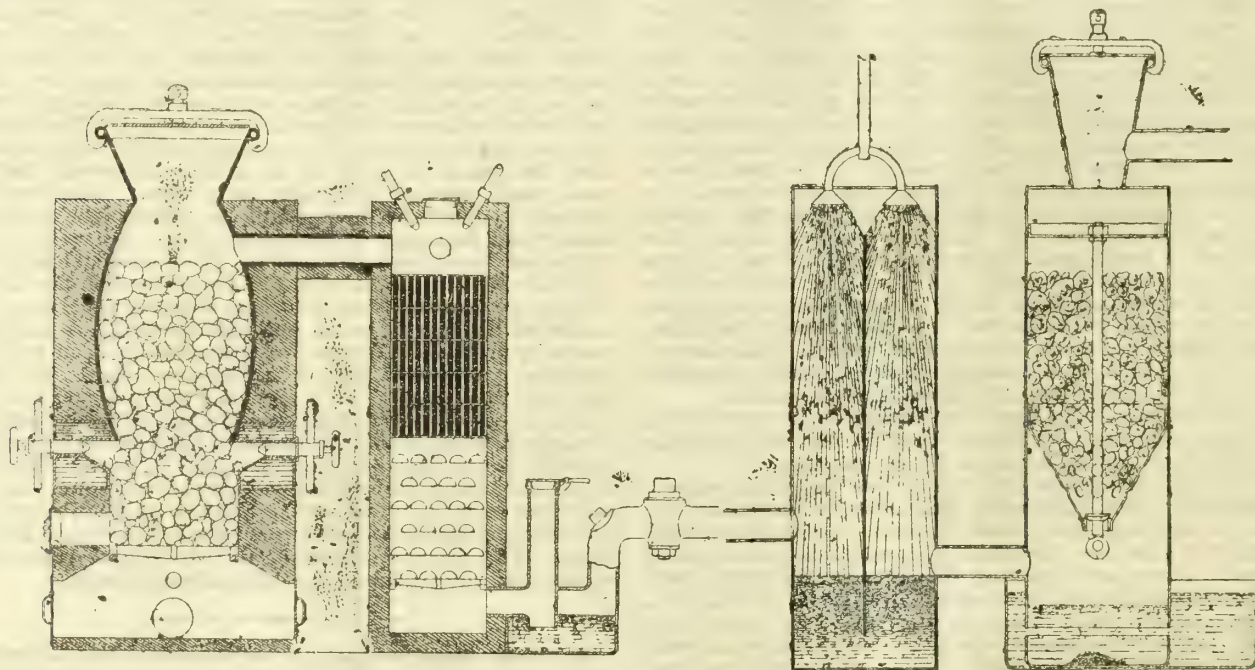
About half way up the mass of fuel, the generator is provided with a water-cooled ring fitted (say) at three places around its circumference,

with injectors by which tar or other liquid or semi-liquid hydrocarbons can be injected by steam into the mass of incandescent fuel, and also at three or other suitable number of points around its circumference with air-inlet openings through which blasts of air can be injected into the fuel. The form of water-ring shown contracts the interior of the casing at one point, below which it is formed with a circumferential groove or recess of wedge section. This arrangement is such that, as the fuel descends past the contracted inner portion of the generator, it leaves below the upper ledge of the water-cooled ring and the internally grooved portion of the ring, a space into which the air-blast pipes and the steam-injectors for the tar or other hydrocarbons deliver. Below the fire-bars are one or more additional steam-inlets.

At a point above the surface of the fuel, the generator is connected by a branch pipe with a superheater comprising a vertical chamber, the upper portion of which is filled with fire-brick arranged chequerwise; while the lower portion contains ingots of iron. At the bottom of the superheater is an outlet passage, connected with a vertical pipe, the upper end of which is provided with a snift valve, and the lower end of which dips into water contained in a closed receptacle, from the upper part of which extends an outlet-pipe provided with a cock. The outlet-pipe is connected to a gas-scrubber, which, in the example shown, comprises a vertical chamber divided by a vertical partition into two connected vertical passages provided at the top with sprinklers. Two or more distinct, but connected, chambers or towers may, however, be used. To the outlet of the scrubber is joined an acetylene generator.

That shown comprises a vertical chamber charged with calico carbide, supported by a lower perforated cone, closed at the bottom by a valve. The valve is attached to a guide-rod, and has a jiggling motion imparted to it by a cam, or its equivalent, on which the valve bears, and which is driven from the exterior of the apparatus at a rate depending upon the amount of acetylene required to be mixed with the diluting gas.

In practice, the apparatus is used as follows: Fuel having been placed in the generator and ignited, it is blown up to a state of incandescence by blasts of air admitted through the several air-inlet openings; and the products of combustion, while at a high temperature, are led down



through the superheater, and allowed to escape by the snift valve—the cock in the outlet-pipe from the water-seal being at this time kept closed. When the mass of fuel has been raised to a bright red heat, the air-blast through the upper air-inlet openings (which may be about midway between the top of the water-cooled ring and the top of the mass of fuel) is cut off; and a small quantity of air is admitted into the upper part of the superheater. This causes the combustion of any carbon monoxide in the gas which is being generated, and completes the heating of the superheating chamber to a dull red. The fuel being now incandescent and the superheater hot, the snift valve is closed, the cock in the outlet-pipe opened, and all the air-blasts cut off. Tar is then sent through the injectors, by means of steam, into the centre of the incandescent fuel; the steam being converted into water gas, and the tar being simultaneously decomposed by the heat into a mixture of hydrogen and methane in its passage through the incandescent fuel. The carbon which is added to the fuel in the generator is at the same time deposited. While this decomposition is taking place, steam is admitted in small quantities into the ash-pit and the lower part of the fuel, through openings below the fire-bars. This steam, in passing through the lower portion of the mass of incandescent fuel, forms water gas, which rises up through the fuel, and prevents the tar remaining in the fuel and becoming over-decomposed.

A certain quantity of sooty and tarry matter will pass forward with the gas into the superheater; and to prevent it choking up the interstices between the fire-bricks therein, there is introduced in a downward direction into the top of the superheater, through nozzles, a regulated supply of steam, which also forms water gas with any carbonaceous matter that may be present, and thus prevents stoppage of the superheater. The mixed gases—consisting of hydrogen, carbon monoxide, and methane—produced in this manner pass on through the water-seal and outlet-pipe to the scrubber or other purifying apparatus employed.

The generation of gas in this manner is continued until the temperature of the fuel in the generator has fallen below the required point, whereupon the supply of hydrocarbon is shut off and a supply of air turned on, so as to again raise the fuel to incandescence; any hydrocarbon remaining in the generator assisting the carbon monoxide generated by the action of the

air on the fuel to reduce to the metallic state any oxide of iron that may have been formed on the iron in the superheater, by the action of the steam previously admitted. In this way, the iron will be ready for re-use when again generating a mixture of carbon monoxide, hydrogen, and methane.

A very large volume of gas suitable for enrichment by acetylene or other hydrocarbons of high illuminating power can be thus produced; and its purification and enrichment by acetylene is carried out as follows: On leaving the outlet-pipe, the gas is led through the washer or scrubber in which, during its passage up and down the vertical channels therein, it is washed by sprays of lime water or lime water and lime sludge delivered from sprinklers at the top. In this way, the gas is to a great extent purified from any carbon dioxide and sulphuretted hydrogen which it may contain, and is also fully saturated with water vapour. The moist gas is led direct into the lower part of the acetylene generator, and ascends through the carbide, so that the water vapour which it contains slowly decomposes the carbide. The acetylene evolved becomes mixed with the gas, which is at the same time thoroughly dried and passes off from the top of the generator.

The amount of acetylene so mingling with the gas would, however, as a rule, be too small in quantity to enrich it to the desired extent. For this reason, the carbide is caused, by the rising and falling of the valve at the bottom of the cone, to pass downward, and be slowly discharged into water arranged to close the generator and act as a seal. As the carbide falls into this water, it is decomposed, with liberation of acetylene and formation of lime; the acetylene mixing with, and passing upward with, the other gas formed, and the lime, to a certain extent, dissolving in the water which is kept flowing through the seal.

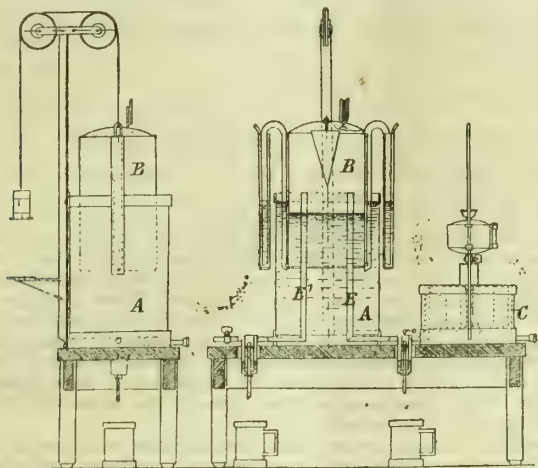
This water, or a portion of it, mixed with lime sludge, may advantageously be used for purifying the gas coming from the main-gas generator. For this purpose, it is pumped up and supplied to the sprinklers for purifying the gas in the washer or scrubber. This utilization of the lime water and sludge produced in the manufacture of the acetylene for the purification of the gas which has to be afterwards enriched, is claimed as a feature of considerable practical importance.



The degree of enrichment of the gas with acetylene is regulated by the rate at which the cam and valve are driven. The patentee has obtained satisfactory results when about 10 per cent. of acetylene is mixed with a gaseous mixture consisting of about 52 per cent. of hydrogen, 16 per cent. of carbon monoxide, and 32 per cent. of methane.

**Acetylene Gas Generators.**—Reggiani, N., and Chrisini, A., of Rome. No. 17,482; July 24, 1897.

The apparatus shown consists of a reservoir A, a moveable bell-shaped top B, and two or more generators C, according to the size of the apparatus. In the reservoir filled with water are two pipes—E, leading from the generators into the bell; the other E<sup>1</sup> forming the outlet-pipe from the bell. To the bell-shaped top is attached a counterweight, by means of a chain passing over two pulleys pivoted to the standard, so that the bell is kept in equilibrium by the pressure of the gas and by the counterweight. Two syphons are attached to the bell, serving to regulate the water-level and the weights of the bell, and to maintain constant the pressure of the gas till the cone in the interior of the bell comes into operation, and, by entering into the water, raises the bell a little. This produces a certain diminution in the pressure of the gas. The syphon-tubes fixed to the bell of the gasholder (and each connected to its own



tube) serve the purpose of keeping constant the water-level in the holder, as well as balancing the weight of the bell. The syphons and the cone can, however, be substituted by two spiral springs attached to the axis of one of the pulleys, and serving to control the action of the weights fixed to the extremities of the springs.

The novel features claimed for the apparatus are: (1) The arrangement by which the water enters directly and automatically into the generators through the action of a cone or other floating body, or by means of a spiral spring fitted to the axis of the pulley of the bell, producing a small diminution in the pressure of the gas. (2) The arrangement shown by which the water, passing from one compartment to the other, and penetrating in each compartment, consumes all the carbide of calcium from the bottom upwards by means of the perforated diaphragms before entering the next compartment. (3) The closure of the generators by means of lids, so as to render the apparatus inodorous; and the arrangement by which the generators can be re-charged at a certain distance from the apparatus. (4) The eduction-pipes for the condensation waters serving as safety-valves in the case of excessive production of gas.

**Manufacture of Gas and Obtaining Bye-Products therefrom.**—Gobbe, E., of Jumet, Belgium. No. 17,976; July 31, 1897.

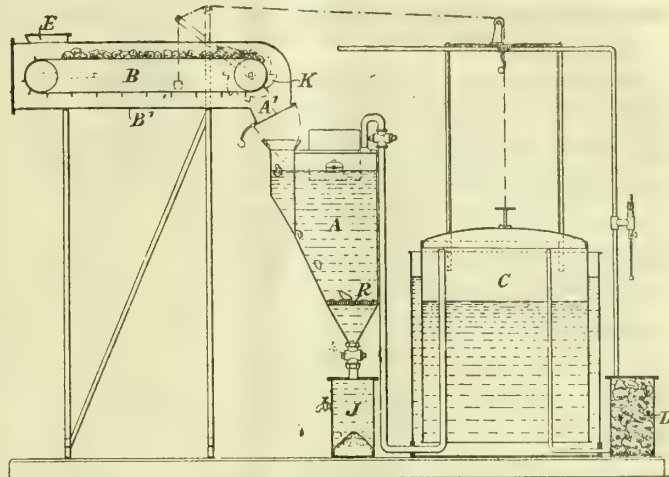
This plant intended more especially for use in glass factories; and it is designed so that the bye-products contained in the fuel gases can be collected by separating the rich gas which contains these bye-products from the poor gas which passes to the place of storage or utilization. Gas-generators as heretofore constructed, says the patentee, necessitate the washing of the whole volume of the gases generated; and as these gases leave the furnace at a very high temperature, there is a very considerable loss of heat, and very extensive washing apparatus is needed. Such generators also yield little sulphate of ammonia per ton of coal, and are not economical because a great quantity of heat is wasted. His proposal, therefore, is to obviate these inconveniences by permitting the separation of the rich gas from the poor gas, so that only the former is subjected to washing. He also proposes the injection of steam into the zone where the nitrogen of the carbon is disengaged from its combinations, and can readily enter into chemical union with the nascent hydrogen of the steam, in order to form ammonia.

**Manufacture of Acetylene.**—Munsterberg, O., of Berlin. No. 19,615; Aug. 25, 1897.

In this apparatus for the manufacture of acetylene, means (carried by the gasholder) are adapted to operate a counterweighted valve on a water-pipe leading to the carbide holder, and, after the holder is exhausted, to operate the counterweighted valve of a water-pipe leading to a second carbide holder—the second valve being provided with means for striking or resetting the first. There is also a device for use in connection with the carbide holder, in which, upon the opening of the holder, the passage for the gas between the latter and the holder is blocked, and on the closing of the carbide holder the passage is opened—the movement acting also to open and close an escape-pipe if desired. A moveable band or intermittently operated measuring and feeding device carries the carbide, controlled by the movement of the holder. Other features of novelty are: The means for feeding the carbide to the water, and the employment in the generating chamber of a partition separating the part of the chamber into which the carbide is directly fed from the part in which the main body of the gas is generated.

The apparatus shown consists of the generator, A; the feed mechanism, B;

the gasholder, C; and the purifying or drying chamber, D. The feeding is effected by means of an endless band adapted to pass around two rollers within a casing B<sup>1</sup>. The outer surface of the band is provided with transverse ledges, the intermediate spaces between which are arranged to hold a given quantity of carbide. The casing B<sup>1</sup> has a feed-hopper E, which can be closed up practically air-tight by a lid, and through which the carbide is passed on to the endless band. An intermittent periodical forward movement of the band is effected either by a separate motor, through clockwork or the like, or by transmission-gearing from the bell of the gasholder. In the drawing, a pawl is used in connection with a lever-arm, which is pulled by a cord or chain attached to the bell of the holder as soon as it has descended to a certain point. A weight attached to the cord brings the lever and the pawl back, as soon



as the bell ascends. The pawl is thrown into gear with a ratchet-wheel K, on the axis of one of the rollers. The contents of each compartment of the belt are successively discharged into the outlet A<sup>1</sup> of the casing B<sup>1</sup> as the ratchet-wheel K is rotated; this outlet being closed by a flap provided with a counterweight. The flap is forced open by the weight of the descending carbide, which falls into the mouth of the generator, which is (as shown) nearly filled with water. The space in the generator above the water-level, and in which the gas is collected, is separated from the mouth by a diaphragm having an opening in it. Through this the carbide falls upon a grate R; the gas generated rising and escaping into the gasholder, from whence it is conveyed through the purifying or drying apparatus D to a pipe, from which it may be taken off to the burners.

When the bell rises to the highest point, it may, if desired, be caused to move a valve so as to open it, and allow the excess of gas to escape at the open end of the pipe, either to waste or to a second gasholder, so that a safeguard is provided against damage from over-pressure.

The lime mud formed as the carbide is decomposed passes through the grid R, and is discharged either through a large valve or else collected in a receptacle J.

**Producing Gas from Sewage Sludge.**—Dancer, W., of Manchester. No. 20,184; Sept. 2, 1897.

In carrying this invention into effect, the patentee first dries or partially dries sludge or sewage precipitate, by means of the heat evolved from refuse destructors or other source of waste heat. It is then put into an ordinary gas-retort, and subjected to distillation at a high temperature. By this means, there is a direct conversion of it into gas and ammonia, together with a small proportion of undecomposed oil. To effect the most complete decomposition, two retorts are preferably used—the second retort containing red-hot coke or other inert substance, so that any oil which may distil over from the first retort is converted into gas on coming into contact with the heated substance in the second retort. The gas produced is mainly oil gas, and may be purified in the usual way. The ammonia carried over with it is separated by washing, as in the case of coal gas. The residue in the retort where lime has been used as a precipitant is of value as a manure, on account of the lime and phosphate of lime which it contains. Where salts other than lime—such as sulphate of iron—are used to effect the precipitation of the sludge, the residue in the retort may also be used for the purification of coal gas, or for other purposes.

Another method of treating the sewage sludge is to distil it at a lower temperature in large retorts similar to those used in Scotland in the manufacture of shale oil. This method would be most suitable, says the patentee, where large quantities of sewage sludge have to be disposed of, and where the gas cannot be used for illuminating purposes—as, for instance, in places where the producers of sludge are not also gas manufacturers. In this method, oil is distilled off at a low temperature, which oil could afterwards be made into gas in the ordinary method of oil-gas manufacture; and any gas given off by this process of distilling oil at a low temperature could, after the recovery of the ammonia, be used in place of fuel for heating retorts, as is at present done in shale-oil works.

**Incandescence Illuminating Bodies.**—Boult, A. J.; a communication from the Chemische Fabrik von Max Jasper, of Bernau, near Berlin. No. 30,145; Dec. 20, 1897.

This invention has for its object to render existing incandescence bodies for illuminating purposes sufficiently durable to withstand any vibrations to which the burner may be exposed. The body is impregnated with a solution containing an alcoholic and an ether organic compound of silicon, which when burnt forms silicon dioxide on the body. The body to be treated may, says the patentee, have been specially manufactured for the purpose, or may be an existing body—such, for example, as a woven mantle, which may be treated either in its new or unburnt condition, or after it has been burnt, when it consists solely of the incandescing ash.

The process consists in immersing the body into the silicon solution, which may be made up, for example, of 15 per cent. of silicic-amyl-ether

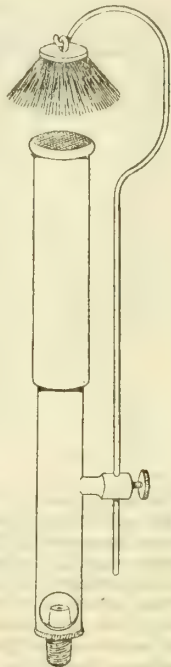


with 85 per cent. of amyl-alcohol. On removal from the solution, the body is ignited while still wet, and maintained at a red heat. The silicic acid thus liberated by the burning of the organic silicon compound adheres to the incandescence body, combining when subjected to heat with the constituent parts of the body. A single dipping is usually sufficient.

Any organic silicon compounds which are combustible and when burnt form silicon dioxide, may be employed for the impregnating solution; but compounds with esters and alkyls are said to be preferable. Alkyls of silicon are, however, less suitable than silicic-esters produced by the action of silico-chloroform ( $\text{Si H Cl}_3$ ) on alcohols, or by the treatment of methyl, ethyl, amyl, or other similar alcohols with silicon chloride ( $\text{Si Cl}_4$ ).

**Incandescent Lamp Device.**—Hooker, L., of Sydney, New South Wales. No. 28,060; Nov. 29, 1897.

This device for use with incandescent gas-lamps consists of a tassel hung on the hooked end of a wire upright to the bracket or burner. The tassel consists of a disc of asbestos covered with linen, calico, or other material, or of wire gauze, platinum, or perforated steatite. Into the disc is fastened one end of a bunch of hemp or asbestos threads—the whole arrangement being narrower at the top than at the bottom. When made the tassel is immersed in a solution consisting of acetate of aluminium, acetate of magnesium, chrome alum, and acetate of zirconium. The best proportions are said to be 1 oz. of aluminium, 1 dram of chrome alum, 1 dram of acetate of magnesium, and 2 drams of acetate of zirconium—the aluminium being saturated with acetic acid with 2 ozs. of water added, and the whole dissolved in an evaporating dish by the application of heat. It is afterwards subjected to the gas-flame and the foundation material destroyed; the tassel remaining a "hard non-inflammable substance." The fact of its swinging freely on a hook above the flame will, says the patentee, ensure its "accommodating itself to the draught from the flame, and always occupying a proper relative position thereto."



**Illuminating and Heating Gas.**—Tooth, E., of Redfern, New South Wales. No. 8555; April 12, 1898.

This proposal is to form a gas by simultaneously bringing into contact with water carbide of calcium, unslaked lime, and terebine (or a solution of resin in molten naphthalene with or without the addition of paraffin). The three ingredients are contained in cartridges in the proportion by bulk of about 40 per cent. of carbide of calcium, 50 per cent. of lime, and from 5 to 10 per cent. of terebine. They are immersed in water, or water is brought into contact with them in sufficient quantity to cause the necessary reaction, in any form of acetylene generator in which the bringing into contact of the solids and liquids is properly regulated.

The unslaked lime should, says the patentee, be as far as possible free from impurities, and especially free from magnesia. The carbide of calcium is preferably the vehicle for holding the terebine; the cartridges, blocks, or lumps, of the carbide being for this purpose dipped in a bath of terebine until they are partially saturated and thoroughly coated with a good layer of it. The terebine or resin dissolved in molten naphthalene is, when in use, slightly heated. It is also said to be advantageous to mix with the terebine another rich hydrocarbon having a low melting-point—such as paraffin—to the extent of about 2 per cent. by bulk.

#### APPLICATIONS FOR LETTERS PATENT.

- 16,675.—FLETCHER, T., NEIL, J., and FLETCHER, RUSSELL, & Co., Ltd., "Condensing gas-stoves." Aug. 2.
- 16,687.—CROSSLEY, W. J., and ATKINSON, J., "Valve gear for internal combustion motors." Aug. 2.
- 16,712.—WISE, W. L., "Generating and burning gas from hydrocarbon oils." A communication from J. H. Moss. Aug. 2.
- 16,723.—HEDGECLAND, F. W., "Acetylene lamps." Aug. 2.
- 16,733.—EVANS, E., "Generating acetylene gas." Aug. 2.
- 16,766.—ORME, F. H., and HOWARTH, W. C., "Prepayment mechanism for gas-meters." Aug. 3.
- 16,770.—FURNIVAL, W., "Automatic lighting of gas-lamps." Aug. 3.
- 16,773.—HUGHES, D., "Cock for gas or other fluid." Aug. 3.
- 16,785.—STRONG, H. O., "Gas-stoves." Aug. 3.
- 16,858.—REID, D., "Bunsen burners." Aug. 4.
- 16,868.—WILLIS, W. G., "Scrubbing and filtering gas." Aug. 4.
- 16,884.—VARON, J., "Production of acetylene gas." Aug. 4.
- 16,885.—THOMPSON, W. P., "Gas-engines." A communication from J. Waldhausen, Blum, & Co., and J. Bauer. Aug. 4.
- 16,894.—VAUTRIN, C., and BROCARD, A., "Producing acetylene." Aug. 4.
- 16,903.—MONTAIS, M. L. J. R. de, "Acetylene gas-generators." Aug. 4.
- 16,978.—CARR, I., "Manufacture of sulphate of ammonia." Aug. 6.
- 16,993.—PARVIN, J. G., "Gas or fluid regulators." A communication from M. Delmard. Aug. 6.
- 17,007.—DUKE, J. F., "Incandescent gas lighting." Aug. 6.
- 17,008.—READ HOLLIDAY AND SONS, Ltd., and READ HOLLIDAY, "Generating acetylene gas." Aug. 6.

**Skipton District Council and the Gas-Works.**—The Skipton District Council have been in negotiation for some time past with the Gas Company with the view of purchasing their undertaking. At a private meeting of shareholders a few days since, the offer of the Council to buy was refused. At the same meeting, it was decided to call up the capital and exercise the borrowing powers under the Company's Act of 1863.

## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### Profit-Sharing.

SIR,—The answer to the letter in the "JOURNAL" of the 9th inst. is in the letter itself. Mr. Little admits the success following the adoption of his limited scheme of profit-sharing. Allowing for all the credit due to the increased attention the officials give since their participation in the profits of the firm, it certainly suggests to us that the workmen must have some of the credit. If so, we think they have established their right to have a share of that which now goes to the few. We also think the workmen are quite capable of being influenced for the better, as the officers and foremen have been. If workmen have been remiss in their duty, it suggests to us that the officers and foremen are not altogether free, by showing they can be effective if they choose, when inducements are offered them. Do not the workers possess the same elements? Then why not join them in the same great principle of profit-sharing. "Laugh and grow fat" is not in it if you seriously consider the facts.

The profit-sharing scheme of the South Metropolitan Gas Company is an additional answer to Mr. Little's letter. Take their prosperous condition and look back prior to 1889, when the Company only did as Mr. Little's firm are now doing—practised limited profit-sharing. We, the delegates of the "Workmen's Committee," do sincerely ask Mr. Little to do and say as Mr. Livesey did, that he saw no reason why the workmen should not share the same as officers and foremen. The difficulties will soon vanish. Then we shall have a trio joining in the chorus profit-sharing, as a remedy to eliminate the lazy and incapable. Mr. Little should adopt the system as it exists in the South Metropolitan Gas Company—that is, each workman who is to share in the profits must sign an agreement to act as an intelligent workman should do. Failing to do so, then he is not allowed to sign again, until he mends his way. These agreements are yearly. By this means Mr. Little would have an effective remedy against the lazy and incapable sharing in the profits.

We sincerely hope that if Mr. Little can see his way to adopt the scheme among his workmen, the same happy results will follow, as the published accounts of Messrs. Richmond and Co. show, in their case, and as we experience in the case of the South Metropolitan Gas Company. Here a spirit of peace and goodwill prevails, accompanied with that excellent quality thrift, which has enabled the employees to save upwards of £100,000. This is, we hope, another answer to the letter why Mr. Little should extend his scheme to his workmen.

We, with Mr. Little, sincerely hope that his letter will open up a good discussion on the value of profit-sharing among workmen and employers of this country. We, however, find it difficult to express all we feel on this subject; but should Mr. Little ever come this way, we are sure we could, in conversation, better explain to him the value of profit-sharing than in writing.

Signed, on behalf of the Profit-Sharing Committee (Workmen's Representatives),

70, Ruby Street, Old Kent Road, S.E., H. T. MANLEY.  
Aug. 12, 1898.

**Dr. Auer's Incandescent Electric Lamp.**—The Austrian Incandescent Gas-Light Company of Vienna have acquired the rights in Dr. Auer's new electric incandescent lamp for Eastern Europe. For this purpose the capital has been increased to 3,500,000 gulden, and the title of the Company has been changed to the Austrian Incandescent Gas-Light and Electrical Company.

**Lamp-Posts as Fire-Alarm Indicators.**—If a suggestion of the London County Council is acted upon, the streets will be brightened up through certain lamp-posts being painted a bright red colour, so as to indicate that a fire alarm is close at hand. The Council's original intention was to have hands affixed to certain lamp-posts, pointing to the alarms; but as only a few of the Local Authorities of London adopted the idea, the bright red lamp-post is now suggested as an alternative.

**The Lighting of Paris Theatres and Music Halls.**—A Commission appointed by the Minister of Fine Arts in Paris to draft new regulations for theatres and music halls has, it is reported, laid down the rule that in future the only illuminants permitted in these places will be the electric light and vegetable-oil lamps. The Commission evidently had some misgivings as to the security of electric lighting, for they specify that an expert electrician is to be in attendance while the halls are in use.

**The Prepayment and Stove-Hire Systems at Karlsruhe.**—The automatic prepayment system of gas supply has been introduced by the Municipality of Karlsruhe. By the deposit of 15 groschen (1½d.), a cubic metre (35·3 cubic feet) of gas may be purchased. The Municipality also let fittings and stoves on hire at 1 mark (1s.) per quarter, for which sum burners with incandescent mantles are provided. It is estimated that under the new arrangement a workman will be able to light his dwelling for 0·1d. an hour, and his wife do her cooking for twice this sum.

**The Public Lighting of Beccles.**—A special meeting of the Beccles Town Council, was recently held to receive the report of the Public Lighting Committee recommending an agreement with the Gas Company for the public lighting for the ensuing year, and also the employment of Mr. Medhurst at a cost of £21 to report on the electric lighting of the borough. Alderman Masters, the Chairman of the Sanitary Committee, moved the adoption of the report, and pointed out that during the last fifteen or twenty years the cost of lighting the borough had increased from £180 to £600. Last year more complaints than ever were made; and the Committee thought it desirable that an expert's opinion should be obtained on the electric lighting of the borough. The Deputy-Mayor (Mr. Pells) seconded the motion, and said they tried incandescent lighting two years ago, but were obliged to go back to the old system. By getting expert advice they would put themselves in a position to settle the question as to what was best for the town. Alderman Walton argued that it was an unnecessary waste, and that it would be much better to spend the money in incandescent lamps than to run into some "wild cat" scheme of electricity. After some discussion, the recommendation of the Committee was adopted.



## PARLIAMENTARY INTELLIGENCE.

### HOUSE OF LORDS.

THE END OF THE SESSION OF 1898.

The following Bills received the Royal Assent last Friday, when the session closed: Carlisle Corporation Water Bill, Filey Water and Gas Bill, Forres Water Bill, Heywood Corporation Water Bill, Keighley Corporation Bill, Mid-Kent Water Bill, Newcastle and Gateshead Water Bill, Newhaven and Seaford Water Bill, Faginton Improvement Bill, Rhymney and Aber Valleys Gas and Water Bill, Rochdale Corporation Water Bill, St. Helens Corporation Bill, Todmorden Corporation Water Bill, Wath-upon-Deane Urban District Council Bill, Wey Valley Water Bill.

## LEGAL INTELLIGENCE.

### HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Tuesday, Aug. 9.

(Before Justices MATHEW and KENNEDY, sitting as a Divisional Court.)

**Granl Junction Water-Works Company v. Hampton District Council.**

This was a case stated by Justices on a summons against the Grand Junction Water-Works Company, on which they convicted the Company under the 3rd section of the Public Health (Buildings in Streets) Act, 1888. The previous proceedings were reported in the last volume of the "JOURNAL," pp. 1146, 1581.

Mr. BOSANQUET, Q.C., Mr. MACMORRAN, Q.C., and Mr. CUNNINGHAM GLEN appeared for the Company; Mr. H. H. ASQUITH, Q.C., and Mr. C. MUNROE represented the District Council.

Mr. BOSANQUET said section 3 of the Public Health Act of 1888 was substituted for an old section of the Act of 1875. After enacting that it should take the place of that section, it said it should not be lawful in any urban district, without the written consent of the Urban Sanitary Authority, to erect and build in any street beyond the front of the main wall. The Grand Junction Water Company, by their Act of 1852, had power to take compulsorily certain lands (among others, the land on which the buildings now in question had been commenced), and to execute certain works—first a reservoir or reservoirs in the parish of Hampton. They had acquired compulsorily a three-cornered piece of land between two roads; and they were authorized to build thereon the reservoir and other works. By the General Act the Company were authorized to make, maintain, alter, and continue engines and other works, and erect such buildings upon the land and premises as they should think proper for supplying the inhabitants of the town or district with water. Land having been given to the undertakers for a special purpose, it was taken out of the ordinary category of private owners' land; and the general enactment which said that one should not build in a street beyond the adjoining house did not apply to such land. Five years was the limit allowed to the Company for executing their works; but this was not to prevent them from making any extension. The limits of the Act had since been increased. In 1897, the Company desired to extend their works, and construct and erect upon the land an additional engine-house. They sent in plans, which the Council would not pass on the ground that the proposed building came in front of those on either side. Thereupon the Company commenced the works, and had expended £1500 upon them. The present building was in front of the two small buildings some way off; and the contention of the respondents was that the appellants would have to go back as far as the buildings behind the engine-house.

Mr. ASQUITH said the short question was whether the Company were authorized by their Special Act to have a statutory licence to override the general law of the land in the district. He submitted that the general power to extend, like all other general powers, was subject to the provisions of the 93rd section of the Water-Works Clauses Act of 1847, which was as wide as language could possibly make it: "Nothing herein contained shall be deemed to exempt the undertakers from any General Act relating to water-works, or any Act improving the sanitary condition of towns and populous districts which may be passed."

Wednesday, Aug. 10.

Justice MATHEW, in giving judgment, said the appeal was against a conviction made on a summons brought by the Hampton Urban District Council against the Water Company. The alleged offence was under the Public Health Act of 1888, which forbade the erection of any building or part of a building in a street beyond the front main wall of the buildings on either side. The conviction was perfectly proper, as the works constructed by the Company were erected beyond the main walls of the houses on either side.

Justice KENNEDY concurred.

Judgment was therefore given for the respondents, with costs.

### A Question as to Hired Gas-Fittings.

At the South-Western Police Court, last Tuesday, before Mr. Francois, Mr. Thomas William Jones, a solicitor's clerk, of St. Martin's Lane, Charing Cross, appeared to answer a summons issued against him by the South Metropolitan Gas Company for fraudulently converting to his own use certain gas-fittings belonging to them, of which he was bailee. The Solicitor to the Company (Mr. Gossmore) stated that the defendant used to live at 19, Temperley Road, Balham, where he had certain gas-fittings on hire. In the agreement he made with the Company, he undertook to give notice of his intention to leave the district, and in such case to pay up

the balance due, or to return the fittings. As a matter of fact, he did leave the district, and sold the house to a Mr. Llewellyn, including the fittings in the sale. He was asked by the Company to pay up all the instalments, but refused, saying he would keep the fittings and continue to pay the instalments. It was not till he had sold the fittings that the Company knew he had left the district. Mr. Francis said he had been quite misled in the matter. When he granted the summons, he was clearly led to believe that the fittings had been actually moved out of the house and sold to some one. It now seemed that they were still on the premises. The Company had their civil remedy against both parties. There was nothing criminal in the case. Mr. W. H. Stevenson, the defendant's Counsel, said it was monstrous that a respectable man like his client should be charged with felony on such a flimsy pretext. As a matter of fact, he had not even sold the fittings; the new tenant was to pay the instalments. Besides, it had been decided that gas-fittings were not goods or chattels. Mr. Francis dismissed the case.

### Disputed Meter Registration.

At the Highgate Petty Sessions on Monday last week, before Lieut.-Col. Orton and other Magistrates, a claim was made by the North Middlesex Gas Company against Mr. J. H. Beardmore, of 24, Baronsmere Road, East Finchley, for £4 odd, for gas supplied to his residence. The amount sued for was in reference to 19,100 cubic feet of gas, at 4s. 3d. per 1000 feet, supplied in the March quarter of the present year. This corresponded with 11,600 cubic feet in the corresponding quarter of 1897, and 14,800 cubic feet in 1896. The meter was complained of; and, in consequence, it was tested and found to be 6.98 per cent. slow. There was also a further defect, inasmuch as only 60 feet were registered for each 62 feet burnt. There was a fire on the defendant's premises, and several weeks had not been reckoned. The defence was that too much gas had been charged for, and that the defendant's daughter was liable, and not himself. The Bench, however, made an order for payment of the amount, with 10s. 6d. costs.

### Abstracting Money from Prepayment Meters.

At the Thames Police Court, on Monday last week, Frederick Jackson, 33, a labourer, was charged with stealing 12s. 8d., the property of the Commercial Gas Company. Mr. Phelps prosecuted. Prisoner, who pleaded "Guilty," had for about two months been lodging with a Mrs. Thomas at 14, Mile End Buildings, Mile End Road. She had a penny-in-the-slot gas-meter in her dwelling; and when the collector called on the 3rd inst., he found that some money was missing from the box. About 4000 cubic feet of gas had been consumed, and there was only 8d. in the meter. Mrs. Thomas, when spoken to, accused her lodger of having tampered with the meter. He said he was very sorry. He had broken it open, and taken out about 13s. On the following Saturday, prisoner went to Bethnal Green Police Station and gave himself up for the robbery; saying he yielded to a sudden impulse. He was sentenced to 14 days' hard labour. It was stated by an officer of the Company that, as these robberies were becoming very common, they meant to deal severely with any offenders discovered.

At the Woolwich Police Court, last Wednesday, before Mr. Kennedy, David Halsey, 11, a schoolboy, residing at 49, Princes Road, Plumstead, was charged with stealing 6s. 10d. from an automatic gas-meter at that address. Mr. E. Mander, one of the Inspectors of the South Metropolitan Gas Company, said there was a gas-meter on the penny-in-the-slot system at the prisoner's home. On going to remove the coppers from the box, witness found it empty; the index showing that 6s. 10d. had been abstracted. Prisoner said he found a key which fitted the meter, and he took the money. The Inspector said the locks had two levers; but he knew that keys could be had which would open them. He handed the Magistrate a bunch of keys which were used by the Company. Mr. Kennedy, on examining them, said the keys were evidently very common ones. The Company should provide better locks and keys for the protection of their coppers. The Police Magistrates were constantly having charges of this kind; and the Gas Companies were laying temptation in the way of children in having cheap and common locks on their automatic meters. He sentenced the prisoner to receive four strokes with the birch rod.

### High-Pressure and High-Service Water Supplies.

At the Clerkenwell Police Court, on Thursday, before Judge Edge, Q.C., the New River Company sued Mr. J. E. Lawler, of Womersley Road, Crouch Hill, for £1 13s. 6d. for two quarters' water rate. Mr. Debenham appeared for the Company; Mr. E. Robins for the defendant. Mr. Debenham said the defendant resided in a house the annual value of which was £50. The house was more than 160 feet above high-water mark; and this entitled the Company to charge an extra 1 per cent., which made the charge 5 per cent. on the annual value. Then the water was delivered more than 10 feet above the roadway, which entitled them to high-service charges, amounting to 14s. The Company also charged 8s. for garden watering. But if defendant said he had not used any water for this purpose, and would not do so, they would waive the 8s. Mr. Robins submitted that if the Company charged an extra 1 per cent. when the house was more than 160 feet above high-water mark, they could not also charge for high service, as surely these were almost identical. Mr. Debenham said in many cases where there was high service the house was not above high-water mark; and the reverse was also the case. Mr. Robins said there was only one high service, and they were really paying 14s. for that. Mr. Debenham said that the extra 1 per cent. was for the water going into the house. If the defendant had no high service, he would have to pay that. Evidence having been given that the house was 270 feet above high-water mark and the cistern 17 feet above the roadway, his Honour said he thought Mr. Debenham's argument was conclusive. It was proved that no water was used in the garden; and judgment for the plaintiffs was entered, by consent, for £1 10s. 6d. and costs.



## MISCELLANEOUS NEWS.

## SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of the Proprietors of this Company was held at the Bridge House Hotel, London Bridge, on Wednesday last, under the presidency of Mr. GEORGE LIVERSEY.

The SECRETARY (Mr. Frank Bush) read the notice calling the meeting; and the seal was affixed to the register of shareholders.

The CHAIRMAN stated that there were now 7966 shareholders, of whom 1186 were employees and over 3000 were consumers. In moving the adoption of the report and accounts, he observed that it had been said that "good wine needs no bush." Applied to the Company, he hoped that his friend on his left (the Secretary) would not think that they did not need him; but he did think that when they had such a report to present, and when the position of the Company was what it was, it was not necessary for the Chairman to say much. The first point in the accounts to which he had to call their attention was in reference to the question of capital; and on this matter he had simply to state that they were continually reducing the capital relatively to the business. During the last five years the increased business had been met at an additional outlay of capital of only £2 13s. 4d. per ton of coal; and the increased business in the last twelve months—putting it in other words—had been met by an outlay of capital equal to £255 per extra 1,000,000 cubic feet sold, which was very low, when one considered that even £500 per 1,000,000 cubic feet for the whole business was not to be regarded as excessive, though, in their case, the total capital amounted to just £430 per 1,000,000 cubic feet sold. With regard to interest and dividend, it cost them in 1889 1s. per 1000 cubic feet to pay interest and dividend. He would give them his reason later on why he took 1889 as the starting point—in fact, 1889 might be considered the critical year of the Company's existence. It cost them now just under 9d. per 1000 cubic feet to pay interest and dividend. This would show them that, though the capital had been diminished considerably in proportion to the new business, the cost of this capital had been reduced in a still greater ratio. There were not many items in the accounts to refer to. The first and most important was the question of coal, which had cost them just 3d. a ton more in the past six months than it did in the corresponding period of the previous year. On the other hand, while they were at a disadvantage of 3d. a ton on coal, they were also at a disadvantage of 3d. a ton on tar. They had realized just 3d. per ton of coal less for their tar in the past half year than in the June half of 1897. He had said a good deal about tar at different times. He thought he might explain that the reason of this great drop in tar was owing to the failure of the Tar Products Association in their contest with the German buyers of products. It was said, in a now notorious reply, speaking of the policy of that Association: "This policy was subsequently adopted by a combination of tar distillers, with, as was to have been expected, disastrous results." It was true that the results had been disastrous; but this was to have been expected simply because the largest producer was persistently selling against the associated tar distillers, and thus playing into the hands of purchasers on the Continent. Of course, the combination failed, as it was bound to do under such circumstances. Coke and ammonia were happily improving. Ammonia had reached a very low figure; but it was considerably better now than it was a year ago. The same might be said of coke. There was another slight advantage—they were still creeping down in the cost of carbonizing; and for this credit must be given to the engineering staff. The cost of coal was almost entirely beyond the control of the management in any way except by choosing the right time to buy; but the working was to a certain extent, and within certain limits, under the management's control. The cost of carbonizing had been reduced by a further 1d. per ton; it was 2s. 3d. a ton last year, and 2s. 2d. this year. They might say: "What is a penny?" Well, it was £4000 a year, and therefore worth saving; and they were entitled to take credit for it. The net result of the working was shown in the report; and instead of, as for the last three or four half years, just holding their own, they were now in a position to come before the proprietors with a considerable surplus, as set out in the second paragraph in the report. In this paragraph, they stated how they proposed dealing with the surplus. He might state that this surplus was derived after charging everything that could properly and fairly be charged to revenue. They had not charged any item to capital that ought not to have been so charged. The works had been maintained, and old plant was renewed and restored, out of revenue; and the entire cost of everything they could properly charge to revenue had been so charged. They had a surplus, including £1802 brought forward, supposing they paid the same dividend as last year, of £21,265. The question was, What were they to do with this surplus? In the first place, the Directors proposed a slight increase of dividend. It was so small that it was perhaps hardly worth considering; the advance only being from 5½ per cent. to 5¾ per cent.—from £5 5s. to £5 6s. 8d. But they must go by easy and gentle steps now. There was, however, a reason for this increase, slight as it was. Their stock divided into multiples of £5. It came for the half year at 5¼ per cent. to an odd ¾d. on every odd £5; whereas making the dividend 5½ per cent., it would divide into even pence with all amounts of stock. It was convenient for book-keeping; and moreover it showed that the Directors felt they were on the upward trend. It had been their policy never to recommend an increased dividend unless they were certain that the advance could be maintained, because they felt it to be of extreme importance that their stock should maintain a steady value—not fluctuate up and down. The reason for this was that they had induced their consumers to a very large extent, and their employees, to invest in the Company's stock; and it was important for these small investors that the stock should not fluctuate, if they could help it. However, they felt that there was a reasonable prospect of maintaining this 5½ per cent.; and the next step he expected would be to 5¾ per cent. But this would not be for some time to come, because they would not feel justified in paying a dividend up to the hilt. Therefore, before they paid 5½ per cent., they hoped they would be able to reduce the price of gas somewhat, in order to have a little margin. The extra dividend took £2333; and being entitled to pay 5¾ per cent., they could add the difference of £4666 to the reserve fund, which would then amount, as stated in the report, to £100,458, and

they would have £14,265 to carry forward. The business continued to increase. The report gave the figures as to the automatic meters for the half year; but in the year from June, 1897, to June, 1898, they had increased the ordinary meters by 3414, and the automatic meters by 11,019. He thought this would be considered satisfactory. They had not yet come to the end of this increase; but the end must come some day. They estimated some years ago that about 90,000 working-class tenements were not supplied with gas; and they had now fitted up 72,000 working-class houses and tenements. There could not, therefore, be so many more for them to capture. But the process was going on at a very satisfactory rate—5000 per half year, or 200 a week. He did not think he had anything further to say on the report; but there was a general question which he would like to deal with. It was very often said—and he thought that some people really believed it—that an increase in the price of gas did not check consumption, and that a decrease in price did not appreciably increase consumption. The reason for this belief was that it had happened not infrequently that when the price had been increased there had not been a diminution of consumption, but rather a considerable increase, which was due to colder weather prevailing under the higher price than prevailed in the corresponding period at a lower price. On the other hand, a reduction of price was sometimes followed by a higher thermometer; and no commensurate increase took place. But he thought that he had some facts and figures which would conclusively prove this question. He eliminated the thermometer altogether by making a comparison extending over a period of sixteen years between the North and South of the Thames. He would go back as far as the year 1882, and take the seven years from that year to 1889, and then the eight years from 1889 to 1897; 1889 being, as he had already said, their critical year, or the year when the crisis, so to speak, of the Company took place. Singularly enough it also happened to be a turning-point in regard to the Company North of the Thames. He would take the end of 1882, because the Company North of the Thames had then absorbed the London Company; and the price charged then on the North was 3s. 2d. per 1000 cubic feet, and on the South 2s. 10d.—or a difference of 4d. In the seven years following, the price North of the Thames was reduced by 8d.—from 3s. 2d. to 2s. 6d. per 1000 cubic feet; while on the South side it was reduced by 7d.—from 2s. 10d. to 2s. 3d. There was, therefore, in 1889 a difference of only 3d. per 1000 cubic feet in the charges on the North and the South sides of the river; the North having gained a penny. Now with respect to the relative increases of business. The Company on the South had rather less than one-third of the business of the Company on the North. Their increase was slightly better than the North. The Southern Company increased 42 per cent., and the Northern Company 27 per cent.; but the increase of the latter Company was nearly 2½ times as much in actual amount as that of the Southern Company. The increase in consumption of gas North of the Thames in those seven years was 3834 millions; and on the South side it was only 1597 millions, comparing 1882 with 1889. But what happened after 1889? In 1889, the great labour upheaval occurred, as well as the great strike in connection with their own Company. From 1889, they might date the period when their relations with their workpeople assumed an entirely different footing—one of friendliness and confidence. From 1889, also, might date the time when their consumers began to have a different feeling towards the Company; and he could not forget that at that time, when they had to give their consumers a short supply of gas, they met the Company in a most considerate manner. A good feeling was started then which he trusted had continued to the present time. Soon after that date they began the policy of offering their stock to the consumers; and since then all issues of stock had been offered to the consumers and taken up by them and their employees. They had thus about doubled the number of their shareholders. The policy they had gone upon had been to try and make friends—to endeavour to satisfy the consumers, to make them feel that the Company wished to treat them liberally, fairly, and considerately—and he thought the Company might be very well pleased with the result. He had given them the results for the seven years between 1882 and 1889; and he would now give them those from 1889 to 1897. The price of gas in the North—which was in 1889 2s. 6d. per 1000 cubic feet—was now 3s., or an advance of 6d. per 1000 cubic feet. In 1889, the price charged in the North was 3d. more than that charged in the South. The price in the South, however, had stood at 2s. 3d. per 1000 cubic feet. They had to increase it (because of the large advance in the price of coal) for a year or two; but it had gone down again to 2s. 3d., at which it now stood. The difference in the price charged on the North and the South sides of the Thames was at the present moment 9d. per 1000 cubic feet; and it had been gradually rising to this figure. In 1889, the difference in the price charged was 3d.; in 1890, it was 4½d.; in 1891, 5d.; in 1892, 6d.; in 1893, 7d.; and now it had got to 9d. What had been the effect on the consumption? It was this—that, whereas in the seven previous years the actual increase in consumption was nearly 2½ times greater on the North than on the South of the Thames, in the eight years to 1897 the increased consumption on the North side had been actually less than the increased consumption on the South side. The increased consumption in the South was 3196 millions; and in the North, it was 2917 millions. The increased percentage of the Company on the North was 16 per cent. on the gas sold in 1889; while the increase of the South Metropolitan Company was 56½ per cent. on the make of 1889. He had troubled them with these figures in order to prove—as thoroughly, he thought, as was possible—that a low price and conciliatory treatment of the consumers did tell. It had often been said: "What do the shareholders care? All that they trouble about is their dividend." He was bound to say that the shareholders of this Company had never manifested that narrow and sordid spirit; but whenever there had been a public question—a question of greater interest than the mere interest of the pocket—their shareholders had responded in a spirit that might be expected of Englishmen. But it might be said: "What does it matter, so long as you get your dividend?" It did matter. Every institution nowadays was on its trial; and if it could not justify its existence, that existence would become very precarious some day. So long as they could justify their existence, so long as they could show that they were rendering a service to the community—a service which the community could not well do without, a service satisfactory to the community—so long, he felt their position was secure. Therefore the shareholders of a gas company required to look at things in rather a broader spirit than the simple question of dividend.



He had no hesitation in saying that, in considering the interests of the consumers and of the other parties who were connected with the Company, the shareholders would find that their own interests would be best served. He did not believe that the position of the Company in regard to the dividend they were paying would be so satisfactory as it was at this moment, if they had not, with the shareholders' full approval and consent, endeavoured to do their best for the consumers; and it was because they had endeavoured to do their duty to the consumers that they were in their present position of prosperity. In regard to their endeavours to serve the consumers well, he felt that it was simply an act of justice to say that the staff of the Company—from the heads of departments down to the subordinate officers and the workmen—were animated by the spirit of doing what was right, fair, and considerate towards the consumers; and he believed that this had tended very largely to bring about the position which was held by the Company that day.

Mr. JOHN MEWS seconded the motion, which was at once carried unanimously without discussion.

The DEPUTY-CHAIRMAN (Mr. Simpson Rostron) then proposed that a dividend at the rate of  $5\frac{1}{2}$  per cent. per annum be declared. They would not, he remarked, require any assurance from him that the dividend recommended had been properly earned, because not only had they the certificate of their own Auditors, but also that of the Government official. As, however, there had been some reference in the newspapers to possible action in the shape of a Parliamentary Committee to inquire as to the result of the sliding-scale, and how it had worked, he might perhaps be allowed to point out what had taken place in regard to the dividend, the price of their gas, and other things which had entered into the prosperity of the Company within the last sixteen years. He said sixteen years, because 1882 was a period when, having amalgamated with the Phoenix Company, their work could be taken fairly in comparison with subsequent years. In that year they charged 2s. 10d. per 1000 cubic feet for their gas, and divided 12 per cent.; whereas they now charged 2s. 3d., or 7d. per 1000 cubic feet less, and the dividend had gone up to 13 per cent., or 1 per cent. more. In 1882 the dividend took 14d. per 1000 cubic feet of gas sold; whereas now the higher dividend and all capital charges took less than 9d. per 1000 cubic feet sold. But the important feature was what the public had got. In 1882, the value of a penny on the gas-rental was roughly three-and-a-half times the amount of  $\frac{1}{2}$  per cent. dividend; now the value of a penny was seven times that of the additional dividend they were entitled to pay on a decrease of price. This was most satisfactory, because they must remember, as the Chairman had said, that they did not divide up to the hilt. They had about 2d. in hand; and therefore if they were forced—and they would have to be forced before they did it—to put up their price, they could do so without diminishing the dividend, which they therefore saw was very safe. On the other hand, they wished to keep faith with the public, who, they knew, had paid a certain premium for their stock in their belief in the maintenance of the dividend which was being paid at the time they bought such stock. If the dividend were diminished, they would find that the next time their stock was offered by auction, the public would say, "Once bitten, twice shy;" and the Company would suffer. They had more than doubled their business in the period mentioned; and the capital per ton had dropped about £1. All these figures were most important to those who understood on what foundation the prosperity of a gas company rested; and he had therefore ventured to draw their attention to them, in order that they might see the very satisfactory position of the Company.

Mr. E. H. CARDWELL seconded the resolution, which was carried unanimously.

The CHAIRMAN intimated that this closed the business of the ordinary meeting. They now had to hold an extraordinary meeting, and it was his duty to move—"That the scheme now submitted to the meeting for the election of Employees' Directors, made under the provisions of the South Metropolitan Gas Act, 1896, and the South Metropolitan Gas Act, 1897, be approved and adopted, subject to such alterations as the Board of Trade may suggest and the Directors agree to." He did not know that it was necessary for him to take up much of their time in dilating on this question. He might, perhaps, explain how it came about. In 1889 (the year he had already referred to), they started the profit-sharing arrangement with their workpeople, to whom they gave the option of either drawing out their annual bonus in cash or leaving it on deposit with the Company at 4 per cent. interest. To the Directors' surprise and gratification, nearly half of them left the money on deposit. The Board then thought that it would not be a bad thing if they gave the workmen the opportunity to invest the money in the Company's stock; and a number of them did so—to the extent of some thousands of pounds. But in 1894 they made a fresh advance. The whole Board were at that time perfectly unanimous. They felt that, if they could induce their workpeople to invest their savings in the Company, their interest in its prosperity would necessarily be more close and greater than if they had no such connection. In 1894, therefore, they, with the consent of the employees, altered the system of bonus—the profit-sharing bonus, which was declared annually. Half of it only was made withdrawable, and the other half had to be invested in stock. Since then, year by year, half the bonus had regularly been invested in the Company's ordinary stock; and, in addition, very considerable voluntary investments had been made by the employees. He did not know to what extent; but the amount was very large. The money had either been taken from the withdrawal account, or the men had put in other savings. This led to what seemed to him the following result: Some day, if the process should be continued, the time would come when the employees would become the owners of a very large proportion of the stock of the Company; and it had occurred to him that this question would then arise: "This stock is ours, and surely we ought to have some voice in its control and management." He did not think that anyone could deny the justice of this view. The only question was as to what the proportion or amount of the stock should be when such a claim could be justified and substantiated. Well, he would confess that his proposal was a forestalling of this period. They went to Parliament for the purpose of converting their capital in 1895; and they failed. They applied again in 1896; and they succeeded. In the Bill they took powers to authorize the election of certain workmen or employee Directors. In the Bill it was also provided that when the aggregate holding of the workpeople amounted to £40,000 of stock, the Directors might propound a scheme for carrying out the object mentioned. The employees' actual holding now was about £55,000

of stock, which was worth nearly £80,000. They had, in addition, about £30,000 on deposit at interest. The Directors had, therefore, brought their scheme before the proprietors for the latter's sanction. It would then have to get the sanction of the Board of Trade; but he might say that it would have been unwise to bring a scheme before the proprietors without having some idea of what view the Board of Trade might hold in the matter. He had, therefore, held unofficial communication with the Board of Trade. His communication had been unofficial, and the reply he had received had been entirely unofficial. But he had made such communication with the Board of Trade, whose view, generally, he knew of the matter. The scheme which had been sent to every shareholder was very much on the lines which they expected would be approved by the Board of Trade. He was, however, in a little bit of a difficulty. He had told them that in regard to the shareholding, the Board had been entirely and heartily unanimous; but in regard to the question of allowing the workpeople to have a representation on the Board, he did not come before the proprietors with the full authority of the Directors. Some of his colleagues—he would not say were opposed to it, but they were doubtful whether the scheme would work. He was not going to tell them that he was sure it would work; by no means. He thought, however, that it was worth the trial; and he would like to see it tried while he was there and able to devote himself to the Company. But whether it was going to succeed or not would depend upon the workpeople themselves. If they elected suitable men, the fears of his colleagues who were in doubt about the matter would be proved to be groundless; and he was quite certain, from what he knew of them, that they were not narrow-minded men, and that if they found their fears were groundless, none of the Directors would welcome the workmen Directors more heartily than those who were now afraid of what might happen. The question, then, was how it was going to work; and this could only be proved by actual experiment. It might be said: "Why not let other people try it?" Well, it so happened there was no one else to try it. He was not a "Little Englander;" and in regard to the business of this Company, he was not narrow-minded. The Company was part of the great community of the country, and they had their part to play; and if it had been brought to them that they were to try a great experiment, which, if it turned out to be successful, would be greatly to the advantage of the country, and greatly to the advantage of both capital and labour, then he maintained that it was not for them to shirk the matter. There was no one else to try the experiment, because there was no other commercial undertaking in this Company's position. He, therefore, felt that he might ask the shareholders to give their consent to this proposal. What were the workmen Directors to do? They were not to take a narrow view of their duties. When the present Directors were elected they might have had various views as to this, that, and the other; but when they came on to the Board, they had three interests to look after. He did not know which he was to put first; but they must all be mentioned. They had to consider the consumer, they had to consider the employee—they had to do justice to both of these—and they had also to consider the shareholders, and do justice to them. They had to look at all the three parties who were vitally interested in the Company—the consumers, the employees, and the shareholders; and they had to do justice all round. The difficulty would be to get the representatives of a class to rise to this condition. He discussed the matter with the late Mr. Mundella, than whom there were very few men who had had larger experience of these questions, or who had a sounder judgment upon them. Mr. Mundella said to him: "I like the idea very much, but what I am afraid of" (and Mr. Mundella, who was generally regarded as favouring the labour side, had the candour and honesty to speak to him of what he was afraid of) "is that the workman may not rise to the position; that he will regard himself as being the representative of a class" rather than as the representative of the three classes he had named—to look at the interests of the Company as a whole, and do his best for them. He had talked to others who knew a great deal about these things; in fact, he was talking only the previous week to Earl Grey on the subject. His Lordship asked him to meet him and tell him what they were doing; and Earl Grey said to him: "You need not be afraid. You may depend upon it that the workpeople will rise to the position, and they will elect good representatives." There was perfect freedom of election. The workpeople could elect whom they pleased; and if they would only select capable, sensible, and fair-minded men, he had no fear of the result. If, on the other hand, they elected the glib talker, the man who promised this, that, and the other—if they elected men of that sort, then the thing would fail, and it would be their own fault. He was speaking there in the presence of a number of the men who were shareholders; and he should tell them all this again when the time came to do so, if it did come. At any rate, working people had had very little experience hitherto—had had no opportunity of gaining experience in general business affairs. They had done their work and taken their wages; but they had no opportunity of learning about the difficulties of carrying on a great business. He therefore hoped that when they sent their representatives to the Board—if the proprietors assented to the proposal—they would see that there was a larger view to be taken of the business of this great country (of which the Company was a small part), and they would have their eyes opened to this larger view, and would in course of time be able to disseminate the larger view among their fellow-workers. He hoped also that they might receive some useful hints from them. The men who were doing the work often found out things which the Directors or even the officials could not discover; and if they would give them hints and suggestions whereby they could improve their working, he was quite sure that he spoke for the whole Board when he said that they would be willing to accept (and gladly accept) any suggestions they might make. He did not know that he had much more to add. He wanted to be a means of educating and elevating the workmen from the position of wage-earners to that of capitalists or employers. If they responded to it, well and good; if not, the scheme provided that at the end of three years it would fall to the ground. He had been told, "If you once start a thing of this sort, you cannot stop it; if it were stopped there would be another strike." He had no fear whatever of such a contingency. He was quite certain that, if the thing failed, the workmen would themselves recognize that it was a failure and would acquiesce, without a word of dissent, in the lapsing of the scheme. The scheme had been circulated among the proprietors. The main part of it was occupied with a description of how the voting was to take place. They had six stations;



and the difficulty was so to arrange the voting that fair play should be given all round. He thought that they contrived this; and some valuable suggestions had been made on the point by the Board of Trade, which they had adopted. As to the qualification of an employees' Director, the provision was as follows: "The qualification of an employee Director shall be the having been not less than seven years in, and continuing in, the employ of the Company, and the having held for not less than twelve months prior to the date of election, and the continuing to hold, not less than £100 in the stock of the Company." They had over fifty workmen from whom to choose; fifty-two of their workpeople had £100 of stock or more—some had as much as £800—and were therefore qualified. With regard to the question of fees, a man could not be a servant and a master at the same time; and when acting in the position of a Director the employee member of the Board would not be under the orders of anyone as a servant, and therefore his duties and pay as a workman would be suspended while he was acting as a Director. The clause on the subject of fees was as follows: "The employee Directors shall have their ordinary duties and the pay attaching thereto suspended during the time that is found to be necessary for their duties as Directors. The fees shall 'bear some proportion to the amount of their qualification,' relatively to those of ordinary Directors, which are equal to one-fifth part of the nominal value of their qualification, and will accordingly be about £20 per annum." The fees for their service as Directors shall be the amount they would have earned if they had been at their ordinary employment, *plus* 10s. 6d. for each weekly attendance." The Act of Parliament limit was that the fees paid to an employee Director should not be more than four times the amount of his ordinary day's pay. But they were starting with the moderate fee of 10s. 6d. in addition to the amount the workman Director would have earned if he had been at his ordinary employment. If the scheme should fail, it would lapse in three years' time; if it succeeded, they must come before the proprietors again for another scheme. They therefore did not commit themselves to anything irreparable, but merely to a three-years' experiment.

Mr. ROBERT MORTON observed that there was a certain amount of fitness in his seconding the resolution. He had had a life-long connection with workmen. He had been a workman himself (during his apprenticeship) and a master; and he had every confidence that the men would make a good choice. If they did so, he was sure that the scheme would be greatly to the advantage of the Company as well as to the men themselves. He had great pleasure in seconding the resolution.

Mr. DANIEL STOCK said that he regarded the proposal as a very excellent one, and he warmly supported it. Ever since Mr. Livesey had been Chairman of the Company, he had done all he could to promote its interests in whatever he had proposed. He saw no reason why the scheme should not work successfully.

A SHAREHOLDER asked what proportion of workmen Directors there would be under the scheme, when it was fully developed, to the ordinary Directors.

The CHAIRMAN replied that the proportion would be two to seven; and it could not exceed three. They had provided in the scheme that the wage-earners—those who were paid weekly wages—should have the power to elect two of their number, and that those on the staff who were paid by salary should have the power to elect one member. The proportion then would be seven ordinary Directors to three employee Directors. But they scarcely ever went to a vote; and he did not think there would be any division on the Board.

A SHAREHOLDER inquired what was the number of employee shareholders who had the right to vote under the scheme.

The CHAIRMAN: 1186. He might state that the smallest amount of stock that anyone could hold was £5; but in many cases this was accumulated without any effort under the revised profit-sharing arrangement of 1894. They had thought it would not be wise to let any man have a vote unless he voluntarily increased his holding to at least £10 of stock.

Mr. HOGARTH remarked that the scheme they were submitting to the proprietors was undoubtedly a novelty, and might prove to be an object-lesson. That being so, he was very glad to find that the Directors had approached it carefully and in a right spirit. He was himself a thorough convert in the matter. By utilizing the best brains of their workpeople in grappling with the affairs of such a great Company as theirs, the best results would be obtained. He felt that there would be no difficulty in admitting their men to the Board so long as they got the right men elected from among the workpeople; and the scheme might prove to be a pioneer for many other companies.

Mr. MITCHELL expressed his regret at having to be on the opposite side. He could not say that he approved the scheme. The Chairman had pointed out that his chief reason for putting it forward was the large holding the workmen had in the Company. Over 1100 workmen had a small interest in the Company as shareholders; but why this class-legislation, why this dividing-up of the shareholders into classes to be represented on the Board? He should imagine that the interests of the workmen were as carefully safeguarded by the present Board as they would be by a Board *plus* the workmen Directors—he meant that the interests of the small shareholders of the Company were, in his opinion, as carefully guarded as those of the largest holders of the Company's stock. He could not see why the Company should be, as it were, subdivided into sections, and thus represented on the Board. He understood the Chairman to say that the men might be able to give useful technical hints as to the working of the Company. He was quite sure that the Board, as at present constituted, would be only too glad to receive any hints from the men as to improvements which might be effected in the working—to accept such hints, and reward them properly, without electing workmen Directors on the Board. The workman shareholder had the same power of electing representatives on the Board as any other shareholder.

The CHAIRMAN stated that the ordinary shareholder had one vote for £100; therefore it would cut out all but 52 of the workman shareholders in the voting for ordinary Directors.

Mr. MITCHELL (continuing), said he still thought that the workman's interest would be as carefully protected as it would be if he had £1000 of stock in the Company. On what grounds were the present Board elected? He supposed because they were business men—men of experience and knowledge of affairs. No one had a higher opinion of workmen than he (the speaker) had; but what experience had they had? They had not had the opportunity of acquiring experience. He knew that the seconder

of the resolution had been a workman; but Mr. Morton did not step out of his position as a workman and at once become a Director. On the contrary, he passed through a long experience before attaining his present high position. And granted that a workman Director had all the fitness and ability to act as a member of the Board, why should he receive only 10s. 6d. per meeting? and that was a question which he would naturally ask himself. He should say that the workman Director, from the latter's point of view, would be entitled—although he could not do so under the present Act—to expect the same fees as the other members of the Board; and why should he not, if he was equally taking part in directing the business of the Company. He (Mr. Mitchell) could not, however, see that this classification on the Board was for a moment required. The man was taken from his position as a workman one day, and was put into the position of a Director the next day; and he (the speaker) considered it probable that a man going through such an experience as this would "lose his head." When a man occupied the position of a workman, he was a workman; and he could not help it. He might rise to a much higher position in time; and it was perhaps easier in this country than in any other to rise from the lowest step of the ladder to the highest. But the rise must be by a series of steps, and not at once from the bottom to the top.

The CHAIRMAN observed that if there was no further discussion on the matter, he would proceed to reply. He thought that the last speaker had not grasped the idea; he looked at the matter from a narrow point of view. The proper point of view was this: Capital and labour were at war; and the feeling between capital and labour was very similar to that which had existed for so many years—and he was afraid still existed—between France and Germany. What they wanted to do was to change all this; to have, instead of a state of war, and antagonism, and distrust, a state of peace and mutual confidence. He thought that mutual confidence could only be obtained by trust. If they showed distrust of any man, he would not trust them. He had stated that he did not come before the meeting with any feeling of undue confidence in the matter. He always considered that, "Let not him that putteth on his armour boast himself as he that putteth it off." He would be able, three years hence, if he should be spared, to tell them more of what the scheme was going to do; but he was satisfied that it was worth a trial. They had succeeded—no one could deny this—in a way that no one could ever have expected in promoting a relationship between their employees and themselves such as he never before knew to exist, or even hoped to see in his time. He wanted to go a little further, and show their employees that the Directors had nothing to conceal—that their business was done in the fairest manner possible. He believed that it would be of great advantage to the Company if the employees were made to know this. He asked the meeting to remember that, next to the item of coal, the amount paid for labour was the largest figure in their expenditure. They expended more than half a million in the half year, and considerably more than one-third of the amount went in wages. It was highly important that the men who gave their work for wages should have a closer interest in the Company, and that they should have a desire to benefit the Company. Their workmen were already shareholders; let the Company go a step further, and allow the men to have not only a share in the profits but also a share in the responsibility. The remark was made to him once by a man of very extensive experience, that if they gave a man responsibility it entirely altered him. Let a man feel that responsibility rested on him, and he would act considerably and judiciously; whereas, if he did not bear responsibility, he might give vent to his feelings in a way which might not be either considerate or judicious. The interest of the workpeople was safe, he believed, with the present Board; but they wanted the workmen to know this, and he did not think that they could be assured of it in any better way than by coming among the Directors and seeing what the latter did. He felt that it would be a great benefit to the Company if the scheme succeeded; and he did not anticipate that any harm would arise if it failed, although if this happened he should be extremely disappointed. If the scheme succeeded, their Company would have done something for the industry of the kingdom of which they might well be proud. He then put the motion to the meeting, and it was carried with two dissentients.

On the motion of Mr. STOCK, a cordial vote of thanks was passed to the Chairman and Directors for the conduct of the Company's business in the half year, "and especially in connection with this scheme."

The CHAIRMAN, in reply, said it was a great satisfaction to the Board to feel that they had such a body of shareholders to deal with. It was a great stimulus to them to do the best they could for the Company; and he assured them that this expression of their confidence would not be forgotten. He might say that he had now completed fifty years in the Company's service; and it was a great satisfaction to him that, on the completion of his fiftieth year's work with them, the scheme which had been put before them should have been so harmoniously carried by the shareholders. He then proposed a vote of thanks to the officers and employees generally of the Company. He was bound to say that a better set of officers it would be impossible to find. Not merely did they do their duty, but the great majority of them—he did not say every man among them—took a real interest in the welfare of the Company. He might say the same of the workmen. There were some black sheep among them; but, taking them as a whole, they did their work thoroughly well.

Mr. JOHN MEWS seconded the resolution; and it was put and carried unanimously.

A LADY SHAREHOLDER, whose name did not transpire, expressed cordial approval of the scheme and high appreciation of Mr. Livesey's services during the fifty years that he had been connected with the Company. She had herself been interested in the Company for forty-one years.

The CHIEF ENGINEER (Mr. Frank Livesey), in reply, stated that they had been for some time partly reconstructing all their old works. This told heavily on the revenue account; but as it reduced the cost of manufacture, and enabled them to make more gas at the old works, he was sure that the shareholders would not be discontented at the outlay. In fact, for the last four or five years the large increase had been to a great extent taken up by the old works. They had still something to work for; and they hoped to continue to receive the shareholders' approval.

The SECRETARY also responded on behalf of himself and those under him. He reminded the proprietors that when they met last February they were all deploring the low price of residuals. Fortunately, prices were now very much better—both for coke and ammonia; but, as the



Chairman had explained, tar did not rise. There was another satisfactory feature in the accounts—that for the first time for several years they were able to add to the reserve fund out of the divisible profits. In 1892 the fund stood at £37,000; whereas it now stood at rather over £100,000. The proceedings then terminated.

### SHEFFIELD UNITED GAS COMPANY.

#### Half-Yearly Report and Accounts.

In the report which the Directors of the above-named Company will present at the 87th ordinary general meeting of the shareholders on the 13th prox., they remark that, bearing in mind the extraordinary mildness of the winter, and the large consumption of gas during the first six months of 1897 (which exhibited an increase of 11·15 per cent. on the corresponding period of 1896), the increase during the past half year of 49,688,000 cubic feet, or 4·7 per cent., must be regarded as satisfactory. The total receipts in the six months ending June 30 amounted to £149,905; while the expenditure was £109,287—leaving a balance of £40,618 to go to the profit and loss account. After paying the usual dividend, there will be a balance of £21,992 to be carried forward; the surplus on the past six months' working being £86 10s. 8d. This amount, the Directors point out, would have been larger but for the reduction of 2d. per 1000 cubic feet in the price of gas which has been in force since April 1. A net sum of £31,440 was expended in the half year on capital account; £29,285 being for new buildings and plant. There is now an unexpended balance of £41,044 on this account.

### PORTSEA ISLAND GAS COMPANY.

The Half-Yearly Meeting of this Company was held at the Offices, Commercial Road, Landport, last Saturday—Alderman Sir JOHN BAKER, M.P., the Chairman, presiding.

The report presented by the Directors stated that the quantity of gas manufactured during the past six months had been 362,026,000 cubic feet, of which 344,908,500 feet were sold for public and private lighting; and after allowing for the gas used at the offices and works, there remained a balance of 16,092,900 cubic feet unaccounted for, which was nearly 4 million cubic feet more than in the corresponding period of last year. The usual dividends of 13, 12, and 5 per cent. (less income-tax) on the several classes of shares were recommended; leaving £25,446 to be carried forward. With respect to the internal management of the Company, the Directors stated that for some time they had been of opinion that, owing to the growth of the business and for other reasons, it would be beneficial to the Company that the offices of Secretary (or Clerk) and Engineer should not be held by the same person; and consequently the secretaryship, which became vacant by the resignation of Mr. S. B. Darwin, had been filled by the election of Mr. C. Jenkins, who had for twenty-five years been in the service of the Company. The Directors having also determined to appoint an Assistant-Engineer, 60 applications for the post were received; and Mr. J. D. Ashworth, who was for twelve years in the service of the Gas Committee of the Manchester Corporation, was selected. Mr. Darwin had finally severed his connection with the Company on the 14th of July, when he resigned the post of Engineer and Superintendent, and since that date Mr. Ashworth had (provisionally) been satisfactorily performing the duties of Engineer to the Company. In concluding, the Directors stated that, with respect to the condition of the works, they had consulted Mr. Alfred Colson, the Gas Engineer of the Leicester Corporation; and, in order to put them into a thorough state of efficiency, the cost would probably be £2000. The total income for the half year had been £54,573.

The CHAIRMAN opened the proceedings by congratulating the meeting on the continued prosperity of the Company, as was shown by the report. Referring to the matter of the separation which had occurred between the Directors and their late Engineer, he said the former had been influenced by the fact that they had not only to look to the interests of local people who were shareholders, but to a vast number of others who, having invested their money in the undertaking, never attended the meetings from the fact that they were resident in all parts of the country. For a long time there had been differences of opinion between the Directors and the late Engineer, owing to the arrangements at the works not being so conducted as the Directors could have wished. This, indeed, had existed over a period of more than two years; and though they much regretted losing the services of so old a servant as Mr. Darwin had been, they felt that in the interest of the great body of the shareholders—which, of course, was the interest of the Company at large—it was absolutely necessary that the changes which they had inaugurated should be deferred no longer. The Directors had fully considered the matter in all its bearings; and they had felt that things had been so slack at the works that a catastrophe might have happened at any moment—a catastrophe which, if it had occurred, would have been sufficient to sink a battle-ship, and caused damage over a great portion of the important town in which their works were situated. There was, he added, the utmost good feeling in the minds of the Directors towards Mr. Darwin, but they could no longer postpone their decision that a change was desirable in the line he had indicated.

Lieut.-Col. C. LANYON OWEN, J.P., moved the adoption of the report and accounts; and, in doing so, referred to the continued inflow of receipts as the results of their manufacture of an illuminant which had been in use for so many years, and with so much usefulness.

Sir W. D. KING seconded the motion.

Mr. FLOWERS, in supporting the resolution, spoke very warmly of Mr. Darwin from the knowledge he had gained of him as a resident in the town; but, of course, he had not, he said, known how matters had stood officially between him and the Directors.

A SHAREHOLDER suggested whether it would not be possible to grant to Mr. Darwin some bonus or allowance.

The CHAIRMAN said the Directors could not see their way clear to carrying out such a suggestion, more especially as Mr. Darwin had, in the office he had held, been receiving no less than £1100 per annum.

The motion was then put, and was carried without a dissentient voice.

### PROVINCIAL GAS AND WATER COMPANIES.

We commence to-day our usual notes on the progress made by Gas and Water Companies in various parts of the kingdom whose reports and accounts come to hand about this time.

#### Gas Companies.

The annual meeting of the Biggleswade Gas Company was held on the 5th inst., when the Manager (Mr. G. R. Casterton) reported an increase of 771,000 cubic feet in the sale of gas, also an increase in the quantity of coke sold. The result of the year's work was 797 tons 13 cwt. of coal carbonized, and 8,625,000 cubic feet of gas made, of which 7,861,300 cubic feet were sold, or an average of 9848 cubic feet per ton. After placing to the reserve fund the sum of £183, making the amount of that fund £650, a dividend of 7 per cent. per annum was declared, and a balance of £24 carried forward.

In the year ending June 30, the Bridport Gas Company sold 13,266,300 cubic feet of gas for private consumption, as compared with 13,019,800 cubic feet in the preceding year. The revenue from this source was £2489, against £2442; and the total receipts were £3692, as compared with £3654. The expenditure was £2713, against £2705; and the balance carried to the net revenue account was £978, against £949. The amount available for distribution is £1443; and at the meeting of the Company to-day the Directors will recommend the payment of 8 per cent. on the ordinary shares, free of income-tax, and 5 per cent. on the preference shares, less income-tax. This will absorb £937, and leave £506 to be carried forward.

At the half-yearly meeting of the Bristol Gas Company next Thursday, the accounts to be presented will show that the sale of gas produced a revenue of £95,582 in the six months ending June 30, as compared with £94,224 in the corresponding period of last year. The returns from the sale of residuals amounted to £23,688, against £25,570; and the total revenue was £121,983, against £122,710. The expenditure on the manufacture of gas came to £79,326, as compared with £76,765—coal and oil figuring for £49,358 instead of £45,957; and the total outlay was £97,134, against £94,263. The balance carried to the profit and loss account is now £24,848; whereas this time last year it was £28,447. The amount available for division is £35,830; and the Directors recommend a dividend at the rate of 5 per cent. per annum. This will take £23,837, and leave £11,993 to be carried forward. The statements relating to the manufacturing operations of the Company show that 84,525 tons of coal and 9545 tons of cannel were carbonized in the six months covered by the report; the residuals produced being: Ordinary coke, 56,645 tons; cannel coke, 3648 tons; breeze, 8676 tons; tar, 1,032,497 gallons; and ammoniacal liquor, 2,008,512 gallons.

Notwithstanding an increase from £680 to £1659 in the assessment of the Bury St. Edmunds Gas Company, the Directors in the past half year added £250 to the reserve fund, bringing it up to more than £4000. At the recent half-yearly meeting, reference was made to the electric lighting scheme of the Corporation, and an opinion was expressed that the townspeople did not want it. At the electric light inquiry, the idea of the Paving Commissioners having years ago provided £2500 for the Company, on certain conditions, was ridiculed; but the Chairman (Mr. F. C. Andrews) pointed out that through this arrangement gas, for which private consumers were charged 3s. 6d. per 1000 cubic feet, was supplied for public lighting at 2s. 3d., and street lamps and brackets furnished by the Company would have cost the borough more than £1000. Dividends of 11s., 8s. 6d., and 8s. per share on the different classes of capital were declared; and a vote of thanks was accorded to the Manager (Mr. Alex. Mitchell).

At the half-yearly meeting of the Cambridge Gas Company, the Chairman (Mr. E. H. Parker) stated that the accounts presented, which were made out in the form required by the Gas-Works Clauses Act, showed the balance carried to the profit and loss account to be £6119; the corresponding figures for the year ending Midsummer, 1897, being £4238. However, though they had made an increased profit, it was not so large as it appeared from the figures, because they had not debited against the £6119 the following items: Interest on mortgage bonds, £594 17s. 3d.; income-tax, £340 19s. 10d.; and another small item bringing the total up to £964 3s. 4d. The items in the new account were debited in the profit and loss net revenue account. Therefore the profits were reduced by £964; leaving £5155. These figures, as compared with the profit made for the half year ending Midsummer, 1897, which were £4239, showed that during the past six months they had realized an increased profit of £916. The reasons for the increase were, he thought, that the gas rental had risen a good deal owing to the greater use of stoves for cooking purposes, and also owing to the re-organization of the coke department at the works. The sale of coke for the half year showed an increase of £345, which was very satisfactory indeed. A better result had also been obtained from the carbonizing. The new works were expected to be ready for use about the end of September. The report of the Directors, in which they recommended the declaration of dividends at the rates of 10 and 7 per cent. per annum, was adopted. At the close of the ordinary business, the meeting considered the course to be pursued with regard to an action commenced against the Company by the holder of stock certificates fraudulently obtained and issued by the late Secretary. The Chairman said the total defalcations, as far as manipulated gas stock, certificates, and mortgages went, amounted to £13,455. They had actions threatened against them involving the sum of £8995. They had taken the opinions of three Counsel as to their liability on the share certificates and mortgages, and they were distinctly advised that they were not liable. The matter was discussed in private.

At the half-yearly meeting of the Chester Gas Company on the 4th inst. the accounts presented showed a sum of £3499 available for division; a balance in hand of £342 being carried forward. The Chairman (Mr. J. Gamon), in moving the adoption of the Directors' report, stated that they had exercised economy in connection with the revenue account; and the saving of expenditure was something like £400. The price of coal, however, had gone up, and was now 9s. 6d. instead of 8s. 11d. per ton. The sale of cookers had very largely increased. This time last year they had 345 out on hire, and they now had 429, being an addition of 20 per cent. The ordinary consumption had augmented, though not very largely, but they were still advancing, in spite of the fact that some consumers had ceased through using the electric light. The Company now had 3615



consumers, against 3534 at the corresponding period last year, while they had 751 automatic meters out, against 481. The consumption through these meters had reached a larger figure than before; being an average consumption of 4859 cubic feet, against 3652 cubic feet for the corresponding period last year. The amount received for gas sold during the half year came to £11,819, against £13,049 in June, 1897. There was a reduction in price, which had materially diminished their income. If they had had the old prices, they would have made up £774 of the deficiency; and there was the fact that they supplied 3 million cubic feet less gas. This was not altogether due to the use of the electric light. There was the extraordinary state of the winter, which continued far into the end of March; and this accounted for much of the deficiency. Ever since April they had an invariable rise week by week; and the previous week there was an increase on the corresponding week of the previous year by 213,000 cubic feet, due to automatic meters, extensions, and cookers. In time they would recover any loss sustained through the electric light. The report and accounts were adopted; and interim dividends of 5 and 3½ per cent. for the half year were declared.

The quantity of gas sold in the first half of the year by the Dorchester Gas Company was 14,334,500 cubic feet—an increase of 800,000 cubic feet as compared with the corresponding period of 1897—and it produced £2720; the total revenue being £3321. The expenditure amounted to £2283; so that there was a sum of £1038 to go to the net revenue account. The amount available for division was £1176; and at the meeting last Tuesday, a dividend of 10 per cent. (free of income-tax) was declared on the ordinary capital, and one of 6 per cent. (less income-tax) on the preference capital.

The Faversham Gas Company have had a successful year's working. The amount received for gas was £224 more than in the previous year. The net profit amounted to £2832, which with £1341 brought forward and £14 interest on investments, less £59 interest payable, make a total disposable sum of £4128. From this a dividend of 9 per cent. has been declared, which will absorb £2419. The Company are proposing to construct additional works, which will necessitate an increase of capital.

The accounts of the Keswick Gas Company for the year ending June 30 show that the revenue was £3325, and the expenditure £2036; the balance carried to the profit and loss account being therefore £1289. Adding to this the amount brought forward, £497, and deducting £84 for interest on loans, there remains £1702. From this the Directors propose to set aside £110 for depreciation, and add £194 to the mortgage redemption account; leaving £1398 available for distribution. They will recommend the declaration of dividends at the rate of 8½ per cent. per annum upon the original, and £5 19s. per cent. per annum upon the additional capital. This will absorb £845, and leave £553 to be carried forward.

Last Thursday the shareholders of the Maidstone Gas Company met to receive the Directors' report and accounts for the year ending June 30 last. These disclosed the favourable balance of £13,750, from which the Directors recommended a dividend at the rate of 11 per cent. per annum, less the interim payment of 5 per cent. The figures indicated a continued expansion of business. In their report, the Directors recorded, with regret, the retirement of Mr. Ambrose Ward, who for more than 32 years presided over the Board, and also of their colleague, Mr. John Arkcoll. In the course of the remarks made by the Chairman (Mr. W. Haynes), in moving the adoption of the report, he mentioned that a new bench of retorts was being completed, which would enable the Company to carry on the manufacture of gas in a somewhat more economical way even than at present.

The business of the Malton Gas Company continues to extend, mainly owing to the growth in the demand for prepayment meters and cooking and heating stoves. The balance of profit for the past half year is £1313; and the amount available for dividend, after paying interest on borrowed money, is £2167. At their meeting last Wednesday, the shareholders decided to pay a dividend at the rate of 5½ per cent.

The report presented at the half-yearly general meeting of the Newport (Mon.) Gas Company last Wednesday showed that upwards of 106 million cubic feet of gas had been sold during the six months ending June 30, bringing in £16,541; and the total revenue was £22,827. There was a profit of £4896. Under the supervision of the Company's Engineer (Mr. Thomas Canning), 11,832 tons of coal and 1230 tons of cannel were carbonized; the residuals produced being 8964 tons of coke, 793 tons of tar, and 414,395 gallons of ammoniacal liquor. The Chairman (Mr. E. J. Phillips, J.P.), in moving the adoption of the report, said there had been an increase of 2 per cent. in the quantity of gas manufactured, and 250 tons more coal had been carbonized, as compared with the previous half year. Though they had made 2½ million cubic feet more gas than in the corresponding half of 1897, there had been a decrease of £88 in the cost of manufacture. Mainly in consequence of the strike in the coal trade, they had had to pay £1000 more for coal; on the other hand, however, they had been able, owing to the same cause, to clear off a very large accumulation of coke. The works had been extended at an expenditure of £2842; an additional mile of new mains had been laid; and 131 new services put in. There had been a serious increase in the rates and taxes, which amounted to £576. The Company gave notice of appeal; but eventually the matter was compromised. In order to pay the statutory dividend, £447 would be taken from the reserve; but if the strike were settled there would be no need for this. The report was adopted; and the maximum dividends were declared.

In the six months ending June 30, the Poole Gas Company received £3013 from the sale of gas, and had a total revenue of £3840. The expenditure being £2680, there was at the close of the half year a balance of £1169 to go to the profit and loss account, as compared with £1240 this time last year. The amount divisible was £5776; and at the meeting on Monday last week maximum dividends (less income-tax) were declared upon all classes of stock. Under the supervision of Mr. W. Davis, 1800 tons of coal were carbonized; and of the total quantity of gas produced, 13,398,800 cubic feet were sold to private consumers, and 1,362,900 cubic feet for the public lamps not lighted by contract.

The half-yearly meeting of the Tunbridge Wells Gas Company was held last Wednesday—Mr. Alderman Delves presiding. The report presented showed the total quantity of gas made to be an increase of 4½ per cent.; while there were 370 tons more coal used. Unfortunately, coal had gone up in price, and it was anticipated that this would be felt in the current half year. The more extended use of gas was shown in every branch of

private consumption. The decrease was in the public lighting; but this only represented 5 per cent. of the total revenue. Prepayment meters showed satisfactory results; and the Directors anticipate a continued addition to the number in use.

The accounts to be presented to the shareholders of the Weymouth Gas Company at their meeting next Thursday show that in the half year ending June 30 there was an increase to the extent of 4·65 per cent. in the sale of gas, as compared with the corresponding period of 1897; the figures being 29,842,800 cubic feet and 31,231,900 cubic feet respectively. This produced £5919; and the total revenue was £7192. The expenditure on the manufacture of gas was £3904—the 3852½ tons of coal used costing £2821; and the total outlay was £4995. The balance carried to the profit and loss account is £2197; and the balance available for distribution is £3758. The Directors will recommend the payment of a dividend at the rate of 5 per cent. per annum, subject to deduction for income-tax. The growth of the Company's business has necessitated extensions of the works and mains, which have been carried out under the supervision of the Manager and Secretary (Mr. J. Lowe).

The result of the past half-year's working of the York United Gas Company was a balance of £8022; the revenue having been £32,858, and the expenditure £24,836. Adding £243, the interest from the reserve fund, made a total of £8265 to meet the dividend. There was an increase of 4·3 per cent. in the consumption of gas as compared with the first half of 1897. In order to secure the advantages of modern methods of gas manufacture, the Directors have determined to put up an installation of plant for the manufacture of carburetted water gas. Enlargements and extensions of mains have been carried out to meet the increasing demands for gas. To satisfy their general requirements, the Company have just received parliamentary powers to raise £100,000 of additional capital at 4 per cent.; the new stock to be issued under the auction clauses. At the recent meeting of the Company special allusion was made to the fact that, with a turnover of something like £30,000 or £40,000, the bad debts only amounted to 20 guineas—a fact which the Company's Engineer and Secretary (Mr. C. Sellers) cited with satisfaction at an inquiry held by a Committee of the York Corporation concerning the collection of their rates. The usual dividend of 5s per share was declared.

#### Water Companies.

The Cambridge Water Company recently held their half-yearly meeting, when the Directors recommended dividends at the rates of 10 and 7 per cent. per annum, less income-tax. They reported that the final settlement of certain claims arising out of the fraudulent transactions of the late Secretary, which were referred to in the last half-year's report, had been unavoidably postponed. They had decided that the secretarial department should in future be carried on at the Company's office, and had appointed as Secretary Mr. William Wythers Gray, the Engineer and Manager. His report set forth that water had been supplied to 177 new premises, the rental from which would be £153 per annum; and that the total number of premises supplied was 14,961. Reports were submitted by Professor Kantback and Mr. E. F. Smith, F.C.S., testifying to the good quality of the water supplied by the Company. The Chairman (Rev. Dr. Perowne), in moving the adoption of the Directors' report, referred to the cloud of anxiety under which the Company were at the time of the last half-yearly meeting through the disappearance of their late Secretary, and said they could now see their way out of the difficulties they had had to encounter. The report was adopted.

At the 83rd half-yearly meeting of the Chester Water Company last Thursday, the report presented by the Directors stated that the result of the six months' working had been a surplus of revenue over expenditure of £2807, to which had to be added the balance of £5671, making a total of £8478. The interest on the preference capital required £450, leaving a balance of £8028. It was recommended that the usual statutory dividends be paid, free of income-tax. This would absorb £1890, and leave £6138. The Chairman (Mr. W. Brown), in moving the adoption of the report, stated that the Directors had resolved to reduce the bath charges per quarter by about one-half. They would have been glad to abolish the rate altogether, and might have done so but for the foolish expenditure they had to incur in opposing the Dee Sluices Bill. The reduction for baths would mean a loss of about £350 a year to the Company. Mr. F. Roberts, in seconding the motion, said that those who advocated that the Company's water should be taken from a point farther up the river or from deep wells, had not considered what it would involve. If they obtained their supply of 2 million gallons a day from the Vyrnwy mains, at a cost of 8d. per 1000 gallons, it would mean an expenditure of something like £28,000 a year, including £4000 for working expenses. This would mean a rate to the city of about 8s. 4d. in the pound. As to what the cost of an entirely new supply from the mountains would be, no one had formed any reliable estimate. But with regard to obtaining water from wells, he alluded to the injurious effects caused by deposits in the pipes, and said that if Chester got the Vyrnwy water, they would not have any better supply than that of Liverpool, which, according to one authority, was rich in typhoid germs, while the much-decried filtered river water, which had long been supposed to be the bane of London, was superior to it. The report was adopted; and the dividends recommended were declared.

After providing for all expenditure, the Cleveland Water Company have a disposable balance of £4255 on the past half-year's working, which has enabled the declaration of a dividend at the rate of 8½ per cent. per annum on the original and "A" shares and £5 19s. per cent. on the "B" shares, the setting aside of £125 for contingencies, and the carrying forward of £1240.

At the recent annual meeting of the Cromer Water Company, the Directors presented a report which showed that the revenue for the year was £2297, and the expenditure £709; the former figure being an increase of £307, and the latter of £101 on those for the preceding twelve months. The profit on the year's working carried to the profit and loss account was £1588. This, added to the balance brought from last year, made the total of that account £1670. After the payment of interest on the debenture stock, there remained a balance of £1445. Deducting from this the sum of £200, which the Directors had applied in further writing down the account for meters and services, they recommended that the remaining balance—£1245—should be dealt with as follows: To be transferred to the reserve, £200; dividend at 5½ per cent. per annum, free of income-tax, £888; and balance carried forward, £157. The estimated



quantity of water pumped during the year was 33,671,600 gallons. The report was adopted.

Continued progress marks the business of the East Worcestershire Water Company. During the past half year 297 additional services have been connected; making the total 4972, exclusive of Droitwich and Rednal. There has been a considerable increase in the quantity of water pumped; the daily average having been 632,900 gallons. The accounts show a further increase in water-rental; and there has also been an additional amount brought to credit through increased activity in the fittings department. The net profit is £1687, against £1416 the previous half year; so that the policy of paying an increased dividend has been fully justified. Adding the amount brought forward from the last account, £803, there is now a disposable balance amounting to £2491, which it is proposed to appropriate as follows: By paying a dividend at the rate of 3½ per cent. per annum, £1079; adding £635 to the depreciation reserve fund; and carrying forward £777.

The Directors of the South Staffordshire Water Company, in the report they will present at the half-yearly meeting on the 25th inst., state that in the six months ending June 30 the number of houses laid on was 1823; making the total supplied 96,681. The gross amount of water-rates was £48,557, against £47,593 in the corresponding period of the previous year. After providing for interest on the debenture and preference stocks, the amount remaining for division (including £4362 brought forward) is £23,024; and the Directors recommend the declaration of a dividend for the half year on the ordinary stock at the rate of 6 per cent. per annum, free of income-tax. The amount of this dividend being £17,850, there will remain £5174 to the credit of the next half year. The report of the Engineer (Mr. H. Ashton Hill) as to the condition of the Company's works is that they are in substantial order and repair.

Mr. A. C. Wilyams, who presided at the recent half-yearly meeting of the Truro Water Company, congratulated the shareholders on the steady progress of the undertaking. The overtures by the Corporation for the purchase of the property had been under the serious consideration of the Directors, who would not recommend the raising of any unnecessary objection to an arrangement with the Council. At the same time, it must be fairly understood that they would expect such a price as would give them an increase on the dividend they were now receiving, because they were justified in looking forward to a very considerable augmentation. The report of the Directors was adopted; and it was decided to pay a dividend of 5 per cent., to transfer £200 to the capital account, and carry forward a balance of £20. The Engineer (Mr. N. Trostrail) said the consumption of water was at present on the increase, while the pumping charges had been reduced from £14 13s. 2d. per million gallons in 1885, to £3 8s. 9d. during the first half of the present year. He believed the Company would be in a position to pay a dividend of 10 per cent. in the near future.

The report of the Yeaton Water Company for the six months ended June 30 shows that the expenditure on capital account in that period was £66; making the total outlay on the works up to the present £55,369. The receipts on revenue account amounted to £1552, and the expenses to £540; leaving a balance of £1012. This, added to £262 from last half-year's account, makes a total of £1274 available for distribution. The Directors recommend a dividend at the rate of £5 10s. per cent. per annum on the original capital, and £3 17s. per cent. per annum on the "E" stock, 1889, which will leave £265 to be carried forward. The reserve fund amounts to £250.

The half-yearly meeting of the York Water Company was held on the 4th inst. at the Merchants' Hall, York—Alderman Rymer, Vice-Chairman, presiding. The Chairman moved the adoption of the half-yearly report, in which the payment of the usual dividend of 5s. per share without deduction for income-tax, was recommended; and it was carried. The Chairman then moved the declaration of the dividend, and said that since the report was issued it had come to the knowledge of the Directors that serious irregularities had been committed by the Secretary (Mr. J. W. Watson). The Official Auditor of the Company (Mr. G. O. Taylor) called the Directors' attention to certain facts, and inquiries were made which brought the irregularities to light. The Directors thereupon suspended the Secretary; and instructed Mr. Taylor to make a thorough examination of the books of the Company. The dividend recommended was based upon the balance-sheet for the past half year; and the Directors anticipated that the bond of the Guarantee Society, coupled with a special guarantee fund which they were themselves providing, would meet the deficiency in the dividend for the current half year which might result from these irregularities. The Board had the most absolute confidence in the Secretary, who had been in the service of the Company for about 30 years, and in many respects had rendered zealous and efficient services. The motion was carried.

#### BROMLEY GAS CONSUMERS' COMPANY.

The Half-Yearly Meeting of this Company was held on Thursday, at the White Hart Hotel, Bromley—Mr. ALEXANDER DICKSON in the chair.

The SECRETARY read the notice convening the meeting; and the report and accounts, of which an epitome appeared in last week's issue, were taken as read.

The CHAIRMAN, in moving their adoption, remarked that a warm and bright winter was by no means a great boon to gas companies, though it might be to their consumers. The climatic conditions which prevailed during the past half year had a distinct impression upon the consumption of gas, and had considerably retarded it. But, notwithstanding, the make of gas had increased during the six months by about 6 million cubic feet, which, he thought, would be considered very fair. Those shareholders who had looked somewhat critically into the accounts would possibly have observed that the whole of this increase had not been sold, and that about 1½ to 1½ millions of it appeared in the unaccounted-for gas. He was asked a question regarding the unaccounted-for gas at the last meeting; and said he thought it would be well to explain the matter at this point. Of course, everyone would desire that there was no such thing as unaccounted-for gas; but he did not think a gas engineer had yet been born who was able to avoid it. It partly arose from the difference in the temperature of the gas at

the point of registration at the gas-works and the temperature at the consumers' meters after the passage of the gas for some distance through the cool mains. Another portion of it might be due to the variation in the quantity of gas in the holders at the end of the half year. For example, supposing at the close of one half year the holders were absolutely empty, and at the end of the next half year they were full, it was obvious that, during the latter half year, they would have made not only the gas sold, but what remained in the holders. The gas in the holders did not come into the money account; and it was not reckoned as stock. It would therefore be understood that there must, from time to time, necessarily be variations in the volume of unaccounted-for gas. Following up the accounts, it would be seen that they had an increased revenue from gas and meter rentals combined of about £729. Then sulphate of ammonia had produced an additional £137 by reason of their having sold a larger quantity at a somewhat better price. There were other small items of increase, which gave them a total advantage on that side of the account of £927, which, however, was reduced by £266 in consequence of the lower value of the tar sold. The net increase in the revenue was £648. Turning to the expenditure, he said there was an increase of £349 in the cost of coal, which was a question of price, and not of quantity. Wages had risen by £145; and in other items they had increases amounting to £109. On the other hand, they had savings to the extent of £103, so that the increase in the total expenditure was £501. Then they had taken advantage of the fact of their having a balance of about £554 after paying the dividends for the half year to write off £240 for depreciation of retorts, which the Directors thought was an expedient thing to do now that they had the funds well in hand. This left them with a net surplus of £313 above the amount required to pay the dividend at the same rate as hitherto, and upon a slightly increased capital. Seeing that the largest Gas Company in the world had had, during the past half year, to raise the price of gas 2d. per 1000 cubic feet in order to maintain their dividend, he thought the shareholders would consider the result in their own case very satisfactory. They had earned their dividend without advancing the price of gas, and had a surplus in addition.

The DEPUTY-CHAIRMAN (Mr. Bertram H. Latter) seconded the motion, which was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. LATTER, a dividend was declared at the rate of 11½ per cent. per annum on the ordinary 10 per cent. shares and 8½ per cent. on the ordinary 7 per cent. shares.

This concluded the business.

#### WINDING UP OF THE COWES GAS COMPANY.

A Special General Meeting of the Cowes Gas Company was held on Monday last week to appoint an Auditor of the accounts for the period ending July 30, 1898, and to vote the Directors a sum by way of remuneration for their services and as compensation for loss of office; the undertaking having, as our readers are aware, been acquired by the District Council on the 1st of January last. The price paid, in accordance with the Umpire's award, was £52,150, in addition to which the Council paid £2409 as the agreed costs of the Company's Act, and £350 for stock-in-trade, stores, &c. The amount to be disposed of was £56,856. The first distribution of assets was at the rate of £20 for each £10 of original capital stock (£13,430); the second, at the rate of £10—absorbing together £40,290. After payment of liabilities, there was a sum of £7374 4s. 6d. to be carried to the general balance-sheet. The statement of accounts presented was accepted by the proprietors, who appointed Mr. A. W. Oke as Auditor, at a fee of £2 2s., and voted £825 to the Directors. The balance of £6547 2s. 6d. will permit of a further payment of £4 17s. 6d. per £10 of stock; making a total of £34 17s. 6d. per share. The highest price the shares ever fetched when the Company were paying 10 per cent. was £20. During recent years, however, the highest dividend has been 8½ per cent.; and the highest selling price of the shares £15 12s. 6d. The proprietors are therefore getting a very handsome return.

#### THE PROPOSED RESIDUALS WORKS OF THE HOLYHEAD AND NORTH WALES GAS AND WATER CORPORATION.

In the report of the meeting of the above-named Company which appeared in the "JOURNAL" for the 19th ult., it was stated that the Directors had secured, near Llandudno Junction, a site for treating their tar and ammoniacal liquor, and that the necessary works were in course of construction. The project has given rise to much opposition in the neighbourhood, notwithstanding that the Company's Manager (Mr. G. E. Saville) has given abundant assurance that no nuisance would be caused. Some time ago a representative meeting was held at Conway to protest against the erection of such a building in the vicinity, it being alleged that it would be injurious to the district as a holiday resort. Strong resolutions were passed, calling upon the Rural District Council to reject the passing of the plans; while another was adopted, having for its object the appointment of a Joint Committee of the respective Local Authorities with the view to aiding financially the action of the Council in any possible lawsuit which might be brought against them. The Committee has been appointed; but, as we understand, no meeting has yet been held. The Council have, however, expressed an opinion upon the subject; for at their meeting last Friday it was decided, without any discussion, not to pass the plans submitted by the Company for their approval, and, further, not to give any reason for their action.

**Sedgley District Council Gas Profits.**—The annual report of the Gas Committee of the Sedgley District Council states that the balance of profit on the year's working amounts to £1006. Of this £600 has been appropriated for capital and interest, £200 for the benefit of the ratepayers, and £200 for meters and fittings. The Chairman of the Gas Committee attributes, in large measure, this satisfactory state of affairs to the interest and energy evinced in the undertaking by the officials.



## THE MANAGEMENT OF THE SOUTHPORT GAS-WORKS.

## Resignation of the Chairman of the Gas Committee.

The annual report of the Gas Engineer of the Southport Corporation (Mr. John Booth), which was noticed in the "JOURNAL" for the 19th ult., was presented with the minutes of the Gas Committee to the Town Council last Tuesday; and, as the conversation which took place at the previous meeting threatened would be the case (see *ante*, p. 163), the discussion took a lively turn, and ended in the Chairman of the Committee (Mr. Dimond) resigning his position.

Mr. DIMOND, in proposing the adoption of the minutes of the Gas Committee, said he believed the gas-works were above the average in every respect. During the last three years, the Committee had done as much as possible to improve them in every shape and form; and to his mind they were model works. As to the profits, on which he expected there would be some discussion, he would take the average of eight years—i.e., the last ten years with the exception of two years when the price of gas was raised. The gross profit for the eight years was £103,867—an average of £12,983; and last year it was £15,154. The net profit in the eight years was £51,403—an average of £6,424; while last year it was £6,716—nearly £300 above the average. Then on mains and services they had spent £1642 more out of revenue than in the previous year. They had lost the rent of meters, £841; and, in addition, had paid £1088 more for interest and sinking fund. For the lighting of the public lamps £1821 was paid; and the gas was supplied at net cost. Altogether they were paying £5463 a year, which had nothing to do with gas production. Then there was £7862 charged to capital account for the Eastbank Street site. They were charged on capital account £1622 for sewer ventilating-lamps, which had been purchased by the Health Committee, but had been tacked on to the Gas Committee. Gas-cookers had cost £6573, which was being put to a suspense account. Then they had cottage property standing at £4650; and altogether they had a total of £23,716, which had no more to do with gas making than the "man in the moon." From January to March, they sold 5½ million cubic feet of gas less than in the same period last year. Those were reasons why they did not make as much profit as before. As to the yield of gas per ton of coal carbonized, he found that they beat Manchester, where the make was 9960 feet of 20-candle power; while their own was 10,066 feet of 20½-candle power. If experts were called in, the Council would have as many opinions as they had individuals. Widnes was a place which was often quoted. There they made gas out of slack; but the Engineer (Mr. Isaac Carr) would not tell anyone how he did it. The charge there was 1s. 4d. per 1000 cubic feet; and Mr. Carr would not be satisfied until he got it down to 1s. But that was the only case of the kind in England. He would give one comparison. Bury, with a similar make as Southport, reported a loss of £1606 last year; but next year's profits were estimated at £3000—less than half the profit made in Southport. During the present year, the Committee had been a little more successful. In the past four months, they had delivered 8,609,000 cubic feet more than in the same period of last year; so that they were on the up-grade. Their works were well cared for; and the Committee were fully alive to their duties. They had enlarged the gas-mains; and Birkdale had now obtained power to lay new mains, so that they expected they would get numbers of new customers. He should like to say that, from the rebate they allowed the Birkdale Authority, they must have paid for the mains many times over; and yet they were giving them nearly £2000 a year to help them to reduce their rates.

Mr. DEWHURST seconded the motion.

Dr. WEAVER was sorry he could not agree with the Chairman's remark that the year's working was satisfactory, and that was why he had given notice of his motion for the appointment of an expert. The profits were over £2000 less than they were a year ago. If that was satisfactory, and the same rate went on, they would soon have no profit at all. They had increased the capital account, and also the cost of manufacture. There might be explanations; but he felt it his duty to take the line he did. The make of gas per ton of coal was put down at a little above 10,000 cubic feet per ton—a reduction of about 600 feet, which made a difference in the year of 20 million cubic feet.

Mr. DIMOND: Last year's make was 9631 cubic feet.

Dr. WEAVER said then he would like to ask why they had not made as much last year as this. They had been told that the leakage of gas was through the tops of the retorts; and if this were so, it was a serious reflection on the management that it was not found out in time. As to the comparison with Widnes, he did not wish to push that too far, as the Manager there must be a sort of genius in gas making. There was, however, a great difference between 1s. 4d. and 3s. Blackpool produced 19-candle power gas and sold it at 2s. 4d., making a profit of £10,000; Manchester produced 19-candle gas and sold it at 2s. 3d.; St. Helens made 18½-candle gas, and sold it at 2s. 4d. As to the return on their capital, the interest was 2·8 per cent.; at Oldham, it was 7½ per cent., the gas selling at 2s. and 2s. 3d. per 1000 feet; at Blackpool, it was 9 per cent., the price being 2s. 4d.; at Nottingham, the profit was 7½ per cent., and the price was 2s. and 2s. 6d. So that there was a great deal of difference between the amount of profit in Southport and the capital involved. He did not think the policy of the Committee was a wise one, seeing that all their profit came from lighting gas. Cooking gas was sold at cost price; so that, if lighting gas was further affected by the electricity undertaking, they would lose revenue more and more. Everything should be done to cheapen the cost of the gas. An advance of a penny on cooking gas would give them a profit. Therefore he thought they ought to have an expert, and see that they were receiving a good return to relieve the rates. It would be a simple matter to get 3d. or 4d. more per 1000 cubic feet, and then they could get back to a 3s. rate. He had no personal feeling whatever in the matter; and he made these criticisms simply as a matter of duty.

Mr. HESFORD regretted that he could not agree that the report was satisfactory. He thoroughly believed that every member of the Committee had an earnest desire to make the department a good one. The material used had been the same for the past three years. Two years ago the production of gas was very small indeed; the average amount that passed through the consumers' meters for every ton of material used being 8523 feet. The succeeding year 10,150 cubic feet were produced

from exactly the same kind of material; and this year the average amount passing through the consumers' meters was 9800 feet—a difference of 350 feet. The amount of material used was 1400 tons more this year than last; and the explanation was that they were working machinery in a defective condition. Comparing their works with others, it was absurd to say that they were doing well. As to the sale of residuals, the results were not equal to those of the best works. He could not understand the Engineer or the Committee saying the management was satisfactory.

Mr. TRAVIS moved, as an amendment, that the report be adopted, with the exception of the paragraph which stated that the results of the working were satisfactory. He could not agree that electric lighting had caused the reduction in the gas consumed. As to the differences in the revenue from residuals, they were so slight as not to be worth mentioning. In regard to the Eastbank Street site, the Committee were receiving rent for it; and as to the ventilating-lamps, they were charged to the Highway Committee. If Southport produced gas at the same price as Blackpool, they would have had £12,000 more in hand than they had; and there would have been no necessity to raise the rates. If Blackpool could do that, why could not Southport. [Mr. DIMOND: You know as well as anyone.] At Lancaster they sold 20-candle power gas for 2s. 3½d., or nearly 1d. per 1000 feet less than it cost Southport to make it; and yet every advantage he could think of was in favour of Southport. Apart from capital charges, the cost of manufacture was 1s. 10½d. in Southport and 1s. 4½d. in Lancaster. If they could make gas at the same price as Lancaster, leaving out the capital account, they would be £9000 better off than they were.

Alderman FISHER said those who had spoken were well aware that they could not compare Southport with any of the places named. When they quoted from the report, they ought to quote all the facts. Mr. Travis did not show that there was a decrease of 16 million cubic feet in the gas supplied on which they made a profit. It was true the Committee had delivered more gas; but that was because there had been an increase of 18 millions in the gas on which they made no profit. He considered they had no business to employ capital in a commercial direction without making a profit. No one knew better than Mr. Hesford and Mr. Travis that the substitution of the electric light for gas had been one of the causes of the reduction of the profit on the gas-works; but there had not been the slightest reduction of capital in consequence. There had rather been a considerable increase in the capital account. If the Committee were in any way at fault in regard to the production of gas per ton or in the price charged, there was a very simple duty before the Council, and that was to dismiss the Committee and appoint another. He contended that the gas undertaking was managed as cheaply and efficiently as any in the kingdom.

The DEPUTY-MAYOR (Mr. J. Boocock) could not see that there was any want of confidence being shown to the Committee in asking them if they could not work on cheaper lines; and, if they had not the requisite knowledge, to call in such authorities as would enable them to achieve the desired result.

Alderman GRIFFITHS said there had been a strong attempt to depreciate the work of the Gas Department. A year ago the profit was £9000; and last year it was £6716. They had lost revenue from the meter-rents; they had sold 16 million cubic feet of gas without profit; and they had spent more out of revenue on the maintenance of their mains. Taking these things into consideration, they reached about the same figures as in the preceding year. The gentlemen who had criticized the Committee's work did not state the facts; and he thought it was abominable. Manchester was in its present position because of the enormous profits in years gone by, in consequence of which their capital was small. He thought it would be a good policy to encourage the use of gas for lighting purposes rather than electricity. If the Gas Committee of former days had not left their works in Eastbank Street, in the very midst of the population, they would now be able to make gas as cheaply as Blackpool. As to Widnes, he did not think they could compare such a town with Southport, with their miles of streets, the semi-detached houses, and separate mains to each.

Mr. HOLLAND seconded the amendment. Both Aldermen Fisher and Griffiths were excellent debaters, and on very many subjects had been known to shine; but on this matter they had done just the contrary. No one knew better than the gentlemen in question that the gas undertaking had been and was badly managed; and the conduct of some of the men had been unworthy of the trust and confidence of the people of Southport. Yet these were the gentlemen who defended the position.

Alderman FISHER entered his protest against this language.

Mr. HOLLAND: You can enter a dozen protests if you like.

Alderman FISHER said he had conscientiously discharged his duties; and he believed the other members had. Why Mr. Holland said they knew the works had been badly managed, and yet remained on the Committee, he did not know.

Mr. HOLLAND said it had been a case of trusting the Gas Committee too long; and he was not going to trust them any longer.

Mr. THRELFALL said he had every confidence in the Gas Committee; but the members of it were not gas experts. He was not going to impeach them; but how was it that for the last fifteen years there had been dissatisfaction at the gas management? All the criticism of the Gas Manager had been taken by the Gas Committee, who had saddled themselves with the responsibility. The gas management was like Tennyson's brook: Committees might come, Committees might go, but the Manager went on for ever. It seemed to him that the position was one which called for the engagement of an expert. He believed if the estate was properly managed, gas could be produced at a cheaper rate, more gas would be produced, more men would be employed, and wages would be better. The discussion came to this—that, as there was not a man on the Committee who knew the ins and outs of gas making, a very strong case had been made out for an expert's opinion being obtained.

Mr. DIMOND said he did not believe any member of the Gas Committee thought he had been attacked. He was not going to say anything about the Manager. They had had him for eighteen years; because they knew it was better to "bear the ills we have than fly to others that we know not of." He alluded to the differences of opinion among gas managers and experts, and expressed the belief that in the near future the gas undertaking would render a better account of itself than in the past.

On the vote being taken, fourteen members declared in favour of the amendment, and eight against it.



Mr. DIMOND (excitedly) : Mr. Deputy-Mayor, I beg leave to resign the chairmanship of the Gas Committee as a protest against such an unfair proceeding.

The minutes were then put, and carried, with one dissentient.

Mr. HESFORD, on behalf of Dr. Weaver, moved—"That a first-class expert be engaged to report upon the gas estate, with instructions to recommend to this Council any improvements which, in his opinion, would be likely to result in an increased profit." He said that, although he was prepared to support the spirit of the resolution, he should not do it without at least a formal instruction being given as to what the expert had to do. He wanted an expert, having full regard to the capital expended, to study and give his opinion upon the cost of making gas, which now stood at 1s. 11-4d. per 1000 cubic feet. He also wanted an opinion upon the question of residuals. The only policy of the Gas Committee for years had been that of marking time; and an expert might be able to give them some light upon essential matters.

Mr. HOLLAND seconded, but took exception to the limitations of the expert's work.

Mr. HESFORD said he would make it an open resolution.

Alderman GRIFFITHS looked upon the resolution as a vote of censure. He thought the proper course would have been to send the resolution to the Gas Committee, so that they could report upon it, and not pass it in the Council.

Mr. HULME moved, as an amendment, that the matter be referred to the Gas Committee.

Alderman Sir GEORGE PILKINGTON seconded this.

Alderman RIMMER said the whole discussion had been against the Gas Manager; and those who objected should have had the courage of their conviction, and brought a resolution that embodied something of this kind: "That the Gas Manager should be dismissed." That was what it all meant. He did not know that he should ever again make a speech in that Council Chamber; the matter had not been fair from beginning to end. The gentlemen who had taken a large part in the discussion were interested in another Committee, who had produced the results before them. They could not have electric light for the town, and have the same profit from the gas-works. Whether there was any fault with the Gas Manager he was not there to say. The arguments had not been against the Manager, but against the Committee. They had been on their trial, and had been treated in a shameful and unmanly way.

Alderman Rimmer here left the chamber; and Mr. Threlfall took exception to his "throwing stones" and then leaving the room.

The amendment was carried, and the matter referred to the Gas Committee to report upon.

## THE PLYMOUTH CORPORATION AND THE GAS COMPANY.

### The Opposition to the Company's Bill.

The report of the Parliamentary Committee of the Plymouth Town Council on the opposition to the Bill of the Plymouth and Stonehouse Gas Company, which was published in the "JOURNAL" last week, was presented to the Town Council on the 8th inst.

Alderman C. H. RADFORD, the Chairman of the Committee, in moving the adoption of the report, claimed that two out of the three points in the Corporation's petition were obtained without going to the expense of engaging Counsel; and that must be regarded as satisfactory. He proceeded to reply to the remarks of the Chairman and Deputy-Chairman at the last annual meeting of the Gas Company (see "JOURNAL" for June 28, p. 1582), on the action of the Corporation, and claimed that, in the interests of the ratepayers, the Parliamentary Committee should have the power they exercise of watching proceedings in Parliament. Mr. Henderson, the Chairman, said that the Corporation opposed the Gas Company "on every possible occasion." The first time opposition was raised to the Company was in 1879; but from 1879 to 1894 the Company did not go to Parliament, and the Corporation had no opportunity of opposing them. The opposition in 1894 was justified by results, for they got considerable concessions on that occasion. The opposition this year was only for the third time in twenty years; and therefore the strong remark as to opposition "on every possible occasion" was misleading, and ought not to have been used in that sense. Mr. Henderson complained that the Company had to take steps to meet the opposition; and though it was ultimately withdrawn, an expenditure of about £1000 was incurred by the Company. This was a most unjustifiable statement. The object of the opposition was set out in the petition, and was more in the nature of a friendly settlement; and he submitted it was untrue that the Company, by reason of the opposition, had had to incur an expenditure of £1000. He believed the Company's expenditure by reason of the opposition was not more than a few shillings or a few pounds. Another reckless statement of the Chairman of the Company was that in 1894 the Corporation, by their opposition, only got an increase of from 14 candles to 15 candles in illuminating power, while the Company had been supplying 15-candle gas before, as was shown by the tests of the Borough Analyst. The fact was, however, that the Corporation's apparatus for testing the gas was not in existence until some months after their opposition to the Bill; and though it was possible the Borough Analyst did make some tests, they were made at the works, and after notice. Mr. J. A. Bellamy, the Deputy-Chairman of the Company, made more serious statements on the same occasion; and he regretted that Mr. Bellamy was not at the Council meeting, in order that he might explain and apologize for some of the things he said at the meeting of the Company. Mr. Bellamy said "the Corporation of Plymouth had apparently considered it to be its duty to oppose any Bill brought forward by the Company." He had apparently forgotten that in 1894 he was himself a party to the opposition then brought against the Gas Company's Bill. On that occasion, when the Council proposed to take power to purchase the gas undertaking, Mr. Bellamy made a speech in which he said that, while he quite agreed that the lighting of the town should be in the hands of the Corporation, the light of the future was electricity. They all agreed, he said, that the gas supply had been well managed by the Company; and to transfer it at a time when it was probably about to be superseded by electricity was most inopportune. That was a speech which he thought Deputy-Chairman Bellamy would repudiate to-day. The change he had made from the position of Councillor to that of Deputy-Chairman of the

Company seemed to have altered all those sound progressive ideas which were once those of Mr. Bellamy. It was neither fair nor proper to say that the Council wished to thwart the Company. They were all gas consumers, and they wished the Company success in regard to the welfare of the town; but they also wished the gas undertaking was in their own hands, and Mr. Bellamy as Chairman of the Lighting Committee. Mr. Bellamy further said at the Company's meeting that they had nothing to fear from competition with electricity, "assuming that the Corporation debited each branch of its business in a proper and honest manner." He (Alderman Radford) did not think any member of the Corporation ought to insinuate that the Council did not keep their accounts in a "proper and honest manner;" and Mr. Bellamy ought to either substantiate his charge or withdraw it.

Alderman SHELLEY, who is the Solicitor to the Gas Company, said that while two of the three objects aimed at in the Corporation's petition had been attained, it must not be forgotten that the Company were ready to agree to, and offered, through him, to concede them from the beginning. It was said that the Company omitted to incorporate in the Bill provisions which would preserve the rights of the public as to a common nuisance; but this was already in a previous Act. What the Company objected to was a different law being made for Plymouth to that which obtained in London, Brighton, and other towns; and this point was dropped by the Corporation. The Company were ready from the beginning to accept any fair and proper terms, and were always ready to give that which the Town Council had obtained. It was, however, a fact that he did not know until after he had left Plymouth for London that no appearance would be made on the petition. Therefore they had to engage Counsel and have witnesses in attendance.

The TOWN CLERK (Mr. J. H. Ellis) contended that, by reason of the petition, the Company were not put to the expense of a thousand shillings. But for one little point, the petition would have been withdrawn.

The Mayor (Alderman J. T. Bond) said there was a petition against the Bill representing between 50 and 60 owners of small property in the neighbourhood of the gas-works, who, because they had not money enough to carry it on, had to suffer annoyance. This showed how vital it was in the interests of the poorer people, that a huge and wealthy Company trading in the borough should be carefully, closely, and critically watched by the Corporation.

The report was then adopted.

Mr. J. A. BELLAMY, the Deputy-Chairman of the Gas Company, has since written to the local papers explaining that a business engagement kept him away from the meeting of the Council. In a long reply to Alderman Radford, he says that that gentleman is misinformed in the statement that the first time opposition was raised to the Company was in 1879. "The Gas Company has been to Parliament four times—1855, 1879, 1894, and 1898; and on all four occasions the Corporation have opposed. The opposition of 1894 was particularly costly to the Company, and therefore to the consumers. It must have cost the ratepayers—nearly all of them gas consumers—a considerable sum of money. The only apparent advantage obtained on behalf of the consumers was the statutory obligation imposed on the Company was to supply gas of 15-candle-power, which it had been doing for years previously without such statutory obligation. I am of opinion that on that occasion at least 'the game was not worth the candle.' Mr. Radford charges me with having been a party to the opposition of 1894, because I was in the Council at the time and raised no protest. Further on, however, he quotes from some remarks I made, from which it is evident I did object to the opposition being offered to the Company's Bill of 1894." Mr. Bellamy says he stands by his criticism of the action of the Parliamentary Committee as to its eagerness to oppose Parliamentary Bills—at considerable expense—without making proper inquiries into the subject, and without making serious efforts to obtain reasonable conditions by friendly discussion before taking up a fighting attitude. With reference to the taunt that he made a speech in 1894 which is inconsistent with his remarks at the meeting of the Gas Company, Mr. Bellamy says: "In 1894, I, together with most of the other members of the Council, understood that the very inefficient lighting of the town was due to the parsimony of the Gas Company. It is only within the last twelve months that I and others have become aware that the number, pattern, and candle power of the public lamps were fixed years ago by the Corporation, and that the Gas Company had been always ready to co-operate in bringing about an improvement in the public lighting. In 1894, the recent system of incandescent gas lighting for streets was in its infancy, and it appeared to me that the electric light would supplant gas lighting for such purposes very soon. I considered it would be folly to buy up the Gas Company's property under such circumstances. I was therefore in favour of the town acquiring powers to supply the electric light; and I still consider the town, and not the Gas Company, should have these powers. But since then public gas lighting has made immense strides; and at the time the Corporation decided to erect the electrical works there were in existence gas-lighting schemes giving the same illuminating power as the electric light, at far less cost." As to the question of the accounts of the Electric Light Department, Mr. Bellamy explains that the electricity works have to supply current for traction for the tramways as well as for lighting, and says that if each of these departments is debited with its own proper capital, maintenance, depreciation, &c., the Gas Company need not fear the competition. He expresses most cordial agreement with the remark of the Mayor as to the necessity of the Company being critically watched by the Corporation; but he adds: "There is a vast difference, however, between this and factious and expensive opposition before Parliament, without any advantage whatever to the public." As to the allegation of nuisance, Mr. Bellamy points out that, after the recent exhaustive inquiry, the Official Referee decided that there was no nuisance from the gas-works. In conclusion, Mr. Bellamy points out that, under the sliding-scale, the interests of the gas consumers are the interests of the Gas Company, and that though it might be possible to harass the Company, the consumers would be the heaviest sufferers.

Alderman RADFORD has written to Mr. Bellamy explaining that he did not mean to say that that gentleman would repudiate what he said in 1894 in the sense of lying about it, but that he would now desire to repudiate the sentiments which he expressed in 1894.

In commenting upon the discussion in the Council, the "Western Morning News" says: "What the Gas Company complain of, and what



the ratepayer may equally resent, is that money is wasted, as in the case of this year's Bill, on opposition which is perfectly useless and futile, and is known by the Corporation to be useless and futile. In 1894 a definite issue was raised. The Corporation sought power to buy the gas-works, and failed to get it. This year it put forward as one of the chief grounds of its opposition an absurd claim to the right to supply gas within the added district of the borough—in Laira and Pennyross—where, if it had the power, it could not by any possibility exercise it. It is true that this demand was withdrawn after a time; but, meanwhile, the money of the ratepayers and of the Gas Company (whether a thousand pounds or a thousand shillings does not affect the principle) was frittered away in useless costs. The Corporation gained nothing which it could not have gained by friendly conference with the Gas Company. Many people will be inclined to think there would have been no opposition to the Gas Company's Bill, or indeed, to the Bill for the extension of the boundary of Devonport, if the temptation to enjoy what in Devonport they call a 'picnic' to London were not too strong to be resisted. Mr. Radford did not allude to the pregnant remarks of the Chairman of the Gas Company on the rights of Corporations to take action in opposition to Bills in Parliament without first obtaining the consent of the ratepayers. On the contrary, he claimed for the Parliamentary Committee 'the power they exercise of watching proceedings in Parliament.' But, surely, if the Swansea case means anything at all, the Parliamentary Committee have no such right; and the Council cannot confer it upon them."

### GAS AND ELECTRIC LIGHTING AT LEIGH.

A Local Government Board inquiry was held at Leigh last Tuesday, by Mr. W. O. E. Meade-King, respecting an application by the District Council for sanction to borrow £25,000 for gas-works extensions, and £10,500 for electric lighting purposes. Mr. P. Thomas, the Clerk to the Council, explained that the old gas-works in Leigh were purchased in 1874, from the Leigh and District Gas Company, for £48,000, by the West Leigh, Pennington, and Bedford Local Boards, which were then amalgamated into the Leigh Local Board. Up to the present time, £100,000 had been borrowed by the Council for the gas-works; but an additional £25,000 was now required owing to the great increase in population and manufactories during the last few years. In March, 1888, the annual output of gas amounted to 54,544,000 cubic feet, and the number of consumers was 1820; while for the year ended March 31, 1898, the output was 110,152,000 cubic feet, and the consumers numbered 4480—an increase of 101 per cent. At present the maximum make of gas was 607,000 cubic feet a day; but next winter it was estimated the consumption would be 700,000 feet. In 1893, 98 new 10-feet retorts were erected at a cost of £6400; but experience had since shown that it was better that the length of the retorts should be from 15 to 20 feet. It was therefore proposed to replace these retorts by 42 others 20 feet long. By doing so, it was estimated that the cost of labour per ton would be reduced from 2s. 8d. to 1s. 4d.; and thus a saving would be effected of about £800 per annum. In regard to electric lighting, it was proposed to erect the works on the gas-works land; and they would save the cost of boilers and chimney stacks by using those for the gas-works extensions. They intended to construct sufficient plant to supply electrical energy for five years; and from a canvass taken in the district, they anticipated making the electric works a paying concern even during the first year of their existence.

### THE FALMOUTH CORPORATION AND THE GAS AND WATER WORKS.

#### The Purchase Scheme Revived.

A Meeting of the Falmouth Town Council was held on Thursday to receive a report from the Gas and Water Purchase Committee, who recommended that a statutory meeting of the Council be called forthwith to consider and decide as to the expediency of promoting in the next session of Parliament, a Bill to enable the Corporation to purchase the undertaking of the Falmouth Gas Company, under the terms of sections 69 and 70 of the Falmouth Gas Act, and, either by agreement or otherwise, to purchase the undertaking of the Falmouth Water-Works Company. The advantages which would accrue from the purchase of the two undertakings were that the ratepayers or their representatives would have control over such important factors in the well-being and comfort of the community, and possess property constantly increasing in value as the community increased. The Corporation at the passing of the Falmouth Gas Act obtained the insertion of a clause empowering them to purchase the undertaking either by agreement or arbitration. In taking advantage of this clause, the Committee point out that the cost of obtaining an opposed Bill in Parliament and of the 10 per cent. usually added for compulsory sale will be avoided, and that next session is the last available for such action, as, after procuring parliamentary powers for obtaining and expending the money, six months' notice of the intention to purchase previous to July 4, 1900, has to be given. With reference to the purchase of the water-works, the Committee referred to the importance of a pure supply of water for a town ranking as a health resort, and expressed the opinion that the Water Company had not done their best to maintain the supply, and to prevent impurities getting into the water. The report was adopted—two members voting against the motion, and one remaining neutral.

### EXPLOSIONS IN ELECTRIC LIGHT CONDUITS.

A serious explosion, by which great damage was done, occurred last Wednesday night in one of the main thoroughfares (Bottom-o'-th' Moor) of Oldham. An employee of the Corporation Electric Light Department went to one of the large arc electric lamps to turn off the light; the cock used for this object being in an aperture at the base of the pillar. He had no sooner turned the cock than a terrific explosion occurred, which was followed by a rumbling noise, and the tearing up of the foot pavement for a distance of about 40 yards. The stone flags were lifted a foot high in

places, many of them being smashed into small pieces; and pedestrians on the pavement were thrown to the ground. As early as possible, Corporation workmen were set to work to effect repairs; and during the following morning they discovered a leakage in the gas-mains. It is supposed that, in switching off the current to the lamp mentioned, a spark was emitted, with the result that the gas which had accumulated in the conduit exploded. The Electric Department are now making a change in the system in operation for laying cables. Up to the present, the wires have been insulated in a three-sided concrete conduit with flag top; but in future the cables throughout the town will all be run through iron pipes.

An explosion took place in one of the electric light conduits in the roadway in Cumberland Terrace, Regent's Park, about a quarter to one last Friday morning, bursting through the road, and extending to two other conduits, in which explosions also occurred. The iron covers of the transformer chambers, weighing about 4 cwt. each, were blown off. Fortunately, no one was injured; but several hotels were thrown into darkness, as was also the case with some of the principal streets in the district.

### POLICE AND SANITARY REGULATIONS BILLS.

The Select Committee of the House of Commons on Bills containing new police and sanitary regulations have presented a special report, which is now issued as a Parliamentary Paper. The Committee give an account of their labours during the past session, and state that they have not granted powers which are in excess of, or which contravene, the general law except in cases where local evidence has been produced, and where, by such evidence, proof has been given that difficulties were experienced in the locality with which the existing law has been found unable to cope, or where it has appeared to them desirable that some powers should be granted to the locality other than those conferred by the general law. With reference to the periods for repayment of loans, the Committee have differentiated between work of a permanent and that of a temporary character; and they have endeavoured to put into practice the principle that the term for repayment shall be based upon the estimated life of the work in question, so that unfair burdens should not be thrown upon a future generation. It appears to the Committee that much unnecessary expense to the parties, and valuable time to the Committee, might be saved by the exercise of greater care in preparing Improvement Bills, in revising them before submission to the Committee in the light of the evidence to be given by the witnesses, and by a more strict regard to the model clauses and recent precedents. It also appears to the Committee to be somewhat doubtful whether in all cases sufficient care has been taken to ascertain, before incurring the expense of a Private Bill, how far the objects to which the promoters attach real importance can be attained under the general law or by means of Provisional Orders. They express their desire to strongly reiterate the suggestion previously offered for the consideration of the House, whether the time has not arrived for the inclusion in a Public Bill of many of the clauses which are so frequently introduced into Private Bills, and which have almost invariably been accepted by Parliament. It appears to the Committee that much trouble and expense might be saved if the necessity for application to Parliament for such powers by individual authorities were rendered unnecessary.

### THE SUMMER MEETING OF THE INSTITUTION OF MECHANICAL ENGINEERS.

#### Visits to Works.

The session of the Institution of Mechanical Engineers recently concluded at Derby included visits to various industrial and municipal works in the adjoining districts, interesting not only to those concerned in purely mechanical affairs, but also to engineers dealing with the questions of gas and water supply.

At one of the meetings, reference was made to the importance of the Midland Railway Company's works; and the Mayor of Derby (Mr. F. Duesbury) acknowledged that the town owed much of its prosperity to those works. The latter, with other premises, cover an area probably of more than 200 acres; and their requirements in respect of gas, water, and sanitary arrangements are equivalent to those of a fair-sized town. Gas is produced in the works formerly used for the town supply, but acquired by the Railway Company in 1875. Since then they have been enlarged to meet increasing demands; and in 1897 upwards of 133 million cubic feet of gas were made and supplied to stations, sidings, and signals in the neighbourhood. Oil gas is also largely manufactured by the Company at Kentish Town, Leicester, Nottingham, Bradford, Birmingham, and Bristol; but one of the most complete plants is at Derby, where the Pintsch process is adopted for producing gas from shale oil. A gallon of this oil will generate about 80 cubic feet of gas having an illuminating power of 45 candles with a consumption of 5 cubic feet per hour. The gas is pumped from a holder into cylindrical steel reservoirs at a pressure of 150 lbs. per square inch, and conveyed through pipes to the passenger stations, where the carriage cylinders are charged. Upwards of 2600 vehicles are now lighted by oil gas on the Midland Railway system. The water used in the works and supplied to locomotives is pumped from the River Derwent. It possesses about 15° of hardness, and is somewhat polluted with sewage and other organic matter. It is therefore highly desirable that efficient means, both for purification and softening, should be provided. These processes are carried on in the Archbutt-Decley apparatus, erected by Messrs. Mather and Platt, of Salford. The softening process not only brings down the hardness to 4.5°, but effects considerable organic purification, and reduces the number of micro-organisms present by about 98 per cent. The capacity of the plant is fully 30,000 gallons per hour. The town of Derby is supplied with gas from two works belonging to the Derby Gas Company, which were visited. The quantity of coal carbonized in the two works amounts to 50,000 tons annually, and the production of gas is 500 million cubic feet.

The Urban District Councils of Swadlincote and Ashby-de-la-Zouch are now combined for the purpose of water supply. A Joint Committee



are in full control of the works, and have been constituted a separate Authority by the Local Government Board. Beyond supplying their own district, the newly-constituted district of Woodville is furnished with water at the rate of 10d. per 1000 gallons. The area of supply now comprises 14 square miles, including the mining and pottery district of Swadlincote, and extending from Burton-upon-Trent to the boundaries of Ashby-de-la-Zouch urban sanitary district. At Milton, eight miles distant from the service reservoir, are the boreholes and a well fed by filter tunnels at the base of the gravels resting on the red marl formation. In the immediate neighbourhood are also the newly erected pumping-station and purifying plant. The general hardness of the water is from 22° to 23°; and it also contains carbonate of iron in a considerable proportion which is oxidized and precipitated on exposure to light and air. In its natural state the water is unsuitable for general use, and especially so for various industrial purposes. It was therefore decided that the whole of the water pumped should be treated by the Archbutt-Decley process to which reference has already been made; and the results obtained have entirely justified this course of action. The apparatus consists of four cast-iron tanks, each of 30,000 gallons capacity, over part of which is built the chemical treatment house. A mixing apparatus with injectors is furnished for each tank, and carbonic acid is laid on from a common producer to floating pipes in the several tanks.

No reference to the industries in the vicinity of Derby having relation to gas and water services would be complete without a mention of the Stanton Iron Company, whose works comprise the Stanton-by-Dale and Hallam Fields blast-furnaces and foundries, besides the Teversal, Pleasley, and Silver Hill Collieries, and extensive ironstone mines in the counties of Leicester, Northampton, and Lincoln. Opened more than half a century ago, the blast-furnaces and foundries have largely assisted in the industrial development of the district. The Stanton works cover about 30 acres. The foundries here include pits for making pipes from 1½ to 24 inches in diameter, and shops for producing special castings for the pipe trade. At Hallam Fields, the works, extending over an area of 60 acres, are equipped with the most modern machinery for the manufacture of pipes up to 60 inches in diameter and 12 feet in length. All pipes are tested by hydraulic machinery before leaving the works. The three collieries are very extensive; the royalties leased amounting to 7000 acres. The coal, coke, and cannel are in high repute for gas-works. The Teversal Colliery yields an average of 1200 tons of coal daily. The Pleasley Colliery is worked at a depth of 1578 feet, and yields 1700 tons daily. It is famous for the exceptional quality of its cannel. The Silver Hill Colliery at present gives 1000 tons daily of soft coal, much in request for gas making. About 9000 men & boys are employed by the Company in their various undertakings.

A new colliery sunk by the Bolsover Colliery Company is situated at Cresswell. Here the celebrated Tophard seam, which is identical with the Barnsley bed of South Yorkshire, is reached at a depth of 1335 feet. The seam is from 5 ft. 9 in. to 6 feet thick; and the present output of coal is about 1700 tons daily, which will be increased to 3000 tons when the underground workings are completed. As regards mechanical appliances, the colliery is one of the best equipped in the country.

## NOTES FROM SCOTLAND.

From Our Own Correspondent.

*Saturday.*

Good progress is being made with the taking down of the old chimney at the Edinburgh Gas-Works by Mr. W. J. Furse, of Nottingham, and his men. The most difficult and most dangerous part of the work has been accomplished, in the removal of the heavy iron and stone work which formed the top. It took about a fortnight to get in order the staging around the top. But little more than a week has elapsed since the actual work of removal began ; and already nearly 15 feet have gone. There are to-day only two courses of stone left. After they are down, the brickwork will be easily handled, and the work will proceed rapidly.

The Committee of the Stirling Town Council who were in charge of the opposition to the Stirling Gas Company's Bill, having had to give way on every point of their policy, have now set themselves the task of seeking to discover for themselves glorious victories. In their report, which was laid before the Town Council on Monday, they say: "The instructions to your Committee were to oppose the Bill in the interest of Stirling rate-payers, either by securing the option under the Gas Act of purchasing the existing gas-works on equitable terms, or by getting the terms of the Bill modified so as to protect the interests of ratepayers in all time coming. Both these objects were kept fully in view by your Committee. In regard to the first, they were successful in getting from the Commons Committee the offer of a clause by which the Corporation would have been entitled to buy the gas-works without putting into operation the Burghs Gas Supply (Scotland) Act, 1876. This offer, however, was coupled with the condition that the price should be only that at which the Gas Company would be willing to sell. This condition was so manifestly unreasonable and inequitable that the Sub-Committee instructed Counsel to decline the clause as offered. In that declinature your Committee heartily concurs. In the second and alternative object, the efforts of your Committee have been crowned with most gratifying success. This will at once be seen if the terms of the Bill as deposited originally are compared with the terms of the Bill as passed by the House of Commons Committee. Taking the four essential points of (1) amount of authorized capital, (2) the amount of dividend payable, (3) the standard price of gas, and (4) the quality of gas, the difference is as follows: (1) The Gas Company proposed £59,544 of original capital; and now that is cut down to £40,000, coupled with an obligation to pay £5000 out of revenue for the repair of their dilapidated works. (2) The Gas Company asked powers to pay £5359 per annum in dividends; and now that has been cut down to £3200, coupled with an equitable sliding-scale. (3) The Gas Company wished the standard price of gas to be 4s. per 1000 cubic feet; and now that has been cut down to 3s. 4d.—the present moderate price under non-statutory conditions. (4) The Gas Company, lastly, asked the minimum quality of the gas to be fixed at 20-candle power; and now that has been raised to 25-candle power. So that the community of Stirling, without incurring any risk of loss, have now got ensured an abundant supply of excellent gaslight at a moderate price; and the Corporation has a free hand in regard to electric or any other form of

## GAS AND WATER COMPANIES STOCK AND SHARE LIST.

Referred to on p. 362.

| Issue.         | Share. | When<br>ex.<br>Dividend. | Dividend<br>or Dividend<br>& Bonus. | NAME.                                         | Closing<br>Prices. | Rise<br>or<br>Fall<br>in<br>Wk. | Yield<br>upon<br>Invest-<br>ment. | Issue.    | Share. | When<br>ex.<br>Dividend. | Dividend<br>or Dividend<br>& Bonus. | NAME.                                 | Closing<br>Prices. | Rise<br>or<br>Fall<br>in<br>Wk. | Yield<br>upon<br>Invest-<br>ment. |
|----------------|--------|--------------------------|-------------------------------------|-----------------------------------------------|--------------------|---------------------------------|-----------------------------------|-----------|--------|--------------------------|-------------------------------------|---------------------------------------|--------------------|---------------------------------|-----------------------------------|
| £              |        |                          | p. c.                               |                                               |                    |                                 | £ s. d.                           | £         |        |                          | p. c.                               |                                       |                    |                                 | £ s.                              |
| GAS COMPANIES. |        |                          |                                     |                                               |                    |                                 |                                   |           |        |                          |                                     |                                       |                    |                                 |                                   |
| 590,000        | 10     | Apl. 15                  | 10½                                 | Alliance & Dublin 10 p. c.                    | 23½-24½            | ..                              | 4 5 9                             | 75,000    | 5      | June 29                  | 6                                   | Malta & Medn., Ltd.                   | 42-51              | ..                              | 5 14 3                            |
| 100,000        | 10     | " 1                      | 7½                                  | Do. 7 p. c.                                   | 16-17              | ..                              | 4 8 3                             | 541,920   | 20     | June 10                  | 5                                   | Monte Video, Ltd.                     | 14-15              | ..                              | 6 13 4                            |
| 300,000        | 100    | July 1                   | 5                                   | Australian 5 p. c. Db.                        | 105-107            | ..                              | 4 13 6                            | 617,946   | Stk.   | Feb. 24                  | 9½                                  | Newcastle & Gateshead Con.            | 235-240            | ..                              | 4 1 3                             |
| 200,000        | 5      | May 26                   | 6                                   | Bombay, Ltd.                                  | 64-64½             | ..                              | 4 8 11                            | 252,355   | Stk.   | Jan. 3                   | 9½                                  | Do. 3½ p. c. Db. Stk.                 | 118-117            | -1                              | 2 19 10                           |
| 40,000         | 5      | " 12                     | 6                                   | Do. New, £4 paid.                             | 43-5               | ..                              | 4 16 0                            | 150,000   | 5      | May 26                   | 8                                   | Oriental, Ltd.                        | 7-7½               | -1                              | 5 6 8                             |
| 980,000        | Stk.   | Aug. 12                  | 12                                  | Brentford Consolidated                        | 275-280            | +1                              | 4 5 9                             | 135,000   | 5      | " 8                      | 8                                   | Do. New, £4 10s. pd.                  | 6-6½               | ..                              | 5 10 9                            |
| 240,000        | "      | " 9                      | 5                                   | Do. New                                       | 210-215            | ..                              | 4 3 9                             | 15,000    | 5      | " 7                      | 7                                   | Do. do. 1879, £1 pd.                  | 1-1½               | -1                              | 5 6 8                             |
| 50,000         | "      | " 10                     | 4                                   | Do. 5 p. c. Prf.                              | 140-145            | +2½                             | 3 9 0                             | 60,000    | 5      | Mar. 11                  | 8                                   | Ottoman, Ltd.                         | 5-6½               | ..                              | 6 6 2                             |
| 159,375        | Stk.   | June 10                  | 4                                   | Do. 4 p. c. Db. Stk.                          | 130-135            | ..                              | 2 19 3                            | 500,000   | 100    | June 1                   | 6                                   | People's Gas & 2nd M. of Chicago) Bd. | 103-108            | ..                              | 5 11 1                            |
| 220,000        | Stk.   | Mar. 30                  | 11½                                 | Brighton & Hove Orig.                         | 263-273            | ..                              | 4 4 3                             | 848,070   | 10     | May 26                   | 6                                   | River Plate Ord.                      | 9-9½               | ..                              | 6 6 4                             |
| 218,820        | "      | " 8                      | 8½                                  | Do. A. Ord. Stk.                              | 195-200            | ..                              | 4 5 0                             | 250,000   | Stk.   | June 29                  | 4                                   | Do. 4 p. c. Db. Stk.                  | 97-99              | ..                              | 4 0 10                            |
| 993,500        | Stk.   | Feb. 24                  | 5                                   | Bristol, 5 p. c. max.                         | 127-132            | ..                              | 3 15 9                            | 250,000   | 10     | Apl. 29                  | 10                                  | San Paulo, Ltd.                       | 15-16              | -½                              | 6 5 0                             |
| 420,000        | 20     | Mar. 30                  | 11½                                 | British                                       | 53-55              | ..                              | 4 1 9                             | 135,000   | Stk.   | Mar. 30                  | 10                                  | Sheffield A.                          | 24½-248            | ..                              | 4 0 8                             |
| 50,000         | 10     | Aug. 12                  | 11½                                 | Bromley, Ord. 10 p. c.                        | 25-27*             | +1                              | 4 5 2                             | 209,053   | "      | " 10                     | 10                                  | Do. B.                                | 245-248            | ..                              | 4 0 8                             |
| 75,000         | 10     | " 29                     | 8½                                  | Do. 7 p. c.                                   | 20-22*             | +1                              | 3 17 3                            | 447,427   | "      | " 10                     | 10                                  | Do. C.                                | 245-248            | ..                              | 4 0 8                             |
| 600,000        | 10     | Apl. 29                  | 6                                   | Buenos Ayres (New) Ltd                        | 9-9½               | ..                              | 6 6 4                             | 5,213,168 | Stk.   | Aug. 12                  | 5½                                  | South Metrop. 4 p. c. Ord.            | 111-144*           | +½                              | 3 14 0                            |
| 98,122         | Stk.   | June 29                  | 4                                   | Do. 4 p. c. Db. Stk.                          | 98-100             | ..                              | 4 0 0                             | 1,185,846 | Stk.   | July 14                  | 3                                   | Do. 3 p. c. Db. Stk.                  | 101-104            | +1                              | 2 17 8                            |
| 150,000        | 20     | July 14                  | 8½                                  | Cagliari, Ltd.                                | 30-31              | ..                              | 5 6 5                             | 60,000    | Stk.   | Mar. 11                  | 12                                  | Tottenham & A.                        | 285-295            | ..                              | 4 1 4                             |
| 100,000        | 10     | June 10                  | 7                                   | Cape Town & Dist., Ltd.                       | 15-16              | ..                              | 4 7 6                             | 60,000    | "      | " 10                     | 9                                   | Edmonton ) B.                         | 205-215            | ..                              | 4 3 9                             |
| 50,000         | 50     | May 9                    | 6                                   | Do. 6 p. c. 1st Mort.                         | 58-60              | ..                              | 5 0 0                             | 182,380   | 10     | June 10                  | 7                                   | Tusean, Ltd.                          | 12½-13½            | ..                              | 5 7 8                             |
| 550,000        | Stk.   | Apl. 15                  | 13½                                 | Commercial Old Stock                          | 315-325            | ..                              | 4 3 1                             | 149,900   | 10     | July 1                   | 5                                   | Do. 5 p. c. Dbs. Red.                 | 100-103            | ..                              | 4 17 1                            |
| 200,750        | "      | June 10                  | 10½                                 | Do. New do.                                   | 252-257            | ..                              | 4 1 8                             |           |        |                          |                                     |                                       |                    |                                 |                                   |
| 200,750        | Stk.   | June 10                  | 4½                                  | Do. 4½ p. c. Db. dc.                          | 118-153            | ..                              | 2 18 10                           |           |        |                          |                                     |                                       |                    |                                 |                                   |
| 600,000        | Stk.   | June 10                  | 12                                  | Continental Union, Ltd.                       | 207-212            | ..                              | 5 13 2                            |           |        |                          |                                     |                                       |                    |                                 |                                   |
| 200,000        | "      | " 9                      | 9                                   | Do. 7 p. c. Prf.                              | 197-202            | ..                              | 4 9 1                             |           |        |                          |                                     |                                       |                    |                                 |                                   |
| 51,600         | Stk.   | Feb. 24                  | 14                                  | Croydon A 10 p. c.                            | 310-315            | ..                              | 4 8 11                            | 746,164   | Stk.   | June 29                  | 10½                                 | Chelsea, Ord.                         | 318-318            | ..                              | 3 6 0                             |
| 168,400        | Stk.   | Aug. 12                  | 5½                                  | Do. B 7 p. c.                                 | 255-265            | ..                              | 4 3 0                             | 150,000   | "      | " 5                      | 5                                   | Do. 5 p. c. Prf.                      | 170-175            | ..                              | 2 17 2                            |
| 555,000        | Stk.   | Aug. 12                  | 5½                                  | Crystal Palace Ord. 5 p. c.                   | 125-130            | ..                              | 4 0 9                             | 160,000   | "      | " 30                     | 4½                                  | Do. 4½ p. c. Prf. Stk., 1875          | 148-152            | ..                              | 2 19 3                            |
| 60,000         | "      | " 11                     | 5                                   | Do. 5 p. c. Prf.                              | 140-145*           | +1½                             | 3 9 0                             | 175,785   | "      | Mar. 30                  | 4½                                  | Do. 4½ p. c. Db. Stk.                 | 157-162            | ..                              | 2 15 7                            |
| 486,000        | 10     | July 28                  | 11                                  | European, Ltd.                                | 28-24              | ..                              | 4 11 8                            | 1,720,560 | Stk.   | Apl. 15                  | 8                                   | East London, Ord.                     | 225-230            | -2                              | 3 9 7                             |
| 354,000        | Stk.   | " 10                     | 5                                   | Do. £7 10s. paid.                             | 163-173            | ..                              | 4 14 4                            | 654,740   | "      | June 29                  | 3                                   | Do. 4½ p. c. Db. Stk.                 | 157-160            | ..                              | 2 16 3                            |
| 5,922,230      | Stk.   | Aug. 12                  | 12½                                 | Gaslight & Coke, A, Ord                       | 288-293            | -7½                             | 4 8 7                             | 990,000   | "      | " 29                     | 4                                   | Do. 3 p. c. Db. Stk.                  | 103-105            | ..                              | 2 17 2                            |
| 200,000        | "      | " 10                     | 10                                  | Do. B, 4 p. c. max.                           | 130-125            | +2                              | 3 4 0                             | 700,000   | 50     | June 29                  | 7½                                  | G'd Junction, 10 p. c. max.           | 115-118            | ..                              | 3 3 7                             |
| 665,000        | "      | " 7                      | 7                                   | Do. C, D, E, 10 p. c. Prf.                    | 305-310*           | +2                              | 3 4 6                             | 310,000   | Stk.   | Mar. 30                  | 4                                   | Do. 4 p. c. Db. Stk.                  | 142-147            | ..                              | 2 11 5                            |
| 30,000         | "      | " 7                      | 7½                                  | Do. F, 5 p. c. Prf.                           | 152-157*           | +1                              | 3 3 8                             | 708,000   | Stk.   | Aug. 12                  | 14                                  | Kent                                  | 364-369            | +11                             | 3 15 11                           |
| 1,300,000      | "      | " 7                      | 7                                   | Do. G, 7½ p. c. do.                           | 239-210*           | +3½                             | 3 2 6                             | 160,000   | "      | " 10                     | 7                                   | Do. New, 7 p. c. max.                 | 210-215            | +½                              | 3 5 1                             |
| 403,000        | "      | " 7                      | 7                                   | Do. H, 7 p. c. max.                           | 192-197*           | +2                              | 3 11 1                            | 1,043,800 | "      | June 29                  | 10                                  | Lambeth, 10 p. c. max.                | 238-303            | ..                              | 3 6 0                             |
| 476,000        | "      | " 10                     | 4                                   | Do. J, 10 p. c. Prf.                          | 905-910*           | +2                              | 3 4 6                             | 406,200   | 100    | " 7½                     | 7½                                  | Do. 7½ p. c. max.                     | 227-232            | ..                              | 3 4 8                             |
| 1,061,150      | "      | June 10                  | 4                                   | Do. K, 6 p. c. Prf.                           | 162-187*           | +1½                             | 3 4 2                             | 350,000   | Stk.   | Mar. 30                  | 4                                   | Do. 4 p. c. Db. Stk.                  | 140-145            | ..                              | 2 15 2                            |
| 291,850        | "      | " 4                      | 4                                   | Do. 4 p. c. Db. Stk.                          | 131-133            | ..                              | 3 0 2                             | 500,000   | 100    | Aug. 12                  | 13½                                 | New River, New Shares                 | 425-430            | ..                              | 3 1 8                             |
| 958,000        | "      | " 6                      | 6                                   | Do. 4½ p. c. do.                              | 148-153            | ..                              | 2 18 10                           | 1,000,000 | Stk.   | July 28                  | 4                                   | Do. 4 p. c. Db. Stk.                  | 140-145            | ..                              | 2 15 2                            |
| 70,000         | 10     | May 12                   | 8                                   | Do. 6 p. c. do.                               | 138-203            | ..                              | 2 19 1                            | 902,300   | Stk.   | June 29                  | 6                                   | Southw'k & V'hall, Ord.               | 166-171            | ..                              | 3 10 2                            |
| 8,800,000      | Stk.   | Aug. 12                  | 10                                  | Hongkong & China, Ltd.                        | 133-144*           | ..                              | 5 10 4                            | 126,500   | 100    | " 5                      | 5                                   | Do. do. 7½ p. c. max.                 | 157-162            | ..                              | 3 14 1                            |
| 376,400        | Stk.   | Aug. 2                   | 4                                   | Imperial Continental                          | 210-215            | ..                              | 4 13 0                            | 489,200   | Stk.   | " 6                      | 6                                   | Do. do. 5 p. c. Prf.                  | 168-172            | ..                              | 2 18 2                            |
| 473,600        | Stk.   | Aug. 12                  | 9½                                  | Do. 4 p. c. Dbs. Red.                         | 98-111             | ..                              | 3 19 8                            | 1,019,585 | "      | Apl. 15                  | 5                                   | Do. 4 p. c. A Db. Stk.                | 141-144            | ..                              | 2 15 7                            |
| 560,000        | 100    | Apl. 1                   | 5                                   | Do. 3½ p. c. Db. Stk.                         | 101-104*           | ..                              | 3 7 4                             | 1,155,066 | Stk.   | June 10                  | 10                                  | West Middlesex                        | 297-302            | ..                              | 3 6 3                             |
| 250,000        | 100    | " 4½                     | 4½                                  | Met. of Mel-1 5 p. c. Db. bourne 4½ p. c. Db. | 110-112            | ..                              | 4 9 3                             | 200,000   | "      | " 11                     | 3                                   | Do. 4½ p. c. Db. Stk.                 | 162-165            | ..                              | 2 14 7                            |
|                |        |                          |                                     |                                               | 107-109            | ..                              | 4 2 7                             | 200,000   | "      | Mar. 11                  | 3                                   | Do. 3 p. c. Db. Stk.                  | 104-106            | ..                              | 2 16                              |



competitive lighting. Although this settlement is worth vastly more than the expense incurred in procuring it, still your Committee regret that the town has been forced into any expense whatever in regard to the matter. By the settlement thus at last happily effected, the Gas Company have been put in this position, that they cannot make more than reasonable profit for all future time. While their legitimate interests are protected, they are also defined and limited, so that the public of Stirling have every reason to wish them prosperity. On the other hand, the town has really lost nothing that it valued; and it has gained much of great value. It is true that the Gas Company cannot now be forced to sell under the Burghs Gas Supply Act of 1876; but this cannot be reckoned a loss, because public opinion was strongly expressed last year against compulsory purchase. It is true also that the Gas Company have statutory permission now to open streets for repairing old pipes or laying new ones. But this is no loss; for such permission was given voluntarily over half a century ago. It was ratified and confirmed by an agreement between the town and the Gas Company in 1862, and is acted on at the present time. What the town has gained is, specially, that the Gas Company are now put under statutory restrictions of the most stringent kind. They are bound under penalties to supply excellent gas; and their possible dividends are fixed at a fair amount, and cannot be increased without gas consumers becoming partners in the profits, and getting, in reduced prices, by far the greater share of them." The Committee express gratification at having secured favourable conditions; but they might have had them in Stirling, without going before a Parliamentary Committee at all, if they had chosen to ask for them. The report is very strange reading, when compared with the statements of some of them while they were still in opposition. A voluminous document, containing the whole of the minutes and correspondence of the Committee, is being printed; and on account of its not being ready, discussion of the report was adjourned for a month. At the same meeting the accounts incurred in the opposition to the Gas Bill were submitted, and were found to amount to £2662. This subject was also continued, in order that the Councillors might consider out of which fund they are to take the money. A very pertinent comment upon the subject is given in the "Stirling Observer" of to-day, in the following note: "We now know what the gas agitation has cost Stirling. Last year's expenses to the town came to £3700; and this year the Corporation have spent £2660 odd in fighting the Gas Company. These two items amount to £6360; and, if the Gas Company's expenses are thrown in—and they may as well be, for the community will have to pay them, too, indirectly—the total cost to Stirling cannot be less than £10,000. This is only in hard cash. What the cost has been in spleen and personal ill-will, can never be known. But £10,000 is a heavy bill to pay without having anything better than rancorous feelings to show for it. Now that it is all past, is there any sensible ratepayer left who will still deny that the agitation which caused all this outlay, lowered the tone of public life, and lost the gas-works to Stirling, was not a blunder of the most colossal kind? And yet it was the work of self-styled public-spirited citizens, and guardians of the Common Good. How they have guarded it, we know. The list of expenses helps the understanding in this respect."

The Glasgow Corporation Gas Department have this week contracted with the Wilsons and Clyde Coal Company, Limited, for a supply of 30,000 tons of coal for the gas-works. This is a further instalment of the year's coal supply, which is being bought as occasion offers.

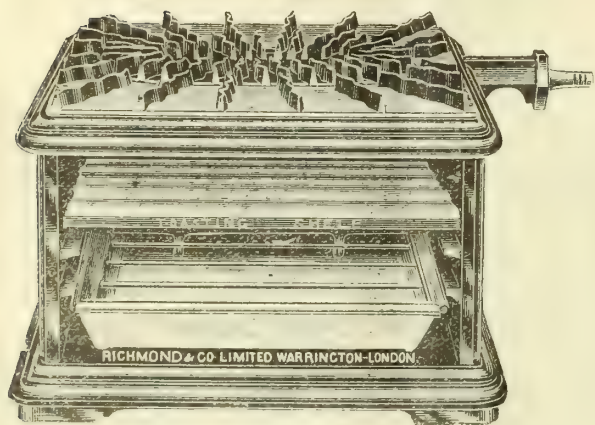
The Helensburgh gas transfer may be said to be completed, though it is not yet formally recorded. At a meeting of the Town Council this week, it was reported that the shareholders of the Gas Company had agreed to accept the offer of the Corporation. Reasonableness prevailed on both sides; and the result is a peaceable and satisfactory settlement.

At a meeting of the Kilmarnock Town Council on Wednesday, it was reported that the men employed in the gas-works had been insured, under the Workmen's Compensation Act, with the Ocean Accident Corporation, for £3700, at the rate of 15s. per £100 of wages paid; the premium being £27 15s. per annum.

The recently created Burgh Commissioners of Monifieth have entered into an agreement with the newly-formed Gas Company under which the Company bind themselves to supply gas for public lighting at a price not exceeding 5s. per 1000 cubic feet; and the Commissioners bind themselves to take gas for public lighting so long as the Company subsist. They also stipulate that, in the event of the Company wishing to sell their undertaking the Commissioners shall have the option of acquiring it, either by mutual agreement or by arbitration. When the agreement was laid before the Commissioners this week, there was some criticism of the obligation to take gas so long as the Company subsist. At this there need be no wonder, for it is a restrictive condition, and might have been left out. The agreement was maintained by Provost Stewart to be of the very essence of a fair and equitable arrangement; and the Commissioners adopted it.

An arbitration has been completed between the Edinburgh and District Water Trust and the Clippens Oil Company, Limited, for the fixing of the price to be paid by the Trust for shale, limestone, and freestone which the Company are prevented from working out. The Company claimed £16,750 for shale and limestone, and £20,000 for freestone. Sheriff Jameson, who was Oversman, has awarded £9000 under the first claim, and £2250 under the second.

The Corporation of Arbroath still pin their faith to the scheme for obtaining a water supply from underground. This week they held two meetings, at both of which the subject was discussed. At the second, they had before them a report by their Engineer (Mr. McCulloch, of Dundee), in which he pointed out that there had been recently a considerable increase of water, which he placed at 441 gallons daily per lineal yard of the adit. From this he argued that, if the adit were entirely completed, and the same ratio of extra supply continued, there ought to be a total additional daily supply of 440,000 gallons. He had no hesitation in advising the Commissioners to continue operations until the first 200 yards of the adit were driven—future action to be determined by the result. His reasons for this advice were: (a) That the test up to now had not been so satisfactory as could be desired, the length of the adit being too small to admit of a satisfactory conclusion being arrived at; (b) the present supply was still too small to depend upon for the period which must elapse before a supply from any other source would be available; and



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Supplied with FIRE-BRICK DEFLECTOR (as block).  
GRILL PAN, GRID, and TOASTING-SHEET.



(c) the cost for the remainder of the 200 yards of the adit would, at contract price, be trifling compared with the cost already incurred. In a discussion upon the report, it was stated that the water-tanks were empty times without number, which is surely a sufficient indication of the serious position of the supply. The Corporation, by 10 votes to 7, adopted the recommendation of the Engineer.

### CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Aug. 13.

**Sulphate of Ammonia.**—Brisk business has been transacted during the week, resulting in a further improvement in values. Buyers have not confined their attention to prompt parcels; but have shown their confidence in the market by making purchases ahead. The main buying has been by dealers. But it is a promising sign that consumers have also contributed to the orders; and their increasing anxiety to buy shows that their requirements are becoming pressing. The prompt business was chiefly done at the prices reached at the end of last week; but at the close quotations are advanced to £9 15s. f.o.b. Leith and Liverpool, and £9 12s. 6d. f.o.b. Hull. For forward delivery, London quotations on Beckton terms have been advanced to £9 10s. to £9 12s. 6d.; and in Scotland £9 12s. 6d. to £9 15s. has been paid.

**Nitrate of Soda** is slightly easier, on spot, at 7s. 6d. per cwt. for fine quality, ex quay.

LONDON, Aug. 13.

**Tar Products.**—After touching 9d., benzols are held a little more firmly. Producers are becoming very anxious about this article; but with the enormous quantities which flood the market from the coke-ovens on the Continent, as well as those in this country, it is difficult to see how any important improvement can come, unless a better understanding among makers can be effected. This is being broached in England, on the suggestion from influential quarters to sell a good line for gas enrichment at about present prices, and thus restrict the quantity going into consumption for aniline. The low price of benzols, and consequent low prices of anilines, has undoubtedly largely extended the use of these colours; and having regard to the enormously increased output of benzol, and the fact that it is all going into consumption in one form or another, shows that the market has an astonishing elasticity. A fair trade is being done in carbolie and cresols. Anthracene is a dead letter, and prices are nominal. A large trade is reported in prepared tar, which should have some influence on pitch and oils. The value of pitch is maintained; and the outlook is more hopeful.

Average values to-day are: Tar, 12s. to 15s. 6d. Pitch, east coast, 23s. 6d.; west coast, 19s. Benzols, 90's and 50's, 9½d. Toluol, 1s. 1½d. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 1d. Crude, 30 per cent., naphtha, 4½d.\* Creosote, 2½d. Heavy oils, 42s. 6d. Carbolie acid, 60's,

\* By a printer's error last week, this product was quoted at 1s. 2d. (the price of solvent naphtha), instead of 4½d., which it should have been.—ED. J. G. L.

2s. Naphthalene, pressed, 57s. 6d.; salts, 32s. 6d. Anthracene, "A" quality, 4d.; "B," 3d.

**Sulphate of Ammonia** keeps firm, at improving rates. A large business is reported in all positions at £9 11s. 3d. to £9 15s. per ton, less 3½ per cent. Sulphate is scarce, and middlemen are evidently oversold.

### COAL TRADE REPORTS.

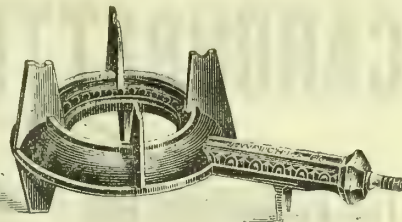
From Our Own Correspondents.

**Lancashire Coal Trade.**—An active business continues to be reported as regards all descriptions of fuel, except house-fire qualities; and prices are strong at list rates for the better descriptions of round coal, with a tendency upwards on the lower sorts for steam, forge, and general manufacturing purposes. A feeling of uncertainty, however, prevails as to the probable attitude of the miners, with regard to the settlement proposals provisionally agreed to by their official representatives and the federated coal-owners. There seems to be a determination among the men not to accept the part of the arrangement which provides for an advance of not more than 2½ per cent. at present; and some apprehension exists that serious friction between the miners and the coalowners may arise on this particular point. With regard to trade generally, collieries with very few exceptions—and these are confined entirely to pits raising house-fire coals—are kept on practically full time; and any stock that is accumulating in house-fire descriptions is not more than colliery proprietors are quite prepared to put down on the ground under present circumstances. Common round coals are in good inland demand; while any surplus output is being readily disposed of for shipment at, in most cases, an advance upon recent quotations. At the pit-mouth, best Wigan Arley are firm at 10s. to 10s. 6d. per ton; Pemberton four-feet and seconds Arley, 8s. 6d. to 9s.; and common house-coal, about 7s. 6d. Steam and forge coals for inland sale average quite 7s. per ton; while for shipment, 8s. 9d. to 9s., and in some special cases where a guarantee of supplies over the present month is required, 9s. 6d. up to 10s., is obtained. Supplies of engine fuel for the most part are plentiful, owing to the increased quantity of slack now being screened; but there is no pressure of surplus output on the market. Prices are well maintained at recent full quotations of 3s. 6d. per ton at the pit for common; 4s. to 4s. 3d., for good medium sorts; and 4s. 6d. to 5s., for best qualities.

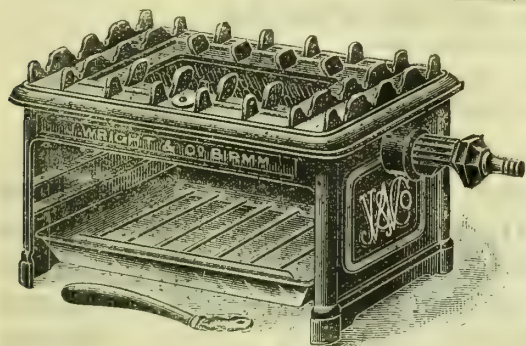
**Northern Coal Trade.**—There is a slightly easier tone in the coal trade of the north, because of the possibility of the end of the strike in South Wales lessening the rush of the demand for fuel. At the same time the whole of the production of the collieries is fully taken up; and both for steam and gas coals there is an abundant demand, and prices are very high where contracts have not been entered into. Best Northumbrian steam coals have varied greatly in price according to the period of delivery; but from 14s. to 15s. per ton f.o.b. may be looked on as the current quotation. For bunker coals there has been a very full demand; and the prices of unscreened qualities may be put as about 10s. 6d. per ton f.o.b. Manufacturing coals are quiet; but the consumption is up to the average. There is no alteration in household coals; the demand being very limited

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## NEW GAS=GRILLER.

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Price 9s.

Both the above are strong and well-made articles; and we can confidently recommend them as being the best value yet offered.

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**London & Birmingham.**



at this season of the year. As to gas coals, the deliveries to the great southern gas companies have been increased, and must now be expected to be enlarged as the long nights draw near. For occasional supplies, the quotation is 10s. per ton f.o.b.; and some contracts have been entered into at 9s. 3d. per ton f.o.b., for some months ahead. Coke is steady in demand. Gas coke is being more freely sold; and the stocks are low at works near navigable waters. Prices show no alteration.

**Scotch Coal Trade.**—Activity in all branches continues, with prices much the same, with the exception of the best quality of ell, which is slightly higher. There is a good demand for everything which is on sale. The prices quoted are per ton f.o.b. Glasgow: Main, 9s. 6d.; ell, 10s. 3d. to 10s. 6d.; splint, 9s. 9d. The shipments were abnormally heavy; there being increases in all the districts. For the week, they amounted to 249,066 tons—an increase of 58,838 tons on the preceding week, and of 57,605 tons upon the corresponding week of last year. For the year to date, the total shipments have been 5,610,483 tons—an increase of 1,002,725 tons upon the corresponding week of last year.

**The Bridlington Water-Works Arbitration.**—Mr. Thomas Newbigging and Mr. G. F. Deacon, the Arbitrators, for the Water Company and the District Council respectively, in the matter of the transfer of the Bridlington Water Company's undertaking, have selected Mr. James Mansergh as Umpire in the event of their not agreeing on terms.

**Reductions in Price.**—The Directors of the Biggleswade Gas Company have decided, for the current season's public lighting, to allow a discount of 15 per cent., and an extra 5 per cent. if the account exceeds £200. The Directors of the Bedford Gas Company have notified their intention of reducing the price of gas to 2s. 9d. per 1000 cubic feet on and after the 31st of December next.

**Tunbridge Wells Water Supply.**—The annual report of the Tunbridge Wells Borough Accountant on the water undertaking of the Corporation shows that the total income for the past financial year amounted to £11,337, after deducting £444 for empty properties, amendments on appeal, &c. The total expenditure on revenue account came to £4864, leaving the excess of income over expenditure £6473, out of which £4184 has been employed in respect of dividends and the redemption of Corporation stock, and £644 for extensions of mains; leaving a net surplus of £1645. During the year a suspense account was opened to adjust the capital expenditure defrayed out of the revenue account in respect to the boring works and the Decoy spring, pending the Local Government Board's sanction to the necessary loans. This was done in order to clearly show the true position of the water undertaking; and the result is that the sum of £4786 appears as a surplus on the profit and loss account. This added to the £739 brought forward and the £1645 surplus for the year, makes a total net available surplus of £7170. The report closes with a comparison of the Tunbridge Wells water charges and those of other boroughs, which shows the former to be below the average by 1d. in the pound.

**Barnet District Gas and Water Company.**—The accounts for the six months ending June 30, which will be presented at the half-yearly general meeting of the above-named Company on the 26th inst., show a balance of £19,221 on the profit and loss account; and the Directors will recommend a dividend, less income-tax, at the rate of 9 per cent. per annum on the "A" and "C" stocks, of 8 per cent. per annum on the "B" stock, and of £6 6s. per cent. per annum on the "D" capital (gas and water stocks). The business of the Company continues to progress.

**American Competition for Pipe Contracts.**—In the "JOURNAL," on several occasions lately, reference has been made to the success of American pipe makers in securing contracts for the supply of pipes in this country. A writer in the "Shipping World" says the circumstances are not generally understood, and are, in fact, very misleading; so he brought the matter under the notice of a leading pipe and tube maker, who gave him the following explanation: "We are full of work at the present time—so full, in fact, that we cannot, and will not, take additional contracts unless at very tempting figures. We do not require to cut in for work, and we are not doing it. If we really required orders, we would soon quote prices that would easily put American rivals out of court."

**New Works of the Cranbrook Water Company.**—The works of the Cranbrook Water Company at Hawkhurst have been completed, and were formally opened last Wednesday week. At the pumping-station, there are duplicate pumps, which force the water up to the Hartley reservoir about four miles distance. This reservoir is covered in, and stands upon one of the highest points in the Weald of Kent, about 400 feet above the pumping-station. It holds something like 250,000 gallons of water. The Hawkhurst well yields about 180,000 a day; and there has been a continuous overflow so far. The Goudhurst well gives no less than half a million gallons daily; so that the combined yield is far beyond the present needs. The Company are in a position to supply Cranbrook, Hawkhurst, Goudhurst, Tenterden, Benenden, and other places in the vicinity. The opening ceremony was performed by Earl Cranbrook.

**A New Water Reservoir at Chester.**—An interesting ceremony, indicating the progress which the Chester Water Company are making in connection with the filtration of the water supply took place last Friday. The event was the opening of a new filtration reservoir, by which it is claimed that the water being supplied to the city will be very much improved from a purification point of view. The new reservoir covers an area of 2000 square yards, with a capacity of 750,000 gallons, and a filtration of 18,000 gallons per hour. The Chairman of the Company (Mr. W. Brown) performed the ceremony of opening the reservoir. In connection with the reservoir, a new and ingenious process, invented by Mr. G. Crow, the Company's Engineer, for subjecting the contents of the reservoir to extra oxidation, with a view to greater purity, has been applied. The construction of the deep filter bed is also a manifest improvement on that previously in use, and the large company present at the inauguration, after seeing the different processes in operation, were unanimously of opinion that nothing had been left undone by the Company to secure for the city a supply of water which is absolutely beyond suspicion.

# CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

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|--------------------------------------------------------------|---------------------|-------------------------------------------------|-------------------|
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| WINDSOR STREET WORKS, BIRMINGHAM . . . . .                   | 2,000,000           | MONTREAL . . . . .                              | 500,000           |
| SALTLEY WORKS, BIRMINGHAM . . . . .                          | 2,000,000           | BELLEVILLE . . . . .                            | 250,000           |
| COLCHESTER . . . . .                                         | 300,000             | OTTAWA (Second Contract) . . . . .              | 250,000           |
| BIRKENHEAD . . . . .                                         | 2,250,000           | BRANTFORD (Remodelled) . . . . .                | 200,000           |
| SWINDON (New Swindon Gas Co.). . . . .                       | 120,000             | ST. CATHERINES (Remodelled) . . . . .           | 250,000           |
| SALTLEY WORKS, BIRMINGHAM (Second Contract) . . . . .        | 2,000,000           | KINGSTON, PA. . . . .                           | 125,000           |
| WINDSOR STREET WORKS, BIRMINGHAM (Second Contract) . . . . . | 2,000,000           | PETERBOROUGH, ONT. . . . .                      | 250,000           |
| HALIFAX . . . . .                                            | 1,000,000           | WILKESBARRE, PA. . . . .                        | 750,000           |
| TORONTO . . . . .                                            | 250,000             | ST. CATHERINES (Second Contract) . . . . .      | 250,000           |
| OTTAWA . . . . .                                             | 250,000             | BUFFALO, N.Y. . . . .                           | 2,000,000         |
| LINDSAY (Remodelled) . . . . .                               | 125,000             | WINNIPEG, MAN. . . . .                          | 500,000           |
| ROCHESTER . . . . .                                          | 500,000 Cubic Feet. | COLCHESTER (Second Contract) . . . . .          | 300,000           |
|                                                              |                     | YORK . . . . .                                  | 750,000           |



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## EDITORIAL NOTES.

## The Home Office and Carburetted Water Gas.

A CIRCULAR reproduced elsewhere would seem to indicate that the deliberations of the Home Office Committee on the question of the regulation of the distribution of carburetted water gas in the United Kingdom are likely to have some practical issue in the shape of a positive prescription. It is not to be too lightly assumed that either the nature or the extent of what may be deemed the necessary regulation of the distribution of carburetted water gas as an element of British illuminating gas has been determined upon by the Committee. The whole question is still open; but it appears tolerably evident that the Committee are disposed to think they ought to "do something" in the matter, in the interest of public safety. It is not too much to say that the entertainment of this idea by the Home Office Committee will be very deeply regretted by every British gas engineer who has adopted, or may be inclined to favour the adoption in his own district of auxiliary carburetted water-gas plant. We trust that, before it is too late, those gas engineers who hold that the best thing the Home Office can do with carburetted water gas is to "let it alone," will take the opportunity now offered of making their protest in our columns. Various gas engineers who have already been before the Home Office Committee have been, we understand, invited by this circular to furnish Lord Belper with their opinion upon a particular point. They are warned that they are not wanted to deal with the general question of whether any legal limit should be put to the proportion of carburetted water gas to be added to town's gas, and, if so, what the proportion should be. This, however, is precisely a question which can be helpfully discussed in the "JOURNAL." And, if the opportunity is neglected, it will be in vain for malcontents to grumble afterwards. Those who are interested in the matter should lay to heart the lesson of the Government Vaccination Bill.

There is in the country a certain amount of clamour for the legal regulation of the sale of carburetted water gas. This is an incontestable fact. The best-instructed technical opinion is that there is no real reason, arising out of any consideration of the public safety, for legal interference with the practice, so far as commercial considerations permit of its being carried in this country. The Home Office authorities are perplexed between these two voices, as well they may be. The old English principle of letting trades and industries alone, at least until somebody was hurt, has of late years been discountenanced by a fussy humanitarianism which cries out before any damage is actually done. In this particular case, there is a certain degree of reason in the argument that the question of public safety should be settled before a vested interest, already growing, becomes overpoweringly strong. Those who want to make carburetted water gas, either for enriching or for supplementing the production of common coal gas, or both, protest against having their hands tied in any way. They desire to be left free to use as much or as little of either kind of gas as the demands of their business call for. We are not aware, however, that any British gas engineer would claim the right of ceasing to make coal gas altogether, if it suited him, and sending out nothing but carburetted water gas in its stead. Yet where is the line to be drawn? Who is to decide how high the proportion of added carburetted water gas is to be; or how is it to be ensured that the permitted proportion shall never be exceeded in the district of supply?

The gas manager will say this had better be left to him. He does not want, for reasons likely to remain operative, to make all carburetted water gas, as they do in some places in the United States. The conditions of the two countries in this regard are not alike. All the same, he does not care to be made liable for all sorts of pains and penalties if he puts in a little more carburetted water gas at one time than at another. This, he will say, is sure to happen if any legal limit is placed upon the admixture of carburetted water gas with coal gas. Besides, how is a legal offence, so created, to be proved against him? Not by anything that could be found out at the works, from books, or by any method of inspection. The public concern is not with what is done in the process of manufacture, but with what exists for the public use in the mains and at the burners. So we are led to a system of testing for carbon monoxide as an indication of the salubrity of the town's gas; and a pretty business this would be! What



a splendid means this testing would supply of illustrating the different value attached by local authorities to gas examination when the gas happens to be of their own make, as compared with the product of a company! The Home Office should remember this fact of statutory gas manufacture: The adoption of economical methods is at the discretion of the administration. Supposing that a gas company might have a reasonable expectation of selling cheaper gas by adopting auxiliary carburetted water-gas plant, where would be the inducement to do so at the price of undergoing a new and probably vexatious ordeal of testing at the will of a hostile local authority? Compare Belfast and Dublin in this regard.

As for the specific suggestion of the Home Office circular—viz., that “the gas supplied after (say) 9, 10, or 11 p.m.” should be required to contain not more than a stated proportion of carbon monoxide,” it is to be described as the sort of recommendation a coroner’s jury might be expected to make. The supply of gas to a great city could not be manipulated in this way. If it were enacted that gas containing more than a stated proportion—say, 16 per cent.—of carbon monoxide should never be sent out from any gas-works in the United Kingdom, it would be quite possible to fulfil the requirement. For the condition of the supply afterwards, the legal responsibility of the makers is already assured; but, technically speaking, they have no means of controlling anything besides the pressure. A question may arise respecting the possibility of extending the responsibility of the sanitary authority for the state of gas-fittings in public lodging-houses, and of giving powers of inspection of new domestic gas-fittings to gas companies; but it would be impossible to make these powers conditional upon the manufacture of a particular description of gas. If such a condition were attached to the powers, they would perhaps be operative one week and not the next. The moment one contemplates departure from the rule of non-interference in this matter of the distribution of coal gas containing an admixture of carburetted water gas, the difficulty of what to do and where to stop presents itself. Hence the most exhaustive discussion is desirable.

There are other questions that suggest themselves in connection with this matter of regulating the distribution of carburetted water gas. We have spoken of the legal responsibility of the manufacturers of illuminating gas for the manner in which they discharge their statutory obligations; and earlier numbers of the “JOURNAL” can be cited to show that we have never accepted the proposition that the nature of a town’s gas might be changed at the will of the producer, except at his peril. It is not a small matter to interfere between the undertakers of gas supply and the public, before such interference has been shown to be absolutely necessary. Many gas undertakings are restricted by their Acts of Parliament to the supply of coal gas; and if officialism were to oppress overmuch, the development of what is in many places a boon to the public will be checked until Parliament can be persuaded to relax these enactments. If coal gas is to be gas directly made wholly from coal, the bonds of the coalowners will be placed once more upon the gas industry; for not a drop of oil or carburetting spirit will be available for the relief of the gas manager with the fear of the photometer upon him. Far be it from us to desire the occasion, but it does seem safer that the taking of the first step towards the regulation of the composition of any town’s gas upon a carbon monoxide basis, should be deferred until some positive evidence as to the insufficiency of the existing law has been recorded. The gas industry has not done anything yet to warrant any increase of government by inspectors.

#### The Affairs of the Liverpool United Gas Company.

THE affairs and experiences of the Liverpool United Gas Company are always of interest to followers of the gas industry, for a variety of reasons. The undertaking is the largest of its kind out of London, in the possession of a Company; and it is administered without the supposed advantages conferred by the sliding-scale of selling price and dividend. Some few years ago, the Company were actively antagonized by the Corporation. But through good and ill report the Directors held on their way; and the management of the undertaking ultimately justified itself against all detraction. Matters are quieter now as regards the gas supply of Liverpool. The Corporation have outlived the severe epidemic of “Progressivism,” which plagued and oppressed the citizens for awhile, and

left them as a memento a municipalized electricity supply, which does not check the growth of the gas undertaking. The future development side by side of the gas and electricity supplies of Liverpool will be interesting. For the present, it is worthy of notice that the Directors of the Company do not propose to do anything exceptional to meet the competition of the Corporation electric lighting. They will go on making their gas and selling it as cheaply as possible, and rely fully on this to bring them in their maximum dividends, as of yore. The only “burning question” concerning the gas supply of Liverpool is the artificial one of the alleged injury done to the consumers by the distribution of a proportion of carburetted water gas with the supply. Certain people in the city have become possessed of the notion that this mixture is detrimental to the consumers in some way. They think the illuminating power suffers, or the heating value is diminished, or the gas when burnt gives off distressing “fumes.” All this is, of course, wholly beside the real question of the safety of town’s gas containing a high proportion of carbon monoxide, which is engaging the attention of the Home Office. It is no more than a local craze, kept alive by two or three irreconcilables who ought to know better, or have something more profitable to do; and it will run its course.

#### Co-operation and the Gas Industry.

THE Co-operative Congress, which has been in full swing at the Crystal Palace during the past week, has furnished an opportunity for some good speaking which we cannot adequately deal with in these columns. At first sight the connection between a function of this kind and gas manufacture is not very obvious; but it exists in the profit-sharing scheme of the South Metropolitan Gas Company. This experiment was mentioned by Earl Grey, President of the Festival, in his Inaugural Address. This oration was designed to bring out the higher aspects of the co-operation movement, which have been less talked about of late than they were in the early days of the movement, when Maurice, Kingsley, and Tom Hughes saw in it the road to a new industrial world that was to redress the balance of the old. The question is now co-operative production; the problem of co-operative distribution being practically solved. Earl Grey remarked that it is now only just beginning to be recognized, both by labour and capital, that the principles of co-partnership, which insist that labour shall have an equal share with capital in the surplus profits that remain after the initial obligations to capital have been discharged, are fair to all parties. The progress of civilized mankind, having been from status to contract, is to be from working for wages to co-partnership. Earl Grey focussed the idea into the definite suggestions “that £1 of wage should receive as much as £1 of dividend, or, in other words, in proportion to the value of their respective services;” and “that the workers should be allowed to invest their profits in the business which employed them.” This is to convert the joint-stock system, which in some aspects is a curse of the age, into a means of delivering the hiring from his uninterested position, and constituting him a partner with, and friend of, his employers. Earl Grey said some very complimentary things of the South Metropolitan scheme. It is only by the testimony of intelligent outsiders, that those to whom the doings of the South Metropolitan Gas Company are so familiar, as they are to the habitual readers of the “JOURNAL” and members of the gas engineering profession at large, can realize how important and significant these proceedings are. That a Gas Company, so often a synonym for all that is hide-bound in business methods, should be in the front line of industrial and economic progress, is a very remarkable thing.

#### The Trouble of South Wales—No Peace before November.

THE South Wales colliers’ strike is declared by competent and credible witnesses to be likely to last until November. Even now, the strike is a notable piece of evidence in support of the well-known general observation that an empty exchequer never prevented a people from going to war. Money is the sinews of war; yet many a long and desperate campaign has been fought, as the Welsh strike is now being fought, with one side penniless. The side that is without money suffers terribly; but it fights on. The public conscience is shocked at the spectacle presented by South Wales just at the present moment; but the public common sense also realizes that nothing can be done by outsiders to improve matters. Of course, the “popular”



newspapers have all along, and more especially of late, endeavoured to fix upon the employers generally, and upon Sir William Lewis in particular, the whole blame for the sufferings of South Wales. These journals have demanded Sir W. Lewis's head, chiefly on account of his alleged contumacy in refusing to recognize the official conciliatorship of Sir Edward Fry, or to admit the voluntary interference of the Bishop of Hereford. On Saturday last, the publication as a Parliamentary Paper of the correspondence respecting Sir Edward Fry's recent mission wrung from the "Daily News" the reluctant admission that all the blame for the failure of the official conciliator does not rest upon the employers. The latter certainly declined to hold any intercourse at all with Sir Edward Fry; and he says that this aloofness made it impossible for him to form any satisfactory opinion on the merits of the matters in controversy between masters and men, or what were the real intentions of the employees. It might be replied to this complaint that if Sir Edward Fry was ignorant of the masters' position, he was singular in this respect. The employers' notices were posted at the pits; and the conditions they required to be fulfilled on the part of any delegation of the men who might wish to discuss these terms with them had been published and were notorious. If the associated employers had met Sir Edward Fry every day for a week, they could have told him no more than that they were, and always had been, ready and willing to meet any properly accredited and responsible deputation of their workpeople, for the purpose of discussing any points of difference, with the exception of certain principles. There is nothing new in this reservation of some things as being beyond the domain of "conciliation." These are the things that can only be effectually disposed of by fighting for them.

It was generally felt that Sir Edward Fry would have to try the men first. He did so, and discovered that the only organized body he had to deal with—the Provisional Committee—were divided among themselves, and did not know what they really wanted. "Though between nine and ten months had elapsed between the giving of the notice to determine the agreement of 1892 and the meeting between the masters and men on July 16, the Provisional Committee had arrived at no figures with regard to the sliding-scale or the minimum [wage] which they could place before the employers." Again, the Committee had not asked for an arbitrator—they knew the masters would not consent to it; and yet when the Committee met the masters in conference on the 16th of July, this was the demand they put forward. As Sir Edward Fry is fain to state, this was "a course of procedure which was certain to wreck the negotiations, and was therefore a grave tactical error." Lastly, at the men's own meeting on July 25, the existence of a hopeless division of counsels among them was revealed. As the "Daily News" very truly observes, "it is deplorable that a great struggle should have been begun with such inadequate preparation, and be continued in such a ramshackle way."

Meanwhile, the consequential mischief and suffering traceable to the strike are terrible to contemplate. The colliers themselves are not so badly off. They are living in the masters' cottages without paying rent, helping themselves to the masters' coal, and getting what they can out of the shopkeepers and the strike funds. They have some soup kitchens; and they had stoneyards, but these are closed. The unhappy dockers who live by handling the coal that has ceased to come to be shipped—even the shareholders of the Great Western Railway Company, who have lately suffered a serious diminution of dividend—are waiting and wondering how much longer the trouble is going to last. Until November, the experts say; and then work will be resumed upon the masters' terms.

**The Discoverer of Coal Gas.**—A paragraph has recently appeared in several Continental journals to the effect that coal gas is now supposed to have been discovered by a Belgian, a Monsieur J. P. Minkelers, who was Professor at the University of Louen. It is said that the first air-balloon was filled with hydrogen in 1783; and that a year later, Minkelers published a report in which he stated that the hydrogen might be replaced by coal gas. On Nov. 21, 1784, he is reported to have exhibited the ascent of a balloon charged with coal gas. In the course of his report on the use of coal gas in place of hydrogen for filling balloons, Minkelers is said to have made the observation that the coal gas might also be purified with lime-water and used for illuminating purposes.

## WATER AND SANITARY AFFAIRS.

IN taking a review of the legislation of the past session as affecting the water supply, and limiting our present remarks to that which concerns the Metropolis, we observe that two measures of importance have thus been dealt with by Parliament. One of these measures was the Southwark and Vauxhall Water Bill, which was to authorize the existing Company to construct additional works, in order to secure an adequate supply of water from the Thames. The demands of London had outgrown the narrow limits that Parliament had set to the operations of the Company; and it had been found absolutely necessary to draw more water from the river than the Legislature had sanctioned. In the session of 1896 a kind of provisional licence had been given to the Company, by which they were enabled to meet the requirements of their district for the time being, on condition that they introduced a Bill in 1898 by which a permanent arrangement should be established. When the question came before Parliament in the session which has just expired, the London County Council sought to make the new arrangement as temporary as possible. They urged that no attempt at a practical settlement of the question should be made until the Royal Commission on the Metropolitan Water Supply had presented their report. But the necessity which beset the Company was clearly discerned by the Select Committee of the House of Commons by whom the Bill was investigated; and the preamble was declared proved, subject to a proviso that if the undertaking were purchased within ten years no additional value should accrue, except in respect of actual capital expenditure. In this form the Bill ultimately passed through both Houses, and became law; power being given to raise the requisite capital by means of debenture stock.

The other measure materially affecting the Metropolis in the matter of its water supply was the Staines Reservoirs Joint Committee Bill, by which it was proposed to enlarge two reservoirs authorized by Parliament in 1896. Other works were projected; and in order to carry out the objects of the Bill, power was sought to raise a quarter of a million of debenture stock in addition to the million previously authorized. It was explained by Mr. Walter Hunter, the Engineer to the Joint Committee, that the authorized reservoirs were constructed to hold some 2500 million gallons of water; but that it was now proposed to increase the storage capacity by 1800 million gallons. Yet the promoters asked for no further powers to take water from the Thames. The estimated cost of the increased storage was £93,000. One-third more storage was to be obtained for an increase in cost of only 12 per cent. They were adding 60 acres to the size of the reservoirs. The Bill was quickly approved by the Select Committee of the House of Commons to whom it had been referred. The preamble was passed, on conditions which presented no difficulty; and the clauses were settled at the same sitting. Subsequently the Bill passed the House of Lords.

We find the Chairman of the London County Council, in his annual address recently delivered, expressing regret that the Southwark and Vauxhall Water Company had not observed a "truce," and refrained from gaining power to enlarge their rights of drawing water from the Thames. Whatever regret the Council may entertain, the people of South London are to be congratulated on the protection thus afforded them against what is called a "water famine." For this protection, the Metropolis is in nowise indebted to the County Council. This body has sought to restrict the development of the present resources, and keeps steadily in view those conditions which may favour the early purchase of the undertakings of the Water Companies. So far as the London Water Question is concerned, the one object of the Council is to secure possession of the undertakings, independently of any considerations as to the interests and welfare of the consumers; it being assumed that all will be right, if only the authority of the Council is rendered paramount.

A restriction in the water supply of East London commencing yesterday gives rise to a considerable amount of excitement in the district affected; but it is the result of a reasonable degree of precaution on the part of the Water Company. Notice was given on Thursday evening that on the ensuing Monday the constant service would for the present be superseded by an intermittent supply, in which the water would be turned on for two periods of three hours each per day. A supply for six hours every day is



quite equal to that which is given where an intermittent service is the rule and not the exception. The abolition of the house cistern which so generally prevails among the working-class dwellings in East London renders anything short of a constant service a source of inconvenience, and occasions an outcry as of a "water famine," although the actual quantity of water sent into the district is adequate for all ordinary purposes. The advice given by Mr. I. A. Crookenden, the Company's Secretary, that consumers should fill "any available vessels" while the water is on, implies that a fair supply will be obtainable where means of storage are employed. Mr. W. B. Bryan, the Company's Engineer, signifies that the restriction will still allow a supply of 25 gallons per head daily. This is a long way short of a "famine," though its adequacy may depend upon reasonable care on the part of the consumers in the avoidance of waste. That there should be need for economy in the use of water during the present season ought to be no matter of surprise. Mr. Bryan has put the case very clearly—proving the actual existence of an extraordinary drought. This is not a mere plea in defence of the Water Company, but is in thorough agreement with independent testimony. Sir William Crookes and Professor Dewar, in their report on the London Water Supply for the month of July, say they have to record for that month "a very serious deficiency in the rainfall at 'Oxford,' making the total shortcoming for the year as much as 5.49 inches." Mr. Bryan speaks of a deficiency of 6 inches, and states that the present drought is the worst he has experienced for many years—corresponding to the fact that the flow in the River Lea is now less than had ever before been recorded. In little more than a year, up to Friday last, the rainfall in the Lea Valley has been deficient to the extent of about 9 inches.

In the face of facts like these, there is something eminently absurd in the agitation which is being raised in Hackney respecting Mr. Crookenden's notification. With regard to the restriction of the supply, a feeling is said to exist that Parliament (we presume the Government is intended) should be asked to take immediate steps to avert the possible danger. If Mr. Chaplin could bring down rain from heaven it would be of little service just now. The mischief arises from the deficient rainfall of the past; and summer rains will not alter the present situation. We have to go back in the history of this question. A year was lost when the Bill of the East London Company was rejected by the House of Commons, under County Council influence, in 1893. The works then proposed were not sanctioned until 1894, and were finished about a year ago. Last year parliamentary power was obtained to construct yet further works; and if these were now in existence, a large addition could be made to the daily supply. It is argued that it is no use to dig big holes if there is no water to fill them. The answer to this is that the big holes can be filled if they are made in due time; and the larger the stock of water, the longer it will last. The Company have been hampered and hindered, or the necessary works would have been constructed earlier, and the present crisis might never have occurred. The talk about uniting the mains of the various Companies is superfluous. The East London Company sought and obtained power last year to enter into agreements with other Companies for supplies of water; and they are now actually receiving a supplemental portion from the New River Company. The present restriction in the quantity distributed is mainly a matter of precaution on the part of the East London Company. They might possibly continue the constant service, and by the setting in of a wet season escape disaster. But they have prudently declined the risk. The Act of 1894 has operated advantageously, for if the works then authorized had not been completed, the present restriction must have been introduced much earlier. London, moreover, is not peculiar in finding the water supply running short. At least three weeks ago the Bradford Corporation gave notice that the night supply would be cut off until the reservoirs were replenished. Other towns are in a similar dilemma; and there is nothing to show that Local Authorities are more fortunate than Water Companies. The institution of a constant service, and the abolition of house cisterns, create a state of affairs which peculiarly affects the supply in seasons of drought. A cessation of the supply for a few hours in the course of the day at once produces an outcry, whereas under the intermittent system the period during which the water is on

may be reduced without exciting attention. The waste under the constant system is a serious question; and, on the whole, there is much to be said in favour of the old order of things. We think it may be safely averred that the constant service, as compared with the intermittent, demands larger reservoirs and increased capital outlay. Withal there is the risk of occasional interruption, ensuing in a popular agitation. It may be remembered that houses which had the benefit of house cisterns or tanks suffered no deficiency of water when on former occasions the constant service in East London had to give place to a supply that was intermittent, or, in other words, restricted.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 441.)

THE prevailing idea in the Stock Exchange last week was that it was too hot to work, especially as most people were away at play. Besides this, as soon as it was known that the Exchange would be closed on Saturday, another influence to repress activity came into action. There was no startling feature in evidence at any time. Anxiety regarding things in China was allowed to sleep awhile; though Consols had a slight fall on Thursday. But the conclusion of terms of peace between the United States and Spain had the effect of booming the former's securities and depressing those of the loser. In the Money Market, the feature is still the unprecedented abundance seeking employment. The excess of supply over demand was probably never greater, if as great. In the Gas Market, business could scarcely be much lighter, especially on one or two days of the week. The chief features were that Gaslight issues seemed in better favour; and both the "A" and the "H" made a little advance in their quotations. South Metropolitan, on the other hand, was for some reason disposed to recede; and both the ordinary and the debenture betrayed a tendency to weakness. Commercial bonds made no sign. Next to nothing was done in the Suburban and Provincial group; and quotations did not move. The Continental Companies were no busier than the rest; and the chief undertakings were without feature. But Cagliari and Tuscan receded a point each. Among the remoter Companies, Melbourne 5 per cent. bonds advanced. Business in the Water Companies was very restricted; but the general tone was quite favourable. West Middlesex had a fair advance; and Kent new shares gained a couple of points, though they get no advantage from the improved dividend.

The daily operations were: The market opened on Monday with a little promise of more activity; but it did not come to much. Hardly anything was dealt in but Gaslight "A" and South Metropolitan; and Gas quotations did not move. In Water, West Middlesex rose 1. Tuesday fell very calm, except for a few dealings in Imperial Continental. Gaslight "A" rose 2; but South Metropolitan and Tuscan fell 1 each. On Wednesday, there was nothing particularly observable; but a tendency to ease in South Metropolitan of both issues. Gaslights were firm; and the "H" advanced 1. Melbourne 5 per cent. bonds also rose 1. West Middlesex Water improved 2. Thursday's business consisted of one single bargain in Gaslight "A." Cagliari fell 1. In Water, Kent new rose 2. Friday's business was of the smallest; but the tendency was good, and Gaslight "A" rose 1.

### ELECTRIC LIGHTING MEMORANDA.

Electricians' Smoky Chimneys—A Case at the Marylebone Police Court—A Word for Coke—The Teaching of Frederick Siemens.

Gas engineers would be more than human if they did not chuckle quietly over the newspaper reports of the prosecutions and finings of electric light companies in London, for creating a nuisance by their smoky chimneys. These proceedings have taken place before several Metropolitan Police Magistrates, whose individual methods of dealing with the cases make interesting reading. The law is, of course, always the same; and the offence is likewise the same. But the temperaments of the administrators of the law come out in their judgments, which are always different. Naturally, these decisions do not please the partisans of electric lighting. The comments of the electrical press upon the punishments magisterially meted out to the companies remind one of the classical yarn about the boatswain's mate who could never please the man he was flogging, whether he hit high or low. The prosecutions have served to emphasize the fundamental characteristic of a statutory undertaking, which was also disclosed in the recent gasholder litigation of the Sutton, Southcoates, and Drypool Gas Company. As with gas companies, so with electric lighting undertakers; they have a statutory right to carry on their business, but not to ride rough-shod over the rights of others at their own good pleasure. The first line of defence usually taken up by an electric lighting company prosecuted for committing a nuisance



by allowing their factory chimney to smoke, is that they cannot help themselves, because they are unable to procure the Welsh smokeless coal which they have been in the habit of using without reproach. This plea is not likely to be advanced again, after the summary way in which Mr. Curtis Bennett dismissed it at Marylebone Police Court the other day.

The case in question was that of the Metropolitan Electric Supply Company, who were prosecuted by the Paddington Vestry, not for the first time, for emitting black smoke from the chimney of their Amberley Street Station. The customary excuse of necessity was offered, but not accepted. The Magistrate allowed that the Company were bound to generate electricity at their station; but he found that they were equally bound to construct their furnaces "in the best-known way, and under the best-known scientific principles," which they had not done. Ordered, that the nuisance should be abated within nine months—this being the time supposed to be required for making the necessary structural alterations to the boiler plant. Costs to the prosecuting Vestry. In the course of the hearing, the Magistrate inquired tentatively why the energy could not be produced at the station by means of gas-engines, to which the reply was given that it would be absolutely impossible. This question terribly galled one of our electrical contemporaries, which declared, in commenting upon the case, that "it is simply maddening to listen to the unpractical babble of technically unlettered Counsel upon engineering subjects." It appears, however, that somebody else must have "babbled" as artlessly or artfully, with less justification, because the Company asked for time to build a chimney for each boiler, if they were expected to burn bituminous coal smokelessly. Hereupon our contemporary remarks that it does not understand the allusion to the separate chimneys, and charitably supposes that the witness "must have been misreported." Inasmuch as the Court allowed the time asked for expressly in order that the chimneys should be built, the natural inference is that the report of what the witness said is correct, and that it prevailed with the Magistrate. Nevertheless, of course, the contention is an absurdity.

It is to be noted that the leading electrical journals do not try to exonerate the electric lighting companies from blame for having been content to avoid smoke prosecutions by the cheap and easy expedient—from the engineering standpoint—of only burning smokeless Welsh coal in their boiler furnaces. Sir James Vaughan was so persuaded upon one occasion that the companies could avoid making smoke if they chose, that he ordered the defendants to abate the nuisance within a week. In the opinion of the "Electrician," this sharp order was absurd; seeing that "Welsh coal is practically unobtainable in London." But our estimable contemporary may be reminded that there is such a fuel as coke to be had in London at a reasonable price. There is no other reason than custom, that we know of, why steam engineers should not burn coke instead of even Welsh coal. It is simply that the engineers have never been taught to use coke, and would almost as soon think of burning flint stones or brickbats. Even granting that coke is not so strong a fuel as anthracite, it only means for a big station the keeping of an additional boiler under fire.

We agree with our electrical contemporaries in the main, that it will be a blessing in disguise if the Magistrates open the eyes of the central station engineers to the fact that their bad stoking practice should no longer be concealed by the expedient of using nothing but smokeless Welsh coal. They have taken to the Babcock and Wilcox boiler because the Americans used it before them, regardless of the facts that as usually set it is wasteful of fuel, and a hopeless smoker with anything but smokeless coal. Even where the much better Lancashire boiler is used, its furnace is too often improperly constructed, and the boiler is spoilt "through the desire of boiler makers to sell cross tubes at 40s. each, by having water-pipes put across the flue-tubes behind the bridge to effectually knock out any life from the struggling flames which burn past the bridge." There is no saving in what is called "burning one's own smoke;" because the thickest black smoke has nothing in it to burn. But though smoke is not worth much as a fuel, the proper burning of bituminous coal in a furnace is an economical proceeding. This the electrical engineers seem to have yet to learn. Frederick Siemens expounded the philosophy of burning flaming fuels many years ago; but his has been as a voice crying in the wilderness. Meanwhile, let us repeat that if there is no Welsh coal in London, there is coke to be had for present use, while the central station engineers are engaged in studying the means of adapting their boiler furnaces to burn bituminous coal without creating an offence.

The Semet-Solvay System of Coke Production has taken a firm foothold in the United States; there being in operation 25 ovens at Syracuse (N.Y.), 25 at Sharon (Pa.), and 50 at Dunbar (Pa.). There are in course of erection, 120 ovens at Birmingham, (Ala.), 120 at Wheeling (W. Va.), and 10 at Halifax (N.S.). In reality, the Solvay Company have been the pioneers of this industry in the United States. The first ovens of the kind were built in 1892; and after a year's trial their number has increased to the present figures. The 350 Semet-Solvay ovens now in operation are equal to the production of 1400 tons of coke per day, only one-fiftysecond part of the capacity of the various existing beehive ovens.

#### A SOBER ACCOUNT OF ACETYLENE.\*

ACETYLENE appears to have possessed in very marked fashion the power of fascinating and distracting those who have essayed to speak or write about it. Lecturers and writers on scientific subjects whose evidence is usually absolutely trustworthy, have been led, as by mesmeric influence, to assign to acetylene virtues and potentialities to which it has no just claim. It has proved a tempting bait to the man who persistently spends his time and money on inventions, and has brought large sums to the Patent Office and to the pockets of patent agents. Small wonder is it therefore, that those who have taken up the manufacture of calcium carbide or of acetylene generators have drawn too glowing pictures of the new illuminant. The licence granted by common consent to a vendor to extol his wares by ascribing to them greater merit than they possess, exempts the manufacturers from severe blame. The lecturer and the writer have not the same excuse to plead; and exaggeration and extenuation should be strenuously avoided by them; for the public looks to such men for impartial verdicts. The discovery of the electrical process for the production of carbide of calcium was fraught with immense possibilities; and a hasty consideration of them upset the equipoise of many minds. Random words were uttered, of which the speakers are now for the most part ashamed. There has elapsed since that period more than enough time for forming a calm and dispassionate opinion on the qualities and uses of acetylene. Yet authors of pamphlets and treatises still seem blinded to its limitations and faults by the mere brilliancy of its flame, and the facility with which it can be produced. We have always deprecated the manner in which nearly all who have had to do with acetylene have attempted to give it more than its due meed of praise; and we have not hesitated to stigmatize as evil counsellors the worst offenders. It is therefore gratifying to be able to say that we have at last before us a treatise which appears to present a strictly sober view of acetylene.

Mr. Gibbs is not reticent concerning the dangers of acetylene; but he quickly disposes of those which are imaginary or avoidable. He anticipates that the intensely bright light of acetylene will make it the object of complaints that it "hurts the eyes;" and those who have watched the advent of the incandescent gas light will not be surprised to see his anticipation realized. But as people cease to regard a light as a novelty, and to gaze directly at it, complaints of this description die out; and Mr. Gibbs has no fear but that the charge will eventually be dismissed as non-proven in the case of acetylene also. He admits, however, that the flame, owing to its small size, casts a sharp shadow, and is unpleasant without a diffusing globe or shade. Visitors to the Acetylene Exhibition at the Imperial Institute have had ample opportunities of comparing the effects of the light with and without diffusive globes; and they will bear out the view that globes are most desirable adjuncts.

In Mr. Gibbs's descriptions of electric furnaces for producing the carbide we find no novelty, until we come to an account of a continuous electric furnace invented by Mr. C. Bradley, of New York. This furnace we are told "seems to satisfy perfectly the conditions of uninterrupted carbide production;" but the description given is derived from the patent specification, and we do not learn that the furnace has actually been used. In the course of some remarks as to the generation of acetylene, the following strange sentence occurs: "When calcic carbide and water are brought together, the calcium decomposes the water in order to unite with its oxygen, for which it has an affinity; while the carbon and hydrogen liberated by the reaction, finding nothing else on which they can seize, unite to form acetylene." How the calcium and carbon have become liberated from their combination, does not appear; and the proffered explanation, as it stands, is sheer nonsense. In several cases we observe that Mr. Gibbs is very weak on questions of chemistry. It is only for sound common-sense and the results of practical experience that his treatise is valuable. It attempts to give very few scientific data or explanations; and those it furnishes are not always reliable. The impurities of carbide, and the purification of acetylene, are not dealt with systematically. Mr. Gibbs apparently thinks that carbide—in America, at least—is now uniformly of good quality, and that it is better to avoid the necessity for purification by generating the gas in such a manner that impurities are as far as possible retained in the generator, than to elaborate schemes for the purification of the gas. The descriptions of numerous generators are very good, though in many cases they savour strongly of the patent specifications. Portable lamps have admittedly been so far rather unsuccessful; and we agree with Mr. Gibbs that "the best acetylene lamps are troublesome to manage," and that "they require a greater degree of intelligence for their successful handling than do the ordinary oil-lamps." The burners invented by Mr. E. J. Dolan, which are of the air-injector type, are considered the most suitable of those so far devised. Mr. Gibbs favours generators in which carbide is added to water; and he has devoted much time to experiments aimed at the production of a satisfactory machine of this type. He describes many of his researches, which, however, are not yet completed.

A list of all the United States patents for calcium carbide and

\* "Lighting by Acetylene. Generators, Burners, and Electric Furnaces." By William E. Gibbs, M.E. New York: D. Van Nostrand Company. London: Crosby Lockwood and Son. 1898.



acetylene apparatus is given; and a study of it reveals the curious fact that the type of generator in which small charges of carbide are dropped into a large quantity of water has been virtually ignored by the inventors, though this style is favoured by French and German experts, and has certain undeniable advantages. It will be remembered by visitors to the Acetylene Exhibition at the Imperial Institute, that this type of generator was represented at one or two stands only. Mr. Gibbs thinks that manufacturers have passed it over because it does not lend itself to production at a very low price; and in the stress of competition they find it more remunerative to make cheap and unreliable generators, and leave the public to learn by bitter experience how dear ultimately the initial cheapness will prove. From the many true sayings in the treatise before us, we will quote one which presents a reason why acetylene fascinates until one of its objectionable features stands out and disillusion the victim: "Acetylene is, until 'something happens,' a substance so easily managed, so capable of control, and apparently so unlikely to manifest its latent affinities, that the vigilance of the experimenter becomes relaxed." In other words, acetylene is a dangerous plaything, and a snare to the unwary experimentalist. In capable hands it is a useful illuminating agent; and those who desire to learn something of its potentialities and limitations may do far worse than refer to Mr. Gibbs's treatise, which we have read with a considerable amount of pleasure.

### RATES OF WAGES AND HOURS OF LABOUR.

THE echoes of the great strike in the engineering trade continue to reverberate in the hollow corners of the industrial world. Last week a London newspaper went so far as to blame those who brought down upon themselves this overwhelming defeat, for the stiffness manifested by the Welsh coalowners in respect to their own labour trouble. A short time since a leading technical journal gave publicity to the statement that several of the London firms who had, under pressure, conceded the eight-hour day had gone back to the old system, the A.S.E. sombrely acquiescing in the reversion. Our contemporary demanded that the firms who had taken this step should confess it as publicly as their submission to the eight-hour demand was advertised at the time. Strict justice, doubtless, requires recantation to be performed as openly as the original profession was signalized. But this particular matter of the working day is, after all, more a question of business than of sentiment; and one cannot blame commercial people for keeping the details of their business to themselves. If it is true, however, that the eight-hour day, or forty-eight hour week, is vanishing from the London shops, one would like to have the fact officially confirmed.

Just at this moment, when it is in question whether the disastrous engineering strike did not set the eight-hour day back instead of bringing it on faster, Mr. H. Llewellyn Smith, the Commissioner for Labour, publishes his fifth annual report on "Changes in Rates of Wages and Hours of Labour in the United Kingdom." This report deals with the changes that took place in 1897, which is characterized as a year of rising wages. It is officially computed that the net result of all the changes recorded was a rise of about £45,000 a week; the greater part going to the engineering and shipbuilding, mining, and building industries. It is observed that rates of wages change much more slowly than earnings. When rates of wages change, as a rule only a small porportion of workpeople feel the difference in any one year. The case of coal miners is exceptional, as among them the influence of a change of the rate of pay is felt at once by a large number, and quickly spreads. Leaving the miners out, the somewhat surprising result appears that for all trades and occupations together, "the vast majority of the wage-earning population are unaffected by any changes in rates of wages during any given year." The years 1894 and 1895 were years of falling wages. The next two years show a continued rise—especially 1897. Last year was also marked by reductions of the hours of labour, generally without any corresponding decrease in weekly wages, and sometimes accompanied by actual increases in the rates. The engineering strike for the eight-hour day is only mentioned in passing. It is stated that, though reductions took place at a number of works, these were "mostly temporary, the longer hours being reverted to at the conclusion of the dispute early in 1898." Such temporary reductions are not included in the statistics of the Labour Department.

It is always an interesting question how changes in rates of wages are brought about. This report can be quoted to prove that, while conciliation boards, mediation, arbitration, and strikes bulk largely in the newspapers, in Parliament, and on political platforms, as means of adjusting the relations between Capital and Labour, none of these things is of much account in reality. "Mutual arrangement between the parties directly concerned was, as usual, the principal method by which changes in wages and hours of labour were settled." The wages settlements under twelve of the eighteen sliding-scales known to be in operation in 1897, affected 23 per cent. of the workpeople included in the returns. All the other machinery, which makes

so much fuss in the world, arranged the affairs of 2½ per cent. of the total. The remainder, forming nearly 75 per cent. of the total, "had their wages altered by personal negotiation or arrangement between the employers and the workpeople or their representatives." A further point brought out is the very large number of changes, both of rates of wages and hours of labour, that took place without anything that could be called a labour dispute. So clear an illustration of the passing out of fashion of the great "strike policy" is worth noting. It shows, among other things, that those Labour leaders who lost the opportunity of foisting themselves into public positions offered by the cropping up of the New Trade Unionism in 1889, have little prospect now of doing anything in the same line. Nor is the independent "Conciliator" in much greater demand.

It is remarkable how widespread are the effects of good and bad years. When wages are going up, everybody, speaking generally, participates in the advance. Thus in the year 1897 only 13,855 persons are reported to have had their wages reduced, as compared with 560,707 who received increases. Again, the building trades are conspicuous for the steady advance in wages extending over several years; while employment in these trades has been plentiful all along. Moreover, wages have risen all over the country. Those who may yet entertain a lingering belief that militant Trade Unionism, with its paraphernalia of brass bands and banners, and its vociferous leaders, is necessary for the improvement of the circumstances of the working man, may be commended to that part of the report which deals with Seamen and Firemen. It is hardly necessary to recall memories of the calamitous mess that the Seamen and Firemen's Union made of itself and its cause; yet last year, Union or no Union, "the general tendency of wages . . . was decidedly in an upward direction." The same with agricultural labour: "In England and Wales there was an upward movement in wages in 1897 compared with 1896."

Respecting the eight-hour day, the report states that "during 1897 the number of workpeople employed in private establishments who secured the adoption of the eight-hour day was unusually large, and more than equalled the total number for the previous four years. On the other hand, the number of employees of public authorities whose hours were reduced to eight per day during the year was small." The actual figures, however, are not very large. "In all, 5896 workpeople employed in private establishments, and 200 employees of public authorities, secured an eight-hour day for a six-day week; while 5036 employed in private establishments, and 302 employed by public authorities, secured an eight-hour day for a week of seven days. Against these totals must be set 300 men who reverted from eight hours per day to longer hours." It is well to have the actual numbers to go by in contemplating the course of a "cause" which is so much talked about. What do the figures show in this connection? It is explained that "the substitution of three shifts of eight hours for two of twelve hours among the blast furnacemen of Cleveland affected about 5000 persons, whose hours were thus reduced from 84 to 56 per week." This accounts for nearly one-half of the workpeople listed as having "secured the adoption of the eight-hour day." But it is misleading to make this confusion between an eight hour-shift, and an eight-hour working day. We argued this point out at the time of the more general adoption of the eight-hour shift in gas-works; showing that the question of the division of a continuous process of manufacture into "watches" of shorter or longer duration differs altogether from that of the length of the working day of an industrial establishment. Besides the Cleveland men, the most important example in the same line is "the case of 2830 employees in gas-works in London, from a week of 54 to a week of 48 hours." This means the mechanics and tradesmen in the employ of The Gaslight and Coke Company, who obtained the 48-hour week for the asking at the time of the engineering strike. It is rather strange that the Directors of the Company have never taken credit publicly for making this concession to the forces of Trade Unionism. If these two groups of workpeople are eliminated, the number of those who, in the language of the report, "secured the adoption of the eight-hour day," was not so large after all.

The bulk of the report is made up of detailed tables, which afford a mass of general information. Several examples of increases of the wages of gas workers, and decreases of their working hours, are included in these tables; and not one of the reverse process. On the whole, while the report conveys the pleasing impression that the trade of the country is good, and that the workpeople are obtaining a share of the benefit flowing from this general activity of enterprise and labour, it does not support the idea that Trade Unionism is to be credited with having anything to do with the promotion of so satisfactory a state of things. The one cause with which Trade Unionism has been most prominently identified during the year under review—the movement for the eight-hour day—has certainly not progressed in the degree claimed by Mr. Llewellyn Smith. What the partisans of the movement would like to see is evidence that it has some "way" of its own, however small, and does not merely exist as a concession "secured" by one party in the labour world against the wish of the other. Capital is not bound to any particular length of working day. The numerous and influential body of managers, foremen, draughtsmen, and clerks would be only too glad to see the working week



shortened, if the output were the same. It is the latter point that governs the question. The advocates of the eight-hour day have always rested their case on the plea that men can turn out as much of all kinds of work—say, engineering—in eight hours as in nine. Mr. Barnes, the Secretary of the A.S.E., used during the strike to talk at large about the physiological laws that forbade a London fitter to look at his lathe for longer than eight hours a day—without overtime. But all that has gone by for the time being. We would not say, however, that the advent of the day of eight hours, as of other improvements of the mechanic's lot, was not hastened rather than delayed by the recent reverse of the "stand-and-deliver" policy of the A.S.E. So long as the Society man fondly imagined he had only to ask and have, and need not scruple about returning bad service for good money, he would have been a bad hand to have about a works for a day of any length. Once convinced that wages must be earned as well as bargained for, the workman is more likely to get what can reasonably be granted in the way of shortened hours of labour than he will ever be able to command by virtue of organization only.

### PERSONAL.

Mr. WALTER JONES has secured the appointment of Secretary of the Southminster Gas Company.

Mr. F. GOLDSWORTHY has been appointed Resident Manager at the Streatham works of the Southwark and Vauxhall Water Company.

Mr. CORBET WOODALL has resigned his position as a Director of the Waltham Abbey and Cheshunt Gas Company, and has been succeeded by Mr. HENRY WOODALL. There has also been a re-arrangement of the official work; Mr. H. GOUGH having, by arrangement, retired from the secretaryship, the duties of which will henceforth be discharged by the Manager, Mr. W. BINCE RANDALL.

An interesting ceremony took place at the Bombay Gas-Works on the 31st ult., when the General Foreman, Mr. G. F. Cutting, on behalf of the men, presented a very handsome silver bowl on stand (Deccan work) to Mr. LOUIS PENNY, M.Inst.C.E., on his retirement from the position of Engineer of the Company. In a few well-chosen words, Mr. Penny acknowledged the presentation, and begged the men to give to his successor, Mr. F. W. Chamberlain, the hearty support they had from the very first accorded to himself.

Last Thursday evening, the men employed at the Halifax Gas-Works met at the offices for the purpose of presenting to Mr. A. J. HOPE, Assistant to Mr. T. Holgate, a gold chronograph watch, subscribed for by 213 men on the works, and a travelling-bag, on his leaving to take up the position of Superintendent of the Effingham Street works of the Sheffield Gas Company. The presents bore suitable inscriptions. Mr. Holgate, in making the presentation, referred to the abilities Mr. Hope had displayed in his work during his eight years' stay at Halifax. Mr. Hope thanked his fellow-workers for their appreciation of his endeavours to discharge his duties satisfactorily.

**Manchester District Institution of Gas Engineers.**—The 115th quarterly meeting of the Institution will be held on Saturday, at Warrington, the home of the President for the year—Mr. W. S. Haddock. According to the programme issued by the Hon. Secretary (Mr. S. S. Mellor, of Northwich) the members will arrive in the town shortly before eleven o'clock, and will first inspect the Longford Gas-Works of the Corporation, where light refreshments will be provided. After the inspection, the members will be entertained to luncheon by the Gas Committee. In the afternoon, there will be a drive to Knutsford, *via* Arley; the pleasure of the trip being enhanced by the fact that Colonel Piers Egerton-Warburton, of Arley Hall, has given permission for the coaches to go through his private park. Tea will be taken at the Royal George Hotel, Knutsford, after which the only business on the *agenda*—consisting of the confirmation of the minutes of the previous meeting and the admission of two new members—will be transacted.

**Acetylene Black.**—Reference has already been made in the "JOURNAL" to the granting of a patent to a French inventor in connection with the above matter. The inventor in question is M. Hubon. When acetylene gas is burned with a smoking flame, three to four times as large a quantity of soot is obtained as from the same quantity of mineral oil. The acetylene soot is very light, and exhibits an absolutely black colour without any tinge of brown. Besides, all tarry admixtures and other substances contained in lamp black, &c., are absent from the soot. It is very bulky, and will be specially adapted for Indian ink, as well as for colours used in printing and lithography. The patentee gives three methods for the production of the colour. According to the first, the acetylene gas is kept in a steel cylinder under two atmospheres pressure, and is then ignited through an electric spark or a glowing platinum wire by way of explosion. The final pressure of the resulting hydrogen does not exceed 12 atmospheres; so that the danger of an explosion is excluded if steel cylinders of corresponding strength are employed. This method has the advantage that the theoretic yield of carbon is obtained from the acetylene; the product being of the greatest purity.

### NOTES.

#### The Working of Gas-Engines.

At the present time, the Beau de Rochas cycle of operations is the one almost exclusively employed for gas-engines. There are, however, certain inconveniences in its application to motors operated by poor gases, or those obtained from blast-furnaces, from the point of view of regulating the working and clearing the cylinder after explosion. According to "La Nature," a French engineer—Mons. E. Heirmann—has devised a new cycle of operations which will remedy these inconveniences, and impart to the motor all the advantages resulting from working with variable explosion. To realize these conditions, he introduces the mixture of air and gas under pressure into the cylinder, interrupts the admission under constant pressure at a fixed point, varied as required by means of suitable devices, and obtains simultaneously ignition of the mixture, which thus produces the working force as far as the end of the piston stroke. During the return stroke, the products of combustion are completely expelled. Besides perfect clearance of the cylinder, there are two other equally appreciable advantages—an explosion for each revolution of the shaft, and a variable admission as for steam motors.

#### The Proper Use of Safety-Lamps.

The use of incandescent electric lamps for coal mines, and for "safety" lamps intended to be employed in enclosed places where accumulations of explosive gases might be expected, has been considered by Mr. H. W. Halbaum, in a series of papers published in the "Colliery Guardian." The writer pronounces against the practice, for a variety of cogent reasons. First, and mainly, it is laid down that the purpose of the old make of miners' safety-lamp, with a flame burning inside a wire gauze casing, was not that of enabling a man to remain in a dangerous atmosphere for an indefinite period without being made aware of the fact. The flame of the lamp, indeed, could not ignite the explosive atmosphere through the gauze; but the gas from without could penetrate to the inside of the lamp, and give the well-known indication of the state of things—thus warning the workman to look out for his own safety. This is the quality of "safety" which is needed in a lamp, quite as much as that of not igniting an explosive atmosphere which is found to exist. Thus merely carrying a good miner's safety-lamp of one of the accepted improved patterns into a dangerous atmosphere at once exhibits the fact that gas is present, which an electric lamp would not do until by some means it was accidentally broken, when it would give the first indication of danger by exploding the gaseous mixture.

#### Hints on Oils and Paints.

In some "Notes on Oils" published in the "Ironmonger," it is remarked that in the mixing of paint it is not always remembered that all the oil should go in first, the turpentine being added afterwards. A better result and more covering power will be obtained by following this rule than when the turpentine is put in first, or added before the whole of the oil has been used up. Turpentine may be kept from becoming cloudy or thick by the addition of a few small pieces of quick-lime. Vermilion being a useful preservative paint, as well as one greatly in demand for painting signals and other objects in works which are meant to catch the eye, a high price is paid for it with the intention of securing the pure article. This, however, is not always sufficient; the price of from 2s. 6d. to 3s. per pound being a great temptation to adulteration with red lead or even iron oxide. To test vermilion for purity, a small sample is to be placed in a fragment of hard porcelain, and heated over a gas-flame or spirit-lamp. If pure, it will evaporate almost completely, while any non-volatile admixture will, of course, remain. Our contemporary speaks a good word for yellow ochre as a most permanent pigment. It may be remarked, as a commentary upon these observations, that signs are not wanting of a revolt against the time-honoured monopoly of iron-oxide paint for structural ironwork in places where the work can be publicly seen. Engineers are paying much more attention to the decoration of ironwork by polychromatic painting than was formerly deemed necessary.

#### Sir W. Crookes on the Periodic Law.

There seems to be a lull for the time being in the announcements of "new" constituents of the air as being discovered by the followers of Rayleigh and Ramsay. Indeed, it is rumoured that one or two of the latest gains of science in this line have disappeared from human ken. Sir William Crookes has submitted to the Royal Society some suggestive observations on the difficulty that has been experienced in placing these newly-found elements in their proper niche in the scheme of arrangement of the elements which we owe to the ingenuity and scientific acumen of Newlands, Mendeléeff, and others. In order to facilitate this arrangement of the elements according to the periodic law, Sir W. Crookes has imagined them as ranged in space in a figure-of-eight spiral. The result is remarkably consistent. With regard to the new atmospheric elements, it is observed that until recently chemists knew no element which had not more or less marked chemical properties; but now, by the researches of Lord Rayleigh and Professor Ramsay, we are brought face to face with a group of bodies with apparently no chemical properties, and forming an exception to the other chemical elements.



Sir W. Crookes ventures to suggest that, in his proposed scheme, these elements—helium, argon, and krypton—naturally fall into their places. Helium comes between hydrogen and lithium; argon between chlorine and potassium; and krypton between bromine and rubidium. There are places for many more inert bodies, some of which, Sir W. Crookes suggests, will eventually be discovered in the solid form.

#### A Chemical Test for Carbonic Oxide in Air.

The difficulty of determining by chemical test the proportion of carbonic oxide present in the air at any time is well known. M. Gautier has been working out this problem of air analysis; and he now claims in the "Comptes Rendus" complete success for his method of absorption by hot copper of the iodine produced when the air containing carbonic oxide is passed over iodine pentoxide at 100° C. A sample of air (10 to 100 litres) is filtered through cotton wool or glass wool, passed over caustic potash in solution to absorb the carbon dioxide, and then over caustic baryta and phosphorous pentoxide. It then passes through two tubes containing respectively iodine pentoxide and finely-divided copper which has been reduced from the oxide by hydrogen at a low temperature, and allowed to cool in a current of carbon dioxide. These two tubes must be connected without india-rubber, are thoroughly dried in a current of hot air before being weighed, and are kept in an air-bath at 100° to 105° C. The increase in weight of the tube containing the copper gives the amount of iodine set free from the iodine pentoxide, whence the amount of the original carbon monoxide can be calculated. The method would not appear to be an easy one to practise; but it is claimed that experiments with known mixtures show that it is extremely accurate, and capable of detecting carbonic oxide in the proportion of 1-500,000th of the air. Experiments on the air of Paris gave amounts of carbon monoxide varying from zero to 9 parts per million. The air of the author's laboratory gave 12 parts per million. The presence of acetylene appears to qualify even this test; so that science seems to have no chemical means for the detection of carbonic oxide in air that would command the confidence of an English Court of Justice.

### COMMUNICATED ARTICLE.

#### THE LOCAL GOVERNMENT BOARD AND THE PROTECTION OF WATER SUPPLIES FROM POLLUTION.

By PERCY GRIFFITH, Assoc.M.Inst.C.E., F.G.S., M.Inst.M.E.

(Concluded from p. 367.)

Having now summed up the existing state of affairs in regard to this important matter, it will be easier to suggest such modifications in the existing Acts of Parliament as would appear to be necessary in order to affect the object in view, which is to *provide some effectual safeguard against the supply of polluted water for public domestic use*. Now no parliamentary enactment is the slightest use that does not allow fully for practical difficulties and lend itself to general application. It will therefore be desirable to consider the matter from a purely practical standpoint. The essential points to be secured in any amendment of the law may be summarized under five heads—

1.—It is above everything necessary that means should be adopted whereby any pollution may be detected as soon as possible after its occurrence, and in any case before the water is allowed to flow from the works into the service mains or reservoirs.

2.—It is next essential that in the event of pollution being discovered at any works or in any one source of supply, this works or source of supply should at once be closed, and not used again for supplying the public until the cause of the pollution has been discovered and removed.

3.—Before these conditions can be made compulsory, some more or less definite basis must be arrived at as a definition of pure and impure water. This must include a clearly defined method of collecting and examining or testing samples of water, and should preferably stipulate certain conditions both as regards physical, chemical, and bacteriological constituents, which could be taken universally as sufficient to render any water unfit for domestic use.

4.—Rules must be laid down and made applicable to all water-works undertakings, whether owned by municipalities or private companies, requiring the regular inspection of all sources of supply, and the regular analysis and examination of the water at the point where it enters the water-works, and also (at less frequent intervals) at the outlet of consumers' services, by properly qualified and duly authorized officials, who must be as far as possible altogether independent of the authority owning the water-works.

5.—Powers must be given to such officials to compel the immediate closing or disconnection of any source of supply, works, or mains that may be found to contain polluted water; and legal power must be given to the local authority to enforce his orders in this respect, whether the works be in the hands of the local authority or otherwise.

In order to give effect to the above conditions, I would suggest

that amendments be made to the existing Acts of Parliament on the following lines:—

#### AMENDMENT OF THE PUBLIC HEALTH ACTS.

1.—Creating an official to be known as the "Water-Works Referee," who shall be appointed under sealed certificate by County Councils, subject to the approval of the Local Government Board, which approval should be endorsed on the certificate, and who shall be duly qualified to examine, test, and report upon sources of water supply and samples of water. These officers should in all cases be either qualified chemists or, better still, engineers of experience; and it would no doubt be necessary for most county councils to appoint more than one official, and allocate the county among them by dividing it into districts according to the number of referees appointed.

2.—Requiring such officials to inspect and examine *all water-works* within their district at intervals of not less than one month, and otherwise as circumstances might require; and to furnish reports to their respective county councils after each inspection, giving analyses and full particulars (physical, chemical, and bacteriological) of the water being supplied, also of the general condition of the source of supply and works. (The Local Government Board might issue forms and general instructions as to the manner of making these reports.)

3.—With respect to water-works in the hands of local authorities, the clauses amending the Water-Works Clauses Act (as suggested below) should be incorporated, with the exception of Nos. 3, 5, 6, and 7.

4.—Providing that, in the event of any local authority refusing to carry out the orders of the referee, it shall be the duty of that officer to report the fact to the county council, who shall issue an order requiring the local authority to obey such orders within a given time; and in the event of continued refusal of the local authority to comply with the terms of the order, the county council shall appoint some person or persons to close the works or part of same, and to carry out the alterations at the expense of the local authority, as per clause 299 of the Public Health Act, 1875, or clause 16 of the Local Government Act, 1894.

#### PUBLIC HEALTH ACT, 1875.

##### Power of Board to Enforce Performance of Duty by Defaulting Local Authority.

Sec. 299.—Where complaint is made to the Local Government Board that a local authority have made default in providing their district with sufficient sewers or in the maintenance of existing sewers or in providing their district with a supply of water in cases where danger arises to the health of the inhabitants from the insufficiency or unwholesomeness of the existing supply of water, and a proper supply can be got at a reasonable cost, or that a local authority have made default in enforcing any provisions in this Act which it is their duty to enforce, the Local Government Board, if satisfied, after due inquiry, that the authority have been guilty of the alleged default, shall make an order limiting a time for the performance of their duty in the matter of such complaint. If such duty is not performed by the time limited in the order, such order may be enforced by writ of mandamus, or the Local Government Board may appoint some person to perform such duty, and shall by order direct that the expenses of performing the same, together with a reasonable remuneration to the person appointed for superintending such performance and amounting to a sum specified in the order, together with the costs of the proceedings, shall be paid by the authority in default; and any order made for the payment of such expenses and costs may be removed into the Court of Queen's Bench and be enforced in the same manner as if the same were an order of such Court.

Any person appointed under this section to perform the duty of a defaulting local authority shall, in the performance and for the purposes of such duty, be invested with all the powers of such authority other than (save as hereinafter provided) the powers of levying rates; and the Local Government Board may from time to time by order change any person so appointed.

Sec. 305.—Whenever it becomes necessary for a local authority, or any of their officers, to enter, examine, or lay open, any lands or premises for the purpose of making plans, surveying, measuring, taking levels, making, keeping in repair, or examining works, ascertaining the course of sewers or drains or ascertaining or fixing boundaries, and the owner or occupier of such lands or premises refuses to permit the same to be entered upon, examined, or laid open, for the purposes as aforesaid or any of them, the local authority may, after written notice to such owner or occupier, apply to a Court of Summary Jurisdiction for an order authorizing the local authority to enter, examine, and lay open, the said lands and premises for the purposes aforesaid or any of them.

If no sufficient cause is shown against the application, the Court may make an order accordingly, and on such order being made the local authority or any of their officers may, at all reasonable times between the hours of nine in the forenoon and six in the afternoon, enter, examine, or lay open the lands or premises mentioned in such order for such of the said purposes as are therein specified, without being subject to any action or molestation for so doing: Provided that, except in the case of emergency, no entry shall be made, or works commenced under this section, unless at least twenty-four hours' notice of the intended entry and of the object thereof be given to the occupier of the premises intended to be entered.

#### LOCAL GOVERNMENT ACT, 1894.

Sec. 16.—(1) Where a parish council resolve that a rural district council ought to have provided the parish with sufficient sewers, or to have maintained existing sewers, or to have provided the parish with a supply of water, in cases where danger arises to the health of the inhabitants from the insufficiency or unwholesomeness of the existing supply of water, and a proper supply can be got at a reasonable cost, or to have enforced with regard to the parish any provisions of the Public Health Acts which it is their duty to enforce, and have failed so to do, or that they have failed to maintain and repair any highway in a good and



substantial manner, the parish council may complain to the county council; and the county council, if satisfied, after due inquiry, that the district council have so failed as respects the subject matter of the complaint, may resolve that the duties and powers of the district council for the purpose of the matter complained of shall be transferred to the county council, and they shall be transferred accordingly.

(2) Upon any complaint under this section, the county council may, instead of resolving that the duties and powers of the rural district council be transferred to them, make such an order as is mentioned in section 299 of the Public Health Act, 1875, and may appoint a person to perform the duty mentioned in the order; and upon such appointment, sections 299 to 302 of the Public Health Act, 1875, shall apply, with the substitution of the county council for the Local Government Board.

(3) Where a rural district council have determined to adopt plans for the sewerage or water supply of any contributory place within the district, they shall give notice thereof to the parish council of any parish for which the works are to be provided before any contract is entered into by them for the execution of the works.

#### AMENDMENT OF THE WATER-WORKS CLAUSES ACTS.

1.—Defining "pure and wholesome water" (section 35 of the Water-Works Clauses Act, 1847) to be water which shall, in the opinion of the water-works referee of the district in which the works are situated, be suitable for domestic use. (The Local Government Board should issue directions as to what conditions may be generally taken to render any water unfit for domestic use.)

2.—Providing for the admission of the water referee to the works of the undertakers at any time between the hours of 10 and 4, on giving six hours' notice in writing, and producing his certificate from the county council and the Local Government Board; and that facilities be given him for examining the sources of supply and works, and taking samples of the water at any part thereof.

3.—Providing penalties for refusal or obstruction.

4.—Giving power to the referee to order the immediate closing or disconnection of any part or the whole of any works, or the alteration thereof for the purpose of protecting the water from pollution.

5.—Providing penalties for refusal to obey same, and limit of time fixed for carrying out any alterations required under the order of the referee.

6.—Providing that in the event of a works or part of a works being closed by order of the referee, the undertakers shall be at liberty to appeal to the Court against the order; and in the event of it being proved that the order was uncalled for or unjustified by the circumstances of the case, the Court may order the payment of damages by the county council to the undertakers for any loss they may have sustained owing to the carrying out of such order, also the cost of the appeal to follow the result.

7.—Providing similar right of appeal against an order to alter the works.

## TECHNICAL RECORD.

### SOME NOTES ON THE MODERN COMMERCIAL GAS-ENGINE.

By W. CARMICHAEL PEEBLES, of Edinburgh.

[A Paper read before the North British Association of Gas Managers, July 28, 1898.]

When asked a few weeks ago to read a paper on gas-engines before the North British Association of Gas Managers, I must say I felt great misgivings as to the treatment of such a subject, owing to the short time at my disposal. The numerous papers and lectures which have from time to time been given to the public, through the medium of many learned societies and the press, also make it somewhat difficult to bring forward fresh points of interest. I must crave your indulgence, therefore, while I endeavour to engage your attention for a little on this subject, which is growing in importance day by day; for there can be no doubt that the gas-engine is becoming more and more recognized as a standard type of machine for the economical production of motive power. The simplicity of the modern gas-engine brings its management within the scope of individuals of ordinary intelligence, who may not even be connected with engineering matters; and the prejudice which at one time existed against it, and still may exist in the minds of a few, is being gradually overcome. That this is so is well shown by the enormous numbers now manufactured and in use all over the country.

In treating my subject, "Some Notes on the Modern Commercial Gas-Engine," I shall, in the first place, recall to your minds very briefly the history of the particular engine which, almost to the exclusion of all other types, holds the supreme position on the market at the present time. I allude to the "Otto cycle" gas-engine. One cannot but feel astonished, in looking over the patent records for the last thirty years, to see the extraordinary number of inventions—some of them, seemingly, of the greatest possible merit—which have failed when put to the hard test of practical work. The gas-engine patent records are no exception in this respect. Hundreds of patents, representing the work of a multitude of minds, have been laid on the shelf as useless, chiefly owing to the

discovery of the "Otto cycle," which made the gas-engine a real success, and raised it to the proud position of being a competitor with the steam-engine.

The cycle of operations in the Otto engine was first suggested by a French scientist, Beau de Rochas, about the year 1862. At the same time he also pointed out the advantages of compressing the charge before firing. Compression, it is true, had been tried by Barnett in 1838; but the real advantage of it was not properly understood until Beau de Rochas came forward and stated, after much study and investigation, that the conditions necessary for economy in the gas-engine were: (1) The largest cylinder volume with the smallest cooling surface. (2) High piston speed, giving rapid expansion. (3) The greatest possible expansion. (4) The highest possible initial pressure before expansion.

The fact that these are the conditions aimed at by manufacturers to-day shows how well Beau de Rochas understood the true theory. He was, however, too soon with his discovery; and it lay latent for nearly 15 years, during which time little appears to have been done with his suggestions. This was, no doubt, owing to inventors trying to follow on the lines of the steam-engine; their endeavours being to produce a gas-engine either single or double acting.

The gas-engines then made were of several types—nearly all being atmospheric or non-compression, and giving an explosion at each outstroke of the piston. The most popular was the Otto and Langen, manufactured at Deutz, in Germany. Some of you may have seen these curious engines, with the rack connecting rod, gearing into a clutch pinion on the crank-shaft. On the upward movement of the piston, the pinion driven by the connecting-rod ran round free; but on the downstroke the clutch engaged with the crank-shaft, giving it rotary motion. The explosion merely lifted the piston, which was of great weight, to the top of the cylinder, the latter being vertical. Advantage was then taken of the vacuum produced by the cooling gases, when the pressure of the atmosphere, assisted by the heavy piston, gave the power to drive the engine. The noise and vibration produced were very much against the engine; and its popularity was, no doubt, due to the low gas consumption—about 44 cubic feet per brake-horse-power per hour—compared with nearly double that quantity used by other engines then made.

While manufacturing the Otto and Langen engines, which were finally brought to a high pitch of perfection, Herr Otto seems to have continued experimenting; and experiments carefully conducted by an earnest worker are certain to bear fruit. He, no doubt, fully realized that the gas-engine had a great future before it, and was aware of the necessity of providing a system which would be more reliable, and less noisy, than that used in the Otto and Langen engine. The result of his work was the adoption of the cycle suggested by Beau de Rochas years before, and the production of the excellent Otto silent gas-engine. This engine was exhibited at the Paris Exhibition of 1878, and created quite a revolution in the gas-engine industry. Messrs. Crossley Bros., of Manchester, secured the patent rights for this country; and through the excellence of their manufactures they soon established the business on a firm footing. Of course, they had practically a monopoly of the whole trade for ten years. Although several other engines appeared during that time, yet, owing to their complicated construction, none of them enjoyed the popularity gained by the Otto engine.

The stimulating effect of the competition set up among makers and inventors was by no means all lost, as many results were obtained by their endeavours, and numerous details were perfected and patented, which put them in a better position for realizing the benefits of the Otto patents when these expired in 1890. At the expiry of these valuable patents, nearly all manufacturers gave up making their own special types of engines, and adopted the Otto cycle—recognizing in it the only really practical cycle for a simple and efficient gas-engine.

The great changes which have taken place in the engine since first brought out by Otto are: (1) The method of igniting the charge. (2) The adoption of lift-valves in place of the slide-valve. (3) The increase of compression.

These all appear exceedingly simple matters; and one is apt to wonder how so many years of constant endeavour and continuous work were required to bring about these changes. Those, however, who have done any original experimental work, and have a knowledge of the intricacies of the gas-engine theory, will allow that the great advance made within the course of 25 years or so has been well, and even quickly, brought about.

The slide-valve was for years a great hindrance to the development of the engine. High compression was impossible, as the slide had to be pressed so firmly to its seat in order to keep it tight, that great difficulty was experienced in lubricating it properly to prevent tearing. Both manufacturers and users suffered through this evil; and the slide proved a continual source of worry. Its effect upon the economy of the engine was also very considerable, not only through the necessarily cramped port area, and consequent small volume of gas and air admitted at each stroke, but also owing to the heavy drag put upon the engine, as the power absorbed in driving the slide was very considerable.

Compression has been continually on the increase ever since the adoption of the lift-valve. In the early days compression ranged between 25 and 30 lbs. per square inch, while now the



ranges found are generally between 70 and 90 lbs. per square inch, depending on the size of the engine. Of course, while stratification of the charge was so much believed in, and considered of such importance in reducing the shock of explosion, the idea of higher compression would, in all probability, have been ridiculed, as high compression and stratification are quite opposed to each other. However, this erroneous theory, and many others held by early inventors, were finally disposed of, and with the introduction of lift-valves for the admission of the charge the compression has been increased year by year as other improvements would allow, resulting in greater economy of gas consumed in the engine.

How far compression may ultimately be carried, it is impossible to say. It would seem, however, hardly practicable to increase it further under the present cycle, for the simple reason that all parts of the engine which receive the strain must be designed strong enough to resist the entire shock of the initial pressure of one explosion only. If we could have a compound engine, or even a double-acting engine, receiving an impulse at every out-stroke and in-stroke of the piston, almost any pressure could be dealt with, without the engine becoming unduly large for the power given out. At present the initial pressure rises as high sometimes as 320 lbs. per square inch; and although this is only for an instant, and occurs but once in every four strokes, yet the engine must be strong enough to resist that pressure, and excessively heavy fly-wheels are required to keep the speed constant during the idle strokes.

This increase of compression has more to do with the economy of the modern gas-engine than possibly any other change—firstly, by the reduction in the size of the compression space wherein the burned products may lodge at the end of the exhaust stroke; and, secondly, by the more intimate and closer mixing of the particles of gas and air, thereby insuring a more complete and instantaneous explosion. The highest temperature of the explosion being reached more rapidly owing to the higher compression, it is not so greatly affected by the cooling action of the cylinder, as the cylinder surface is not much exposed until the piston has moved a little forward; and by that time the bulk of the power contained in the gas has been given to the engine.

Mr. Dugald Clerk, in his excellent work on "The Gas and Oil Engine," gives some tests showing the result of increased compression on a Stockport gas-engine, as manufactured by Messrs. J. E. H. Andrew and Co., Limited, of Reddish. The engine tested was altered by fitting on compression chambers of different capacities. It gave, with 60 lbs. compression, 20·8 brake-horse-power on a gas consumption of 22·3 cubic feet per brake-horse-power per hour; while with 90 lbs. compression the brake-horse-power rose to 24·4, and the gas consumption decreased to 20·75 cubic feet per brake-horse-power per hour. This is an increase of 17 per cent. in power, and a decrease of 8 per cent. in gas consumption.

From the earliest date down to the present day the ignition of the charge has been a continual source of trouble; and there are many engines, even of recent manufacture, which give annoyance in this respect. The difficulties connected with the ignition of the charge have not easily been overcome. Being such an important factor in the economical working of an engine, there is little wonder that so much care has been bestowed upon the igniting arrangements. Of course, the ignition is the life of the engine—the vital spark, so to speak, which transforms the charge of gas and air into the power which is given out through crank and fly-wheel. When watching any good modern engine at work, fitted with tube ignition and timing valves, one is apt to imagine the whole thing very simple. But the fact is, the igniting arrangements have had to pass through many changes before being brought to their present state of perfection.

So long as the engines were of the non-compression type, the charge was easily fired by an external flame, which was sucked into the explosive mixture when the slightest vacuum was formed in the cylinder. We all know—some of us from actual experience, through the wrecking of houses, gasholders, governors, and meters—how easily a mixture of gas and air at atmospheric pressure is exploded; in fact, special precautions have to be taken to prevent accidents on this account. But compression at once changes these conditions. A flame applied to the orifice of a vessel containing an explosive mixture under pressure has no tendency to run in, but burns fiercely at the outlet of the cylinder or other vessel from which the explosive mixture is being forced.

Some arrangement had, therefore, to be got which would fire the charge inside the engine cylinder, notwithstanding the compression. Perhaps the simplest flame-igniting device, which would do this was that of Barnett, brought out as far back as the year 1838. It consisted of a stop-cock, having a hollow plug, in which was placed a small gas-jet. The plug had a long narrow port in one side of it, running lengthwise; and this port, when the plug was in one position, communicated with the air through a similar port in the barrel or shell. Here the jet was lighted by an outside flame, and at the proper moment (determined by mechanism connected with a moving part of the engine) the plug was turned through a quarter of a circle, when its port came opposite a port communicating with the cylinder, and fired the charge. This extinguished the jet; but it was re-lighted on the plug being turned back to its original position.

Otto's improvement in the firing of the charge consisted of a

simple arrangement of a cavity and ports in the slide-valve, whereby he obtained a flame under pressure. This was brought about by admitting to the cavity in which the ignition jet burned a small portion of the explosive mixture from the cylinder, which gradually raised the pressure of the flame to that of the compressed charge. This arrangement was in use for many years, although not always quite satisfactory, especially at high speeds and full power loads, as great difficulty was experienced in ventilating the small passages and cavity in which the jet had to burn. When we consider that ignition had to take place as often as 100 to 150 times a minute, according to the speed and load on the engine, we may admit that the clearing out of these small passages so rapidly was no easy matter.

The electric spark has also had its share of the inventor's attention; and many valuable arrangements have been brought out. They are all, however, dependent upon a battery and induction coil; and the electrodes exposed to the explosion are so liable to corrode, thereby causing much trouble, that this system has not come into general use in this country, at least. It has, of course, its good points, which, in certain cases, are well worth the extra trouble involved in keeping the several parts in proper working order.

It was as a great boon, therefore, that the hot tube came to assist the gas-engine one step further forward; and many are the improvements connected with even such a simple part of the engine as the ignition tube. The first tubes used were made from ordinary  $\frac{1}{2}$ -inch bore iron gas-pipes, either welded or closed by a cap at one end, the other end being screwed into the cylinder or some part communicating with it. So long as they are new, iron tubes give a good reliable form of ignition, and are still largely used. Owing, however, to the action of the continued heat, the composition of the gas, and the pressure of the explosion on the inside, they soon get choked up by a deposition of carbon. The iron becomes quite thick and brittle; and when fractured, it shows quite a crystalline appearance.

All sorts of alloys have been made and used for the manufacture of ignition tubes, in the endeavour to get some metal that would heat easily, keep clean internally, withstand compression, and have lasting qualities. These points have not been attained with metal tubes, as they have to be made so thick that they are difficult to heat, and it takes a large amount of gas to keep them hot.

The use of porcelain for tubes was first tried by Watson in 1881, and has since been proved to be the best material for the purpose. The tubes have a drawback, certainly, in that they require more careful handling than metal tubes; but, once connected to the engine, and the joints made tight, they work admirably—tubes, after use for years, when taken out, being perfectly clean and apparently unchanged in any way.

The ignition valve is, in my opinion, a most important feature in the modern engine. Many engines are still made which have the firing tube continually open to the cylinder; and the moment for explosion is timed by raising or lowering the bunsen flame, so that the tube is heated higher up or lower down, as desired. With absolutely unchanged conditions, during the whole life of an engine, this method of regulation would, perhaps, be perfect. The burned gas and air left in the tube, if compressed to exactly the same extent each compression stroke, determines the position in the firing tube to which the fresh explosive mixture will be forced; and if the heated portion of the tube is properly adjusted, ignition will not take place until the full compression has been reached—that is, when the piston is full in, and the crank just passing the dead-point.

You will readily see, however, that we have many circumstances to deal with before we can insure absolutely constant conditions. The compression which we depend upon to force the fresh charge up to the same height in the tube every time, may not (owing to the speed of the engine or to a leaky piston or valves) be always sufficient. Then the tube, unless made of some incombustible and incorrodible substance, will change its character and size. And, lastly, the continual varying conditions of pressure in the gas-mains will slightly alter the proportion of the charge, and possibly affect the bunsen flame, and therefore the heat of the tube.

With a timing-valve, we at once get rid of nearly all these difficulties. The distance from the cylinder to the tube can be made exceedingly short, so as to insure that even the most variable charge will reach the heated portion; and early firing is prevented by the timing-valve, which is opened mechanically as the crank passes the dead-centre. Besides, nearly all gas-engines are now fitted with an adjustable governor, so that the speed of the engine may be altered while running. If there is no timing-valve, the economy of the engine, should the speed be much altered from the normal, may be seriously affected; a higher speed causing early firing and knocking of the piston and connecting rod, while a lower speed may cause slow firing and even miss-fires.

I regret that, owing to building operations for the extension of our works, I have been unable to prepare any special tests to lay before you, as our testing arrangements have all been upset. However, as there have been recently many exhaustive tests made and published by some of the highest authorities on the gas-engine, I do not think you will miss anything I could have given you, meantime, in this way.

With your permission, I should like briefly to refer to some of the improvements, chiefly connected with details, which my

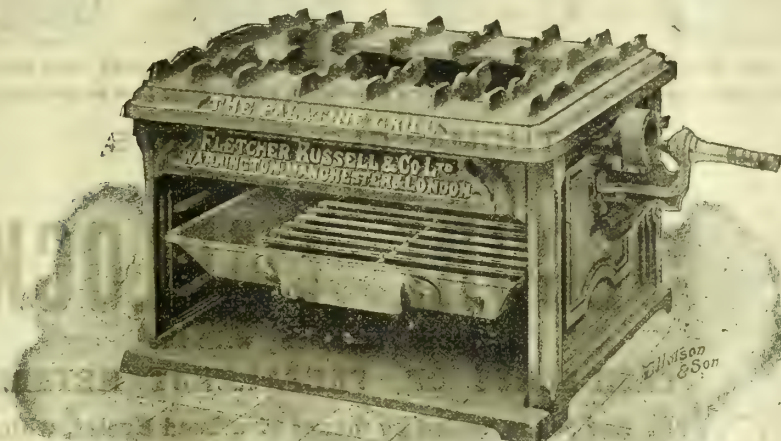


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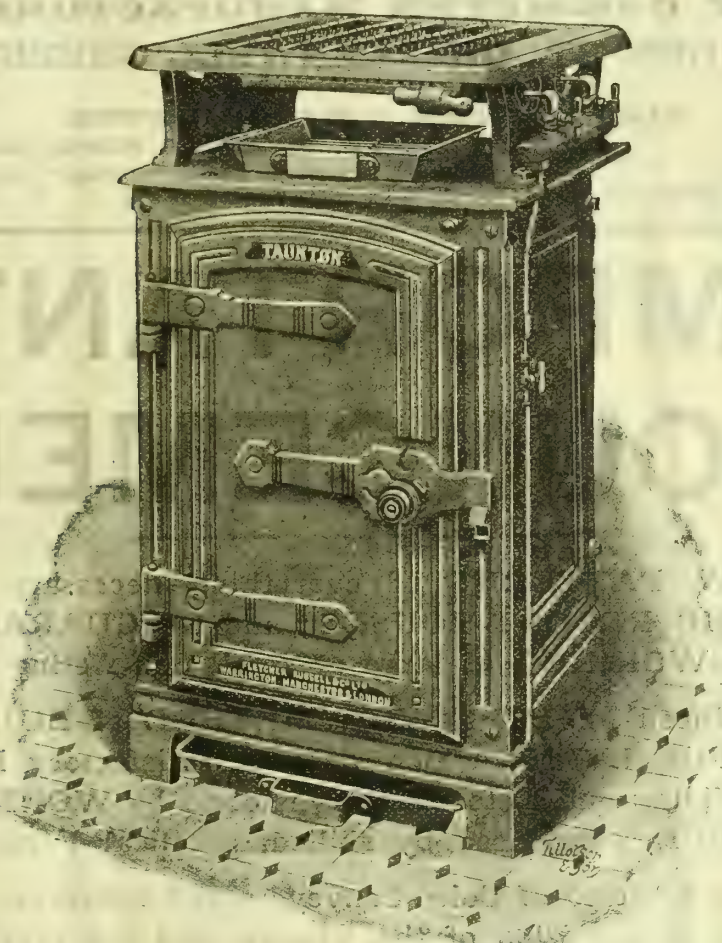


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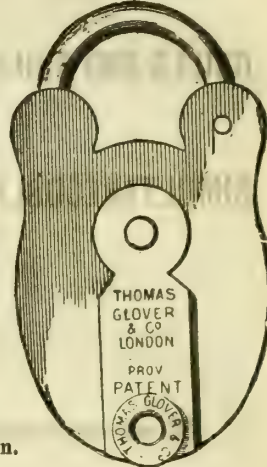
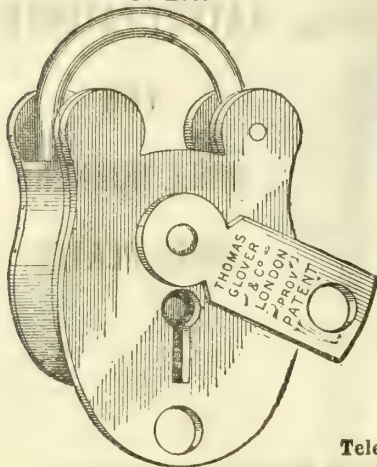
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own firm have introduced. Our engine is of the usual Otto type, and is designed specially to render it as simple and reliable as possible. The explosion chamber at the end of the cylinder, into which the charge is compressed, has had our greatest attention, and we have tried many different shapes. The design we have at last adopted for this part is in the shape of a cylindrical cone. The base of the cone is next to, and of slightly larger diameter than the cylinder, which gives the necessary clearance for the end of the piston. The length is regulated by what is required to admit the exhaust valve; while the small end of the cone depends on the space necessary for the amount of compression required. In this way we get as large and open a space as possible; so that the explosion is not choked or cramped. The whole charge also is confined in one space; there being practically no ports or passages in which the burnt products may lodge. The inlet-valve for admitting the charge is placed directly behind the exhaust valve on the centre-line of the cylinder; and it opens into a short cavity, the front of which freely communicates with the compression space, while at the back of the cavity is a small short hole leading to the ignition tube. The gas enters from the gas-valve, and, mingling with the inrushing air, both pass through the inlet-valve into the compression space, clearing out the cavity and tending to suck the burnt products of a previous explosion from the ignition tube.

The other points I would draw your attention to, and which, I believe, are quite novel, are the cylinder oiler, the ignition tube, the timing valve, and the crosshead bearings in small

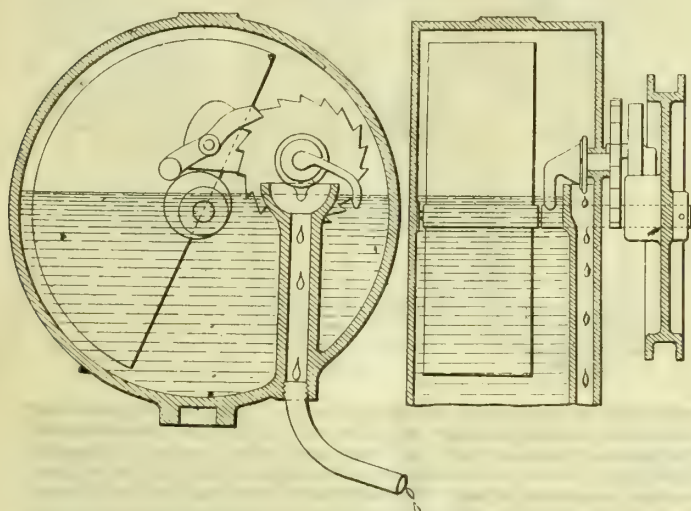


FIG. 1.—CYLINDER LUBRICATOR.

engines. You will notice in the oiler (fig. 1) your old friend the semi-cylindrical float, used by Sanders and Donovan for their wet gas-meters. The importance of absolutely constant oiling for the cylinder cannot be overrated, as the high temperature of the flame of the explosion soon burns off the thin film of oil on the surface of the cylinder; and if this is not continually renewed, cutting of the cylinder at once takes place. The float in this vessel keeps the oil always at the same height, so that the small rotating spoon, driven slowly round by the engine, receives exactly the same amount of oil at each revolution, and this continues during the whole time the engine is running.

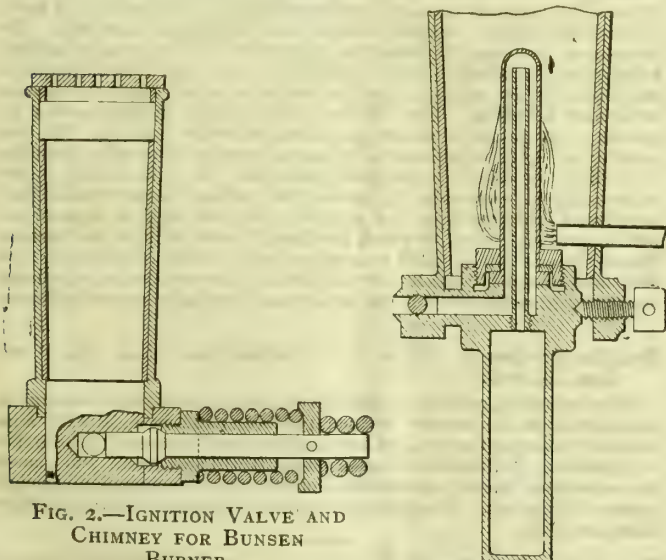


FIG. 2.—IGNITION VALVE AND CHIMNEY FOR BUNSEN BURNER.

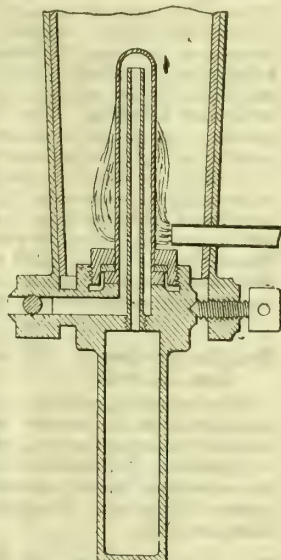


FIG. 3.—PORCELAIN IGNITION TUBE AND HOLDER.

The ignition-valve (fig. 2) consists of a straight steel spindle, about  $\frac{3}{8}$  inch diameter, which closes and opens the passage from the cylinder to the ignition tube, when moved to-and-fro by a lever

through a cam on the side shaft. It is sometimes astonishing what a small trifle prevents the regular firing of the charge; the least increase or reduction in the size of the ignition hole being sufficient to cause the charge to miss fire. The form of this valve allows of a perfectly straight hole from the cylinder to the tube, which is very important, as any bends or elbows are not conducive to sharp instantaneous firing. The valve is very loosely fitted, and just crosses the hole from the cylinder to the tube. During compression the small portion of the fresh mixture, which passes the valve owing to it not being quite tight, gradually drives out the products of the previous explosion into a chamber in the ignition tube holder. The valve rod works easily in a long gun-metal gland; and, to prevent leakage, it has a double-faced valve turned upon it. The valve rod is pushed in—not directly by the lever, but by means of a strong spring; and the inner valve face prevents leakage during compression. At the moment of explosion the cam on the side shaft releases the lever, and the spring is withdrawn; while another spring comes into play and pushes back the valve rod, closing the other valve face upon its seat. This valve works well and gives no trouble. One has been in constant use in one of our engines for over three years; and, to my knowledge, it has not been taken out for any repairs or adjustment.

The ignition tube (fig. 3) we have adopted is made of porcelain. It is unusually short, closed at one end, and the open end has a flange formed on its outside, by which a hollow nut secures it in position, in a specially constructed holder. A small metallic tube extends from the holder inside and almost to the top of the porcelain tube; so that the burned products of a previous explosion pass down this small tube into a chamber at the bottom of the holder, which allows the fresh charge to reach the heated porcelain. The small metal tube does not undergo any change, as it is never red hot, and the pressure on it is equal both outside and inside. This ignition tube has given great satisfaction; the ignition is most reliable, taking place with certainty at either fast or slow speed.

The difficulty of fitting small engines with adjustable brasses for the end of the connecting rod in the piston is so great, on account of the small space available, that many engines are made without this provision at all. Consequently, when the least wear of the crosshead pin takes place, the only remedy is to fit in a new pin. To avoid this we have reversed the order

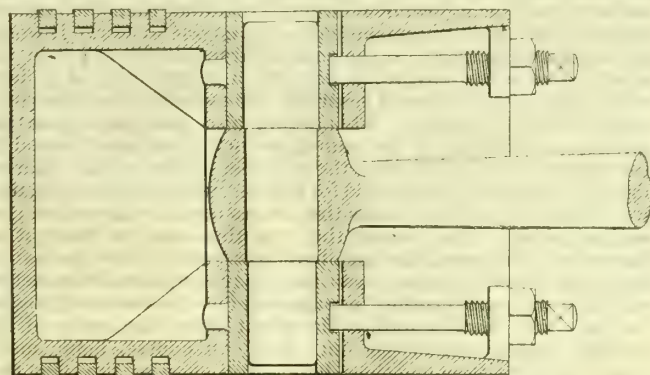


FIG. 4.—PISTON OF SMALL ENGINE, SHOWING METHOD OF TAKING UP WEAR AT CROSSHEAD.

of things, by placing the adjustable brasses in the piston (fig. 4), fixing the pin so that it turns with the rod. By this means, although a little costly at first, the smallest engine can be adjusted when wear takes place at the crosshead pin.

There can be no doubt that a great deal has yet to be done to improve the action of the gas-engine. The main direction in which a change must be looked for is, I think, in the cycle. But this would seem almost impossible without introducing complicated mechanism. At present—at least with the smaller sizes—the successful competition of the gas-engine with the steam-engine is chiefly due to the convenience and economy with which the gas-engine can be operated, especially for intermittent work. With engines above 40 or 50 horse power, using producer gas, the cost of working, as compared with steam, is very greatly in favour of the gas-engine, as has been proved time after time. We shall find, therefore, that the large gas-engines will not stop at 400 or 500 horse power, but increase gradually year by year, until they compete in power with the largest steam-engines made.

What the gas-engine has done for the benefit of small masters, it is impossible to estimate. Many hundreds of these employers were driven out of existence by the introduction of the steam-engine. But they are gradually springing up again; and, by the aid of the gas-engine, they are able to secure a respectable share of trade. That the gas-engine will rank in the near future as one of the chief sources of power there can be no doubt; and I would add, in closing, that as gas managers are chiefly concerned in the manufacture of the working fluid, they should do all in their power—by giving a plentiful supply, at a good pressure, and, if possible, at a reduced rate—to help forward this excellent motor to a greater extent of usefulness.

Discussion.

The PRESIDENT said they had listened to a very graphic



description of the gas-engine; and if anyone wished to put any questions to Mr. Peebles, he would be pleased to hear him. He (the President) would like, for his own sake, to have had a comparison of gas power with steam power, if Mr. Peebles had been able to give it, as it would have been interesting to many of those present.

Mr. D. VASS (Edinburgh) said he should like Mr. Peebles to give them the working pressure which he found most serviceable. A gas-engine, as a rule, was required during the day, when they wished to keep their pressure as low as possible; and as this caused them to have their pressure extra low in some districts, it might not be serviceable. A hint from Mr. Peebles in this direction might be useful; and perhaps, also, he might give them something in the way of figures for the sizes of pipe required per horse power. This would be of service to anyone contemplating using a gas-engine.

Mr. J. NAPIER MYERS (Saltcoats) said he would join with others in thanking Mr. Peebles for his efforts to instruct them in the matter of gas-engines. One question arose in his mind with regard to supplying gas for engines, and it was which, in Mr. Peebles's opinion, was the best way to measure the gas for an engine—whether through a dry or a wet meter.

Mr. PEEBLES said, with regard to Mr. Vass's question, he considered the best pressure for working a gas-engine was about one inch. They, as a rule, arranged the different valves—at least his firm did—to get a supply at about an inch pressure. They knew what they got in this way. If the pressure went down below that, the gas-engine maker, in putting in an engine, had to reduce the air supply, in order to make the engine work satisfactorily with the reduced gas. The consequence was that the cylinder did not get a complete charge of gas and air, and they were working with a reduced charge all the time. The effect on the engine was that they had not only a drag put upon it, but had also the reduced charge, giving them less effective power, at each explosion. He considered an inch pressure was, as a rule, easily obtainable during the daytime in good districts. But very often, through large consumptions in certain districts, by other engines being at work, by having small mains, and other things, pressures were much lower than that; and this had to be fought against. As to the capacity of the mains per horse power, there could hardly be a rule laid down, as it was a matter for individual and local consideration. The pipes up to the meter should be a good deal larger, if possible, than the connections of the meter recommended by the engine maker. It would be found an advantage in the case of large engines to put in the street, as near the engine as possible, a length (say) of 12-inch main-pipe, so as to form a reservoir from which the engine could easily draw its supply. This would also tend to reduce the pulsations occurring in the immediate neighbourhood caused by the engine. He could give the members a list of the different meters his firm recommended for engines, which, he thought, they would find to be larger than the meters used by any other gas-engine maker. The reason they did this—and he thought he impressed this upon the members last year, in the discussion upon Mr. Pooley's paper—was that they considered the meters put in in the past by other manufacturers to be too small, owing to their not understanding the effect upon the meter of the sudden withdrawal of gas out of it. Of course, being meter manufacturers, they had the advantage of knowing the effect that would take place in the meter, which was this—and he had tested it—that at each draw of the engine, unless they had a large meter, they sucked in the diaphragm, and obtained more gas per revolution of the meter than it was actually intended to give. There was a certain space in a meter which was a constant, as it were—which was not emptied when the meter was working under ordinary conditions; but if they put on a gas-engine to draw the gas quickly out of the meter, they emptied this space, and emptied the meter beyond its normal condition, and thereby got gas for nothing. Mr. Myers asked whether it was better to measure through a wet or a dry meter. He should certainly say a dry meter, and for this reason—that, especially if the weather were at all warm, the water in a wet meter was apt to evaporate, and wet the gas. They had found this in an experiment they were recently making. They were trying to get a new anti-pulsator, and they got something which acted admirably. The idea was to use the water-vessel which was sent with every engine, and to put a bell into it; but they found, after a week's working, that the pipes were all filled with condensed water. He thought this answered Mr. Myers's question, and showed that a wet meter would not be a good thing to use. Mr. Wilson had asked for a comparison between the gas-engine and the steam-engine as regards cost of running. This was a very intricate question, depending on so many considerations. He thought that certainly the gas-engine had the advantage by a long way, especially for small powers. And it was the same for large powers, because producer gas then came into operation. For small powers, where coal gas was used, the gas-engine worked out, as a rule, at 1d.—sometimes  $\frac{3}{4}$ d.—per brake-horse-power per hour. They would very seldom find a small steam-engine working for anything less than 2d. or  $2\frac{1}{2}$ d., which showed a considerable difference in favour of the gas-engine over a steam-engine.

Mr. W. FOULIS (Glasgow) asked what was the price of coal and of gas.

Mr. PEEBLES said gas at 3s. per 1000 cubic feet, and coal at 10s. per ton.

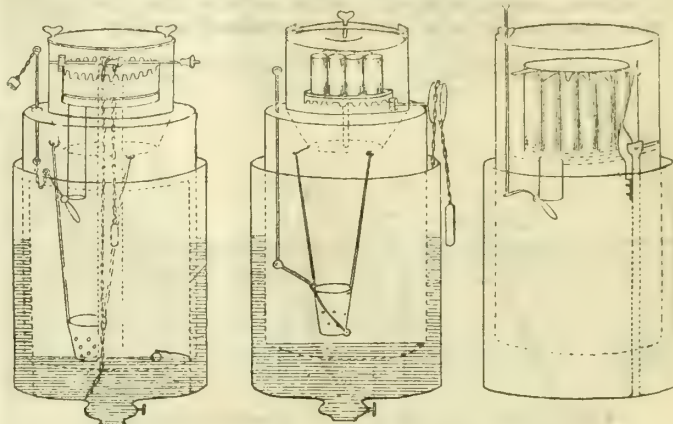
## REGISTER OF PATENTS.

**Automatic Pressure-Regulators.**—Leigh, H. H.; a communication from F. V. Maquaire, of Paris. No. 16,652; July 13, 1897.

This invention relates to a system of automatic pressure-regulators, the object of which is "to maintain between two fixed limits the variations in the pressure exerted by the fluids by one movement, whatever may be the absolute pressure resulting from the actions or movements brought into play by the fluids in question." This object is attained by an arrangement of balanced dynamo-metric commutator-lever, serving both to measure the value of the phenomena it is desired to regulate, and to control, either directly or indirectly (by the aid of feed motors and connecting gear), the apparatus necessary to effect the regulation. The particular combination preferred is not, however, described apart from a sheet of detail drawings accompanying the specification.

**Generating Acetylene.**—Barnard, E., of Christchurch. No. 17,090; July 20, 1897.

This apparatus consists of two cylinders, one rising and falling within the other (like an ordinary gasholder); the lower and larger one containing the water used in the generation of the gas, and also forming the gas-seal. Depending from near the top of the smaller and inverted cylinder, hangs a receiver for the carbide of calcium; and as the smaller cylinder descends, carrying the container with it, on touching the water, gas is generated, and the inverted cylinder rising lifts the carbide out of the



water, but does not really stop the generation of the gas. To prevent any excess of gas being generated beyond what is at the time being consumed, the patentee combines with the rising and falling receiver "a rotating mechanical device set in motion by the rising and falling of the cylinder, such as a revolving wheel, discs with holes corresponding, through and by which carbide placed above might be automatically discharged into the carbide receiver." As an alternative, "a pocket or other receptacle or series of pockets revolving, or rotating, or set in motion, or other like device, discharging themselves automatically of their carbide according as consumption goes on," may be used.

Three forms of the carbide-distributing device are shown in the engraving.

**Making Gas from Garbage and other Refuse.**—Harris, L. G., of Toronto, Canada. No. 19,887; Aug. 28, 1897.

The patentee claims a process of manufacturing a combustible gas from garbage by mixing with it "a composition of matter consisting of a liquid hydrocarbon and one or more equalizing ingredients." The composition consists of a liquid hydrocarbon and one or more ingredients, "whereby the hydrocarbon is prevented from being prematurely driven off, and the action is equalized and amplified." It consists of a liquid hydrocarbon, alkali, chloride of lime, and powdered soap bark. The ingredients are used in about the proportion of 2 quarts of alcohol, 4 lbs. of caustic alkali, 8 lbs. of chloride of lime, and  $\frac{3}{4}$  lb. of powdered soap bark. When water is used instead of alcohol, about 2 gallons of water may be added. There is then added to this mixture about 100 gallons of petroleum, or a light petroleum derivative—gas oil. The total quantity of liquid so produced is sufficient for admixture with 16,000 lbs. of garbage, or other gas-producing material. It is thoroughly mixed with the liquid—preferably by passing the garbage in its wet state, as it is collected, through a mixing machine provided with an agitator and with a spraying device, by which the liquid is sprayed upon the garbage. The mixture is then distilled in retorts of any suitable construction; and the gas so produced is preferably subjected to the action of a superheater on its way from the retort to the holder, and purified in any suitable way.

**Fuel-Gas Producers.**—Kitson, A., of Philadelphia, U.S.A. No. 21,296; Sept. 16, 1897.

This invention, relating to fuel-gas producers, consists of certain improvements in the hearths of such producers, and in means for automatically charging the fuel, and keeping it in a continuous and uniform state of agitation. For details of construction, it will be necessary to consult the somewhat lengthy specification of six pages, accompanied by eight sheets of drawings. There are no less than forty claims for the invention thus described.

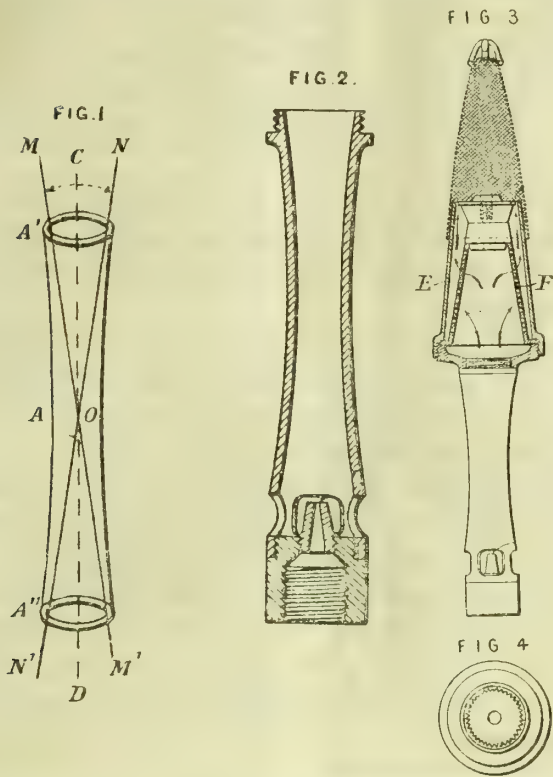
**Bunsen Gas-Burners.**—Moeller, J.; a communication from O. Kern, of Paris. No. 30,831; Dec. 30, 1897.

This invention relates especially to burners employed for producing light by the incandescence of a refractory mantle. Such burners, says the patentee, have been made with a tube in which air and gas are mixed and ascend; this tube having near its middle (or a little below it) a narrow neck from which the tube tapers both ways to a larger diameter—the taper of the upper portion being part of a cone, the sides of which



are inclined to each other at an angle not exceeding  $10^{\circ}$ . It has, however, been found that "the efficiency of a tube of this kind is greatly enhanced by making its taper not uniform but following the outline of a hyperbola; so that the interior of the tube is in the form of a hyperbolic spindle or solid of revolution formed by the revolution of a hyperbola round the axis of a tube."

The particular form of the hyperbola and the construction of the tubes are shown in the engravings—fig. 1 being a diagram showing the form of the hyperbola, fig. 2 a vertical section of the tube, fig. 3 a section of the burner placed on the tube, and fig. 4 a plan of the top of the burner.



In fig. 1, C D is the axis of the tube, and O the centre of the neck or narrowest part, where the radius A O of any desired dimension determines A the vertex of the hyperbola. Through O are drawn two straight lines M M' and N N', each inclined to the axis C D at an angle of about  $8^{\circ}$ . The hyperbola A<sup>1</sup> A A<sup>11</sup> is drawn such that these inclined lines are its asymptotes. The part of the tube below the neck may be varied in length. A suitable length is three or four times the diameter of the neck. With such proportion it is found that the air which is admitted at the holes, near the base, and the gas entering by the central jet orifice form an explosive mixture while ascending to the neck through the lower part of the tube.

The burner shown in figs. 3 and 4 comprises an outer case E somewhat tapering, the inner screen F of perforated metal having at its top a button of good conducting metal, on which is fixed a disc a little smaller in diameter than the mouth of the case, and having its edge serrated so that it presents the appearance of a toothed wheel. The mixture of gas and air after ascending the lower tube passes through the perforations of the screen F, then through the annular opening surrounding the disc, and also through the intervals between its teeth. Here, being kindled, it produces "an intensely heating non-luminous flame," which heats to incandescence the mantle fitted above.

The taper of the case and the screen may be varied; they may even be made cylindrical without any taper. Also the button may be of less depth than shown; but it is preferred to have a considerable mass of metal to conduct heat from the disc to the screen F, thus preventing the disc from being overheated, and giving heat to the combustible mixture on its way to the tip of the burner.

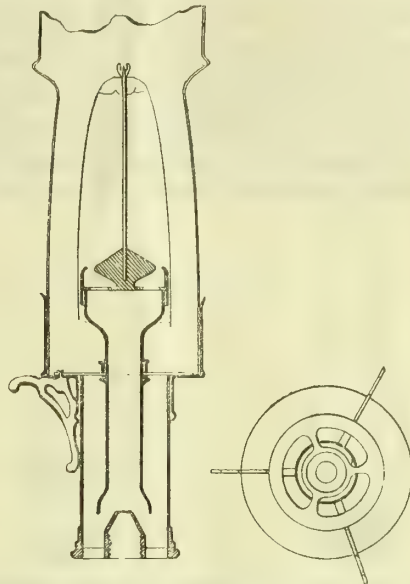
**Incandescent Gas Lamps.**—Mulch, T. H., and Wiederhold, O., of New York. No. 6659; March 18, 1898.

One of the objects of this invention is to enable the influx of gas and air to the mixing chamber or burning place of the burner to be efficiently regulated, so as to allow of the employment of the burner "for a great variety of uses, and to burn therein gases which hitherto could not be successfully burned"—for instance, the burner is adapted for use with water gas. It has heretofore been attempted, say the patentees, to burn gas at high pressures, and to regulate the influx thereof to the burner; but "such efforts have hitherto been unsuccessful, for the reason that more or less constricted passages have been used, which reduce pressure to such a degree that it is impossible to obtain a bunsen flame—it being understood that in order to have a bunsen flame it is necessary that the gas should rush out with considerable velocity." Instead of employing a constricted passage, the inventors regulate the flow of gas to the burning point by means of "as short a passage as is possible." Another object of the invention is to produce a lamp wherein the blackening of the mantle will not readily occur, and wherein the supply of air to the upper part of the mantle will be efficiently brought about, by the use of an air-drawing draught tube.

**Incandescent Gas Burners.**—Lake, H. H.; a communication from A. Armellini and E. Kerbs, of Milan. No. 10,140; May 3, 1898.

This burner consists of two parts. Within the lower part B is arranged a small screw-threaded tube closed at its upper portion by a perforated plate, the perforations in which regulate the admission of gas to the burner. The apertures at the sides serve for the admission of air. The

upper part rests on the lower part, in such a manner as to be readily removable. It is connected with the central portion, which is an ordinary bunsen burner except that the space where the combustion of the mixture of gas and air takes place is formed by a perfectly free annular aperture, instead of being provided with a metal mesh or grating, and that the admission of the air takes place at the base instead of at the side, and through an annular aperture instead of through holes.

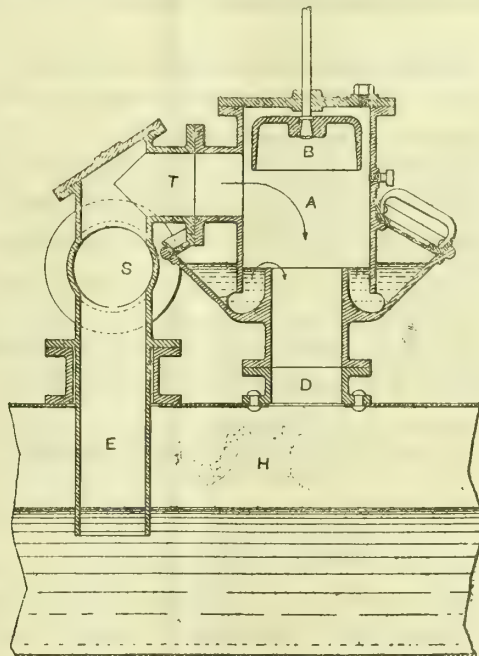


The glass chimney fits in the usual manner, and its outline follows that of the mantle; but at the part corresponding to the top of the latter, the chimney spreads out and is continued upwards in a cylindrical form. In this manner, the external air has no communication with the interior except through the aperture at foot and at the top of the chimney. As soon as the gas is turned on it mingles with the air and rises, causing a draught through the apertures at foot as in the ordinary bunsen burner; but when the heat given off by the burning mixture heats the external air, fresh air will replace that which has risen owing to the heat and that which combines with the gas during the combustion. Thus when combustion continues to take place, there exists a current of air which enters the burner through the apertures at foot; and this current of air, owing to the proportion existing between the sections of the different conduits, exerts its greatest effect in the central conduit.

**Hydraulic Main Valves.**—Simon, H., of Manchester. No. 10,746; May 11, 1898.

This invention has been designed with the object of enabling solid matters to be removed from the cavity or seal chamber of the hydraulic main at any moment, without interrupting the working of the plant.

The gases from the retorts arrive by the pipe S, and pass by the pipe T to the valve B in the valve-chamber A. Thence they descend through the pipe D to the main H. With this arrangement of inlet-pipes, the double change in the direction of motion of the gases at S and T causes

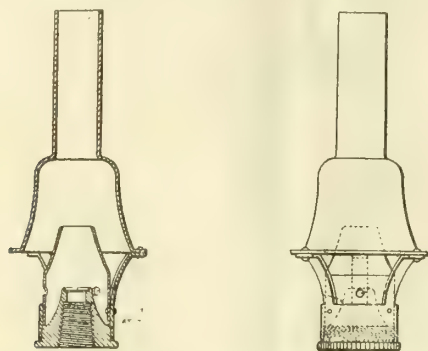


any heavy matters carried in the gases to this point to drop through the dip-pipe E to the bottom of the main. The chamber containing the liquid seal opens at the bottom into an outer trough or troughs. Consequently, the liquid enters and partly fills them as well as the seal-chamber. But, inasmuch as the wall of the valve-box A extends below the surface of the liquid seal, it is impossible for the gases to pass into the troughs, and they may safely be left uncovered. It is, however, advisable, says the patentee, to cover the troughs by segment plates provided with lifting handles. As indicated by the engraving, an annular trough is supposed to be used, connected with the valve casing by means of wing walls.



**Incandescent Gas-Burners.**—Fritz, F., and the Daylight Incandescent Mantle Company, Limited, of Old Broad Street, E.C. No. 12,772; June 7, 1898.

The patentees state that it has been found, in practice, that the supply of air to an incandescent burner as ordinarily constructed is irregular, and the proper flow of the gas into the mixing chamber "is liable to interference by external draughts or currents of air, so as often to cause flickering of the light or even to cause the flame to be extinguished." According to their invention, in order to obviate these disadvantages, they arrange the gas-delivery apertures of the nozzle of the burner within a short tube terminating in a hollow truncated cone, supported over the nozzle so as to leave an annular space between the two parts for the passage of a current of air admitted through lateral openings in the tube. They also form or fix on the mixing-tube or chamber a second hollow cone or bell, into the base of which the first cone extends for a short distance—a suitable annular space being left between the two cones for the admission of a second current of air. The nozzle and short tube



and inner cone thus form (as it were) a shortened incandescent gas-burner; while the mixing-tube and outer cone resemble the mixing-tube or chamber of an oil-gas burner. In this manner they "provide for the flow of concentric annular currents of air to mix with the combustible gas, and thus ensure a very regular and efficient mixture of the air with the combustible gas; and, by reason of the rapid rush of the air into the annular spaces between the cones or the like, the combustible gas cannot escape or pass out except through the head of the burner."

As shown in the illustration, the base of the burner is provided with a conical top or nozzle having in its upper end the usual perforated plate through which the combustible gas passes into the mixing chamber. Over the nozzle is mounted a short tube terminating in a hollow truncated cone, and secured in a ring or annular piece screwed on the base, and provided with lateral openings for the admission of air. An outer cone or bell is attached to the lower end of the mixing-tube, on which the burner-head is to be placed in the usual way. This outer cone or bell surrounds the upper part of the cone so as to leave an annular space of suitable dimensions between them; and it is supported on arms formed on the ring and secured to the cone or bell. By this arrangement, the air enters in separate concentric currents between the inner cone and the nozzle and outer cone respectively. The air entering between the nozzle and inner cone mixes with the combustible gas issuing from the perforated plate; and the gaseous mixture thus produced, on issuing from the upper end of the cone, is mixed with a further quantity of air entering through the annular space between the cones, and finally passes up through the mixing-tube to the head of the burner.

#### APPLICATIONS FOR LETTERS PATENT.

- 17,031.—STRONG, H. O., "Atmospheric burners for gas-stoves." Aug. 8.  
 17,073.—GRANT, D., "Gas-burners." Aug. 8.  
 17,079.—GEHLERT, F., "Producing acetylene gas." Aug. 8.  
 17,083.—KEMP, T. T., "Acetylene lamps and generators." Aug. 8.  
 17,088.—SCHUMACHER, J., "Acetylene generators and lamps." Aug. 8.  
 17,089.—KRIEGER, F., "Igniting device for lamps." Aug. 8.  
 17,094.—BRILLIE, E., "Governing and regulating the supply of fluids to internal combustion motors." Aug. 8.  
 17,095.—BYNOE, F. O., and CUBISON, H. J., "Means or apparatus for receiving and delivering gas." Aug. 8.  
 17,100.—HART, F. C., "Apparatus for testing anthracene." Aug. 9.  
 17,101.—HART, F. C., "Apparatus for the testing of ammoniacal gas liquor for free and fixed ammonia, and also density of same." Aug. 9.  
 17,127.—BAILEY, J. W., and CLAPHAM, J., "Generating acetylene gas." Aug. 9.  
 17,199.—BERANGE, F. P., "Acetylene gas generators." Aug. 9.  
 17,212.—GREENSILL, F., "Gas-stoves and heating-apparatus." Aug. 10.  
 17,230.—SMITH, W., "Water jacket for acetylene gas generators." Aug. 10.  
 17,243.—BOWER, A. S., "Manufacture of sodium carbonate, caustic soda, sodium, and sodium carbide for producing acetylene gas from common salt, or from sodium sulphate or sulphite." Aug. 10.  
 17,250.—BOULT, A. J., "Automatically lighting and extinguishing gas-jets." A communication from the Automatic Gas Lighting and Extinguishing Company, Ltd. (Hoare and Kennedy Patent). Aug. 10.  
 17,277.—CARMONT, W. E., "Regenerative gas-burners." Aug. 10.  
 17,293.—DAUBENSPECK, G., "Gas-burners." Aug. 10.  
 17,327.—SPENCE, H. K., and THE BRITISH ACETYLENE GAS GENERATOR COMPANY, "Acetylene gas-lamps." Aug. 11.  
 17,350.—SCHWARZ, I., "Acetylene lamps." Aug. 11.  
 17,387.—RICHMOND, E. W. T., "Gas-grillers." Aug. 12.  
 17,388.—MILLER, C. A. & F. J., "Acetylene gas-burners." Aug. 12.  
 17,449.—MANGER, T., "Acetylene gas generators." Aug. 13.  
 17,504.—EMMERSON, G. W., "Generating acetylene gas." Aug. 13.  
 17,518.—ALLEN, T. G., jun., "Generating and storing acetylene gas." Aug. 13.  
 17,525.—OTTO, M., "Measuring and registering apparatus for gases and the like." Aug. 13.

## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### Profit Sharing.

SIR,—Mr. Little, in his letter of the 9th inst., asks gentlemen, also working men, to contribute their ideas on profit sharing, and their experience of the same among working men connected with the gas industry. My advice to Mr. Little, as a worker, also as a profit sharer in the South Metropolitan Gas Company, is to make further inquiries into the working of the scheme as practised by them. He should send for the rules, and master their details. He would thus learn how to prevent the lazy and incapable from sharing in profits they had not honestly helped to create. If "example demonstrates the possibility of success," then the success of the profit sharing of the above Company is an example unique in the history of human efforts and endeavours to assist the working man to help himself.

I hope that something may be said which will assist Mr. Little in his inquiry and desire to do good and benefit his workpeople—a desire to awaken in them a more intelligent interest in their work, and good done to all concerned. The lazy are made industrious, the incapable improved, and the intelligent workman made to feel he has greater interests at stake. This encourages him to do his best, "that by the force of his own merit to make his way."

I don't think anyone can give a better reason for the adoption of profit sharing than Mr. Little has done in his letter. If it has worked such changes in his chiefs and foremen, I am sure the same changes will take place with his workpeople. Such distinctions are the cause of dissension, and must lead to discord and bad feeling between workman and foreman. My experience under our profit-sharing scheme is that the intelligent workman becomes more stable, has less desire to change when other inducements crop up, and is less likely to be disturbed by the changes constantly taking place in the labour world—the ever-recurring conflicts between labour and capital. The more the principle of profit sharing is adopted, the more will the possibilities of the conflict be narrowed down. Consequently the stability of the business of those who adopt it is more secure against constant warfares and suicidal strikes. If workpeople become shareholders in the concern they work for, it follows, as light follows darkness, that they will become more thoughtful and less likely to be influenced by the socialist agitator. Such is my experience, supported by one of the latest additions to profit sharing. Messrs. Richmond & Co. found it to work so well at their Warrington works that they have extended it to their Stratford factory; and I hope soon to read in the "JOURNAL" that Mr. Little has added his firm to the growing list of profit sharers.

East Greenwich, Aug. 16, 1898.

H. AUSTIN.

SIR,—I have just returned from a short holiday in parts where even the "JOURNAL" does not penetrate; and on looking through the back numbers I see Mr. Gilbert Little's letter on the above subject in your issue of the 9th inst. All additions to the ranks of profit-sharing employers are to be cordially welcomed, even if they have only got a small way on the right road. Experience of the system will, I believe, tend to its wider application in Mr. Little's own case, besides drawing attention to the system in his own locality.

One prominent feature, however, should not be lost sight of—viz., that profit sharing to be successful must benefit the men as well as the employer. Now, Sir, my reading of Mr. Little's letter is typical of the view many employers take of this question. They ask only what benefit they will get. Surely the men will in return be likely to approach the question from the same standpoint of self-interest only, instead of the one we want profit sharing to inculcate—i.e., *mutual interest*.

I quite agree that heads of departments and foremen can save and make more than an ordinary workman. We recognize this by giving the foremen 50 per cent. more than the workmen and managers 100 per cent. more; but we believe the men and boys ought to have some share of the profits earned after the ordinary share capital has had 6 per cent.

I would ask whether it is not better that some who have not earned their profit should have it, than that those who may have earned it be passed over. Therefore, we pay every employee who qualifies by three months' service and signs our forms—although the Directors reserve to themselves the right to eliminate the names of those who may not be desirable, which might mean that they were not worthy of employment. Our Profit-Sharing Committee serves a useful purpose in dealing with the merits of any individual.

The great need of the working classes is to learn thrift; and it surely is no small help toward this object to make them all shareholders, and to open a small savings-bank account for them. To spend is natural to many; to save is natural to few. If profit sharing makes for thrifty employees (and we believe it does), the advantage to all concerned is mutual and at once apparent.

I have ventured to trespass thus far upon your space as our system was referred to; and I can only hope that those who decide to adopt the system will do so on broad and comprehensive lines.

Romford, Aug. 18, 1898.

E. W. T. RICHMOND.

P.S.—Since writing the above, I have seen Mr. Manley's letter, representing the South Metropolitan Profit-Sharing Committee, and quite agree with it.—E.W.T.R.

**Discounts for Large Gas Consumers.**—At last Wednesday's meeting of the Goole Urban District Council the Gas and Water Committee recommended that the North-Eastern Railway Company should be allowed a discount of 15 per cent. off their gas account. One of the councillors, in opposition to the proposal, contended that the 15 per cent. would cost the Council more than they would make by the extra 2 million cubic feet of gas they would sell. Moreover, the Aire and Calder Navigation and the Lancashire and Yorkshire Railway Company both consumed more than 2 million feet of gas, and only received 10 per cent. reduction. A warm discussion ensued, and eventually the proposal was carried by a large majority.



## MISCELLANEOUS NEWS.

## THE HOME OFFICE WATER-GAS COMMITTEE.

We understand that the following letter has been recently addressed to a number of Gas-Works Engineers throughout the country, by the Secretary of the Committee charged by the Home Secretary with the task of inquiring into the subject of the supply of carburetted water gas, in certain towns and districts, in admixture with coal gas:—

*Whitehall.*

Sir,—I am directed by the Chairman of the Water-Gas Committee to say that he will be much obliged if you will favour him with your views upon a proposal which has presented itself as worthy of consideration since the Committee had the advantage of hearing your evidence.

Assuming that the Committee came to the conclusion that some steps must be taken to secure consumers against the dangers necessarily, in certain circumstances, attending a high proportion of carbon monoxide in the gas supplied to them, and having in view the fact that it is during sleep that the most serious danger would appear to occur, it has been suggested that a distinction might be established between the gas supplied during the day and that supplied during the night.

Provided that the carbon monoxide in the night supply was kept low, the proportion of that gas which might be distributed during the day might reasonably be held to be a matter of minor importance.

The proposal is that the gas supplied after (say) 9, 10, or 11 p.m. should be required to contain not more than a stated proportion of carbon monoxide. The exact limit remains for further consideration—*e.g.*, whether it should be 15 or 16 per cent., or whether it should be only slightly above the normal percentage in coal gas. Similarly, the question whether any limit or none should be placed upon the percentage in the day supply, need not for the purposes of the present question be decided.

Lord Belper is anxious to have your opinion from the business point of view of a practical supplier of gas, as to the ease with which you could, by manipulating your sources of supply, comply with a regulation that, after a given hour, a sample of gas taken as it entered a house in any part of your district should not contain more than a somewhat given percentage of carbon monoxide.—I am, &c.,

JOHN PEDDER,  
Secretary to the Committee.

## LIVERPOOL UNITED GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Tuesday—Mr. E. LAWRENCE, J.P., the Chairman of the Company, presiding.

The report presented by the Directors showed that in the six months ending June 30 the revenue was £534,930, and the expenditure £418,144; leaving a surplus of £116,786, which had been transferred to the profit and loss account. After deducting the amount taken for the payment of the dividend declared last February, and interest on the debenture stock, there remained a balance of £52,621, out of which the Directors recommended the declaration of a dividend for the half year of 5 per cent. on the ordinary stock, and of 3½ per cent. on the 7 per cent. stock.

The CHAIRMAN, in moving the adoption of the report, referred to the loss the Company had sustained by the death of one of the Directors—Mr. J. Barkeley Smith—whose place had been filled by the appointment of Mr. T. Comber. With regard to the accounts submitted, he thought he might safely congratulate the shareholders on the fact that these were of a satisfactory nature. The past winter, as they were aware, was one of the mildest experienced for a long time; and he was afraid at one period that they might have to show a very considerable decrease in the quantity of gas sold in the year. However, during the last three or four months of the financial year a very considerable increase took place; and the proprietors would be glad to see that the deficiency on the sale during the twelve months was a mere bagatelle—a matter of only £2400. He was of opinion that they had every reason to feel very satisfied with this result. If they looked at the achievements of many other companies, they would find that they suffered from like causes to those which had affected the Liverpool Company, and many of them had had to mark a very considerable decrease in the quantity of gas sold. Perhaps it would be more satisfactory to the shareholders if he told them, as an indication of what was going on in the public world, that during the six weeks which had elapsed since the close of their year they had had a very marked increase in the consumption of gas as compared with 1897, though at this period of last year it showed a considerable increase over the preceding twelve months. Up to date, they had actually consumed this year more than 5 per cent. of gas in excess of the quantity burnt in the same period of 1897. This, he thought, showed that there was nothing very alarming in the condition of affairs. He knew he had been called an optimist with regard to the consumption of gas; but he did not think he had ever said anything he was not warranted in saying. He had not spoken in any wild optimistic strain, but had merely from time to time told them of the conclusions he had formed upon the facts before them. He could only again repeat that he did not think the holders of gas stock had any reason to be alarmed in regard to their property. It was true that they had to meet with very serious competition in the electric light. He had never refused to acknowledge that fact. There was no doubt that the Corporation, who were now the owners of the electric lighting plant, were doing everything possible—and very naturally—to promote an increase in the consumption of electricity. Therefore the Company had to meet what might almost be called a fierce competition from them. But there they were, in spite of all the competition and opposition, maintaining the position they had long held with regard to their property; and he had no reason whatever to doubt that this property would be just as safe in years to come as it had been in years that were past. After alluding to the rapid increase in the price of coke, and dealing with other details connected with the accounts, he said that after the payment of the dividend as recommended there would remain a balance of £837 to the credit of the profit and loss account. The reserve fund account went on gradually increasing each year. There was no doubt the working of the plant and machinery during the past year had been most satisfactory.

Everything had been well conducted; and the results achieved in the different departments had been on a par with anything they had had before. He thought they owed a great deal to their officials for the zealous way in which their duties were discharged. Mr. King looked very faithfully after the manufacturing department, and Mr. Robinson after the administrative department; and they were seconded by an able staff. He thought they might feel that their interests could not be in better hands.

Sir T. EARLE, Bart., seconded the motion.

Alderman STOLTERFOHT mentioned that there was the question of water gas. They could not, he said, be ignorant of the fact that there were, whether rightly or wrongly, many and loud complaints about the quality of the gas supplied in several districts of the town. He had spoken to the Engineer and others, and had always been assured that he was wrong, and that there was satisfactory evidence that everything was of the best quality. He thought, in face of the serious competition of the electric light, it was necessary that they should in every way possible avoid all cause of complaint on the part of the gas consumers. He thought there was rather too much disposition to pass over these complaints. A medical gentleman stated that gas with which water gas was mixed was very deleterious to human life, especially in the case of invalids. He could not say anything about the quantity that was mixed; but he believed that about 25 per cent. was used in London.

The CHAIRMAN, in reply, said he could not agree with Alderman Stolverfoht, because he was convinced that there was no ground for complaint. He was speaking now as to the quality of the gas for purposes of illumination. With regard to the question of water gas, it was a very difficult thing to answer from their point of view in a way that would be satisfactory to those who had apparently already made up their minds against it. It was impossible for them to consult everyone who might have a theory, and consider himself an expert in gas matters or in chemistry, and arrange their manufactures in accordance with these views. They had necessarily, as the shareholders would understand, to take the view they considered to be right in the matter, and act upon it. There was no law or regulation guiding them as to the quantity of carburetted water gas which should be mixed with coal gas. The proprietors were aware, no doubt, that in the principal towns in North America scarcely anything but water gas was used; and he could not help feeling that this was to a very great extent an answer to those who pointed to the dangerous qualities possessed by this gas. He was not going into this question, as he did not consider it was his province to do so. They were guided by the very best advice as to the way in which they mixed the water gas with coal gas. There was a Departmental Committee of the Government sitting at the present time to inquire into these matters; and if it resulted in legislation in reference to the quantity of water gas that was to be permitted, he could only say the Liverpool Gas Company would very loyally abide by it. Alderman Stolverfoht said he believed in London 25 per cent. was used. He (the Chairman) was not quite sure about London; but there were many large towns in England where a very much larger percentage was employed, without any objection being made to it. Alderman Stolverfoht had mentioned that a certain amount of public feeling had been aroused; but he (the Chairman) believed this had been done, in the main, by gentlemen who had theorized on the matter, rather than by those who possessed a practical acquaintance with the work. He thought one of the most amusing statements made in connection with the objections raised to water gas was to be found in the remarks made by a gentleman who occupied a prominent position in municipal affairs. He said he was quite satisfied that the Company were using more water gas than they ought to do, for, when sitting in his house, he had felt that he was being affected by the peculiar noxious fumes said to arise from this gas. The proprietors would hardly believe it, but into this gentleman's house not one foot of water gas had ever been introduced, for it was situated in a part of the town where, if the Company wanted to supply it, they could not do so. If there were any danger at all, it did not arise from the use of the gas itself, but from leakage. They might rely upon it that the Company would recognize their obligations to the public to the fullest extent possible, and everything would be done to supply them with an article respecting which there could be no cause of complaint. He claimed that in regard to the quality of the gas they had no such cause. They were watched by the Corporation; and the result of their experiments during the whole year showed that the quality of their gas was higher than was required by Act of Parliament. His desire, as Chairman of the Company, was to do everything possible that would be conducive to the safety of those who used water gas. He did not think anybody could ask that it should not be used. It had proved to be very largely employed in America; and there was no reason why, with proper care, it should not be used in England. It had sometimes been stated that in America the case was different, because the gas companies were obliged by law to test the fittings before gas was supplied. They had made inquiries, however, and found that there was no obligation to test the pipes—that some did so for their own purposes, and others when they were asked to do so by the tenants.

The motion was then put, and carried unanimously.

The dividends recommended were then declared; and the retiring Directors and Auditor having been re-elected, the proceedings closed with a vote of thanks to the Chairman.

## BRISTOL GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Thursday, at the Company's Offices, Canon's Marsh—Alderman J. W. S. DIX, J.P., in the chair.

The SECRETARY (Mr. J. Phillips) having read the notice convening the meeting, the report and accounts, dealt with in the "JOURNAL" last week, were presented.

The CHAIRMAN, in moving the adoption of the report, remarked that the accounts were perfectly clear and open. It was true that the Company had not earned their dividend by nearly £3600; but when he mentioned that they had had to pay £3300 extra for coal, that £2000 less had been received for coke and £1400 less for tar, that there had been a reduction in the charges for stoves, a lowering of prices in the added areas, and that during the last few years gas had been reduced 6d. per 1000 cubic feet, which was in itself a lessening of the income by £36,000, he



thought that the Company had done exceedingly well, and that it was a matter for congratulation that they had come out so well as they had. The Directors intended—as they had always endeavoured—to do the best they could for the shareholders and the public. People were beginning to find out their interest in the department of domestic economy; and the number of orders received for the hiring of stoves really occasionally overwhelmed the department. The result was that applicants were not always supplied as quickly as the Company would like. They were facing their responsibilities, too, with regard to the outer districts. Last year a gasholder was erected at Bedminster; the year before, one at Warmley; and they were now going to erect one at Horfield. He trusted the receipts would increase proportionately to the efforts put forth by the Company for the convenience of the public.

Mr. R. D. ROBJENT seconded the motion, which was carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. A. J. SMITH, the usual dividend resolution was passed.

A vote of thanks having been accorded to the Chairman and Board, the meeting closed.

## TOTTENHAM AND EDMONTON GAS COMPANY.

### Half-Yearly Report and Accounts.

In the report which the Directors of the above-named Company will present at the half-yearly meeting next Saturday, they state that the quantity of gas sold in the six months ending June 30 showed an increase of 15,613,300 cubic feet, or 7.29 per cent., on that of the corresponding period of 1897. The total number of meters in use at Midsummer was 13,118, of which 6672 were ordinary and 6446 automatic; the increase being 427 ordinary and 1643 automatic—a total of 2070—as compared with Midsummer, 1897. The number of cooking-stoves fixed and on rent on the 30th of June was 2134; the increase over the corresponding half year being 419. The revenue from the sale of gas amounted to £34,261; rental of meters and stoves, to £2644; and residuals, to £3448—the total being £40,363. The expenditure on the manufacture of gas was £21,593 (coal, oil, and coke figuring for £13,496); on distribution, £4091; on management, £2130—the total outlay being £31,132. In the manufacture of gas, under Mr. Broadberry's supervision, 10,747 tons of coal and 428,220 gallons of oil were employed; the make of gas being 244,429,000 cubic feet, of which 234,507,000 cubic feet are accounted for. The estimated quantities of residuals produced are given as follows: Coke, 6623 tons, of which 2321 tons were used in making carburetted water gas; breeze, 1323 chaldrons; tar, 152,232 gallons; ammoniacal liquor, 2985 butts—the make of sulphate being 97 tons 18 cwt. The amount available for distribution is £10,258; and the Directors recommend dividends at the rate of 12 and 9 per cent. per annum. These will absorb £8814, and leave £1444 to be carried forward. The Company's Bill to sanction the consolidation and conversion of the capital has passed, and the Act comes into operation from the day of the meeting.

## CROYDON COMMERCIAL GAS COMPANY.

### Half-Yearly Report and Accounts.

At the half-yearly meeting of the above-named Company next Friday, the Directors will submit the accounts for the six months ending June 30, which show that the total quantity of gas sold in that period was 2.93 per cent. more than in the first half of 1897. The total revenue was £57,288, of which £44,160 was for gas, £2627 for meter-rents, and £10,426 for residuals—the receipts from these sources showing a reduction of £1432, arising partly from the still further fall in the market value of tar, and also from a diminution to the extent of 7208 tons in the quantity of coal used, resulting in the production of 4324 tons less coke. The total expenditure was £40,954; coal, oil, &c., costing £19,053. Though the quantity of gas sold was greater than in the corresponding half of last year, the expenditure upon oil, coal, &c., was £2145 less; and there was also a saving of £579 in wages. These satisfactory economies result from the introduction of carburetted water gas. Large numbers of additional gas cooking and heating stoves were fixed, and 324 small houses were fitted up and supplied with gas under the weekly prepayment and automatic meter systems, during the half year. Under the supervision of Mr. J. W. Helps, the Engineer and Manager, there were used in the manufacture of gas 22,520 tons of coal, 104 tons of cannel, and 254,109 gallons of oil; the quantity of gas made being 332,529,000 cubic feet, of which 321,310,000 cubic feet are accounted for. The estimated quantities of residual products are given as follows: Coke, 13,574 tons; breeze, 3709 tons; tar, 284,302 gallons; ammoniacal liquor, 635,392 gallons—the make of sulphate of ammonia being 206 tons. The amount available for distribution is £15,405; and the Directors will recommend dividends at the rate of 14, 11, and 9 per cent. per annum upon the different classes of stock, all less income-tax. The payment of these will take £14,811, and leave a balance of £594.

## PROVINCIAL GAS AND WATER COMPANIES.

### Gas Companies.

At the half-yearly general meeting of the Bath Gas Company next Friday, the Directors will recommend the payment of maximum dividends. The sale of gas in the six months ending June 30 produced £27,524; residuals, £4328; and the total revenue was £33,550. The expenditure on the manufacture of gas was £20,147; on its distribution, £2519; and on management, £1492—the total being £26,208; leaving £7342 to go to the profit and loss account. The balance of net profit is £10,489. Under the supervision of Mr. C. Stafford Ellery, 17,199 tons of coal and 141,156 gallons of oil were employed in the manufacture of gas; the residual products being: Coke, 9871 tons; breeze, 1100 tons; tar, 932 tons; ammoniacal liquor, 481,000 gallons—the production of sulphate of ammonia being 149½ tons.

The half-yearly meeting of the Colchester Gas Company was held last

Friday—Mr. Charles Coleman in the chair. The revenue account to June 30 showed a balance of £2155, which, with £11,602 brought forward and £83, formed the credit side of the profit and loss account—totaling £13,840. This was balanced on the debtor side by dividends £2050, and interest £180; leaving a remainder exceeding by £7 10s. that carried forward at the commencement of the half year. The report and accounts were adopted; and it was decided that a dividend of 10 per cent. should be paid on the old shares for the six months ended June 30, and one of 5 per cent. on the new shares. Votes of thanks were passed to the Chairman, Directors, and Manager (Mr. H. S. Pike).

The sale of gas by the Dover Gas Company in the six months ending June 30 produced £12,164; and the total revenue was £16,612. The coal employed in the manufacture of gas cost, including carriage and labour, £5720, and a sum of £627 was paid as town dues thereon. The total expenditure was £13,485; leaving a balance of £3127. At the meeting of the Company on the 5th prox., the Directors will report a satisfactory increase in the consumption of gas, largely due to its extending use for cooking and heating purposes. They were unable to secure contracts for coals for the current year except at an advance in price, which will entail an increased expenditure on this item of about £900 per annum. The price of gas to private consumers has been reduced 1d. per 1000 cubic feet; and had it not been for the rise in the price of coal, the reduction would have been 2d. The Directors will recommend the usual dividend for the half year at the rate of 7½ per cent. per annum.

The last annual meeting of the Filey Water and Gas Company, before the handing over of the concern to the Urban District Council, was held last Friday. The Mayor of Scarborough (Mr. J. Pirie), who presided, read letters from several shareholders, all congratulating the Directors upon the terms they had secured. He said the sum paid for the undertaking, with the expenses, would amount to £58,000, which, all things considered, was very satisfactory. It was expected that the taking over of the works would be completed by the 29th of September; and if not then, the Council had agreed to pay them 4 per cent. until it was completed. He moved the adoption of the report, recommending maximum dividends; and the motion was carried unanimously.

The Directors of the Hartlepool Gas and Water Company have another very satisfactory report to submit to the shareholders at the annual meeting to be held on the 31st inst. There has been a steady increase in the consumption of both gas and water. The revenue amounts to £30,436, as compared with £30,386 last year. The Directors recommend the payment of a dividend for the half year at the rate of 10 per cent. per annum on the "A" shares, 7½ per cent. per annum on the "B" shares, and 7 per cent. per annum on the "C" and "D" shares; leaving £1733 to be carried forward. The erection of additional gas-works is being proceeded with; and the Bill empowering the Company to raise £80,000 additional capital, with borrowing powers of £20,000, to construct much-needed storage reservoirs to meet the growing demands of the district for water for manufacturing purposes, has received the Royal Assent.

At the recent annual general meeting of the Kildgrove Gas Company, the Directors reported that the sale of gas reached 19,567,500 cubic feet in the past twelve months, as compared with 17,086,100 cubic feet in the previous year. They recommended the usual dividends. The Chairman (Mr. J. Gater) remarked that this was the 41st anniversary of the formation of the Company, and during the whole of this time the shareholders had received as large a dividend as the law allowed. This, however, had not been done at the expense of the consumers, for the price charged for gas had been reduced. The report was adopted.

The ordinary general meeting of the Leatherhead Gas Company was held on the 11th inst.—Mr. G. Brown in the chair. The report for the year ending June 30 showed that the profit amounted to £789; and the Directors recommended the payment of a further dividend of 2 per cent.—making, with the interim dividend, 4 per cent. per annum. To meet the expenses of carrying out the works referred to in the report of the Engineer (Mr. F. S. Cripps), the Directors decided to increase the capital by issuing £1800 of 3½ per cent. debenture stock at par. This had been done, and the stock was readily taken up by the shareholders. Mr. Cripps reported that the supply of gas had been satisfactorily maintained, while several improvements at the works had been effected. About 1600 yards of 6-inch, 2300 yards of 4-inch, and 1000 yards of 3-inch mains had been laid during the year, principally in connection with the supply of gas to Mickleham and Great Bookham. The revenue account showed that the manufacture of gas, including £1511 for the cost of coals, absorbed £2563; the total expenditure being £3503. The gas sold to private consumers realized £3462, less £347 for discounts allowed; public lamps brought in £397; rental of meters and cookers, £105; and residual products, £663—making, with smaller receipts, a total of £4292—leaving the balance of profit as above stated. In moving the adoption of the report, the Chairman congratulated the shareholders on the continued steady increase of business, and on the prospects of the Company. During the year 2210 tons of coal were carbonized—being an increase on the preceding year of 233 tons; and compared with the last report there was a net increase of £216 in the receipts from gas and residuals. There was still an extended demand for gas cooking-ranges, and prepayment meters. At the present time there were 75 ranges on hire, and 106 prepayment meters in use. The report was adopted.

Next Tuesday the Morecambe Gas Company will hold their twentieth annual meeting, when the Directors will report a continued increase in the amount received from the sale of gas. In the twelve months ending June 30, it was £8822, about £2000 of which was for gas used for cooking and heating purposes; and the total revenue was £10,958. The expenditure being £7231, the balance carried to the profit and loss account is £3727. The amount of profit available for dividend for the year is £3317; but as £1200 was used in paying the interim dividend, there is left a sum of £2117, which will enable the Directors to recommend the payment of a dividend of 6 per cent. for the past six months; making 12 per cent. for the year. The enlargement of the retort-house, and the introduction of the regenerative system of heating, were carried out during the twelve months covered by the report; and in the current year the purifying plant will have to be increased. Under the supervision of Mr. W. Duff, the Company's Secretary and Manager, 6029 tons of coal were carbonized last year; the make of gas being 55,052,000 cubic feet, of which 52,660,900 cubic feet were sold. The estimated



quantities of residuals were: Coke, 3665 tons; tar, 91,939 gallons; ammoniacal liquor, 146,000 gallons.

The Peterborough Gas Company have again declared full maximum dividends for the last half year; the profit during this period closely approaching £3000. They have now on hire 270 gas cooking-stoves and 113 prepayment meters. When the Company took over the works 30 years ago, the unaccounted-for gas amounted to 23 per cent. on a make of 30 million cubic feet. The leakage is now only  $7\frac{1}{2}$  per cent. on a make of more than 100 millions. The shareholders accorded hearty votes of thanks to the Chairman (Mr. W. Harris) and Manager (Mr. J. Barton).

The half-yearly meeting of the Pontefract Gas Company was held last Friday—Alderman J. Taylor presiding. The usual maximum statutory dividends of 10 per cent. per annum on the original shares, and of 7 per cent. per annum on the new ordinary shares, were declared. A slight increase in expenditure had been more than counterbalanced by increased revenue; thus enabling the dividends to be paid without trenching on the reserve fund, which now amounts to £2589 16s. The quantity of gas sold during the past half year was 18 million cubic feet.

The Rochester, Chatham, and Strood Gas Company held their ordinary half-yearly meeting on the 11th inst.—Mr. Thos. Winch, Chairman of the Company, presiding. In their report, the Directors recommended that a dividend at the rate of 10 per cent. per annum on the "A" and "D" shares, and of 7 per cent. per annum on the "B" and "C" shares, should be declared. They also stated that the demand for gas continued to steadily increase; and in order to cope with it, the Directors had considered it necessary to materially increase the manufacturing power at the Gillingham works. For this purpose a contract had been entered into for the supply and erection of additional plant, capable of producing 500,000 cubic feet of gas daily. The report was adopted.

The accounts presented at the half-yearly meeting of the Scarborough Gas Company last Saturday, showed that the sale of gas in the six months ended June 30 produced a revenue of £14,778; residuals brought in £3144; and the total receipts were £18,967. The expenditure being £13,370, there was a sum of £5597 carried to the profit and loss account. The amount available for division was £6130; and after payment of the maximum dividends, which the Directors recommended, there was a balance of £357 to be carried forward. Extensions of the manufacturing plant are progressing, under the supervision of the Company's Engineer and Secretary (Mr. J. Holliday); and for the purpose of meeting the outlay thereon, additional capital is to be called up. In the six months covered by the report, 10,539 tons of coal and cannel were carbonized. Of the total quantity of gas produced and in store, 99,618,600 cubic feet were sold to private consumers, and 9,319,449 cubic feet for public lighting. The estimated production of residuals was: Coke, 6323 tons; tar, 646 tons; ammoniacal liquor, 1128 tons.

The annual general meeting of the Truro Gas Company was held last Tuesday—Mr. J. James in the chair. The sale of gas produced £5615, as compared with £5809 in the year ending June 30, 1897; the difference arising from a reduction in price, and not from diminished consumption. The price of coal increased last year from £2658 to £3185 owing to the coal strike in South Wales. The balance on the profit and loss account was £1769; and it was appropriated as follows: Dividend of 6 per cent., £960; addition to reserve, £200; carried forward, £609.

The half-yearly meeting of the Wakefield Gas Company was held on Monday last week—Dr. Statter, J.P., in the chair. The notice convening the meeting having been read by the Secretary (Mr. W. H. Parker), the report, with the accounts for the six months to June 30, was presented. The accounts showed that the sale of gas had produced a revenue of £13,045; residuals brought in £3018; and the total receipts were £16,946. The expenditure on the manufacture of gas was £7861; on its distribution, £1375; and on management, £587—the total expenses being £11,059. The balance carried to the profit and loss account was £5887; and the amount available for distribution was £7108. The Directors recommended the payment of the usual dividends—viz.,  $11\frac{1}{2}$  per cent. per annum on the £25 and £5 shares, 9 per cent. per annum on the "B" fifths £5 shares, and  $8\frac{1}{2}$  per cent. per annum on the new ordinary shares, all clear of income-tax. The Chairman went through the various items in the accounts, which he considered very satisfactory. He reminded the meeting that services were now put in free, and that in the past half year the gas had been sold at 2d. per 1000 cubic feet less than in the corresponding period of 1897, which meant a loss to the Company of £870. Notwithstanding the abnormally mild winter and the introduction of the electric light by the Corporation, there had been an increased consumption of nearly 1 million cubic feet. During the ensuing half year, the Company would have to face an increase of 10 per cent. in the cost of coal, while tar had fallen in value about 16 per cent. The Workmen's Compensation Act, which came into force on July 1, would also involve additional expenditure; but the Directors hoped to pull through with the price of gas at the reduced rate. In May last a series of cookery lectures were given at the offices of the Company; and as they were very well attended, it had been decided to have a further series in October next. He concluded by moving the adoption of the report; and the motion was carried. On the motion of the Chairman, seconded by Mr. Howden, it was resolved to pay the usual dividends. The retiring Directors (Dr. Statter, J.P., and Mr. G. H. Roberts, J.P.), and Auditor (Mr. C. Hopkinson) were then re-elected. A vote of thanks was accorded to the Chairman for presiding, and to the Directors for their attention to the business of the Company. In acknowledging it, the Chairman proposed in generous terms the usual complimentary vote to the staff, which was acknowledged by the Engineer (Mr. H. Townsend) and the Secretary (Mr. Parker).

The Waltham Abbey and Cheshunt Gas Company sold 8,843,700 cubic feet of gas to private consumers, and 1,413,000 cubic feet for public lighting and under contracts, in the six months ending June 30; producing a revenue of £2000. The total receipts were £4054, and the expenditure was £2607; leaving a balance of £1447. Deducting £150 carried to the suspense account, there was £1297 to go to the profit and loss account. The Directors, at the half-yearly meeting next Friday, will recommend dividends at the rate of 7 per cent. on the original, and 5 per cent. on the additional capital, after payment of which and the debenture and stock interest there will be a balance of £925 to be carried forward. The shareholders will be asked to sanction the issue of £10,000 of additional share capital and £3125 of debenture capital under the Company's Order of 1881. Under the management of Mr.

W. B. Randall, the works turned out 17,242,000 cubic feet of gas, of which 16,733,000 feet are accounted for.

The annual report of the Directors of the Wigton Gas Company, Limited, states that improvements and additions to the works have been carried out at a cost of £300, and the works are now in a better and more efficient condition than they have ever been. A dividend at the rate of 15s. per £10 share (fully paid up) is recommended. Mr. J. Hepworth, the Company's Consulting Engineer, states that the deficiency in the quantity of gas sold could be more than made up—as has been the case in other towns—if the prepayment meter system were further extended. During the past financial year, the quantity of gas made per ton of coal averaged 10,000 cubic feet, which, with the coal purchased, was good work; but he would not be satisfied to see a lower result. It would be necessary to increase the storage at no distant date, at a cost of £700.

The report of the Winchester Water and Gas Company which will be presented at the half-yearly meeting of the Company on the 30th inst., states that the receipts on revenue account amounted during the six months ending June to £9823, and the expenditure to £6137; leaving £3686 to be carried to the profit and loss account, and making the balance of that account £6251. The Directors recommend the payment of dividends at the rate of 10 and 7 per cent. per annum, less income-tax, on the original and new capital, for the half year. The contract for lighting the public lamps will expire on the 1st of November; and a fresh one has been entered into for three years from that date. In the first half of 1897 the receipts on revenue account were £9970, while the expenditure was £5982, leaving a balance of £3988.

The half-yearly general meeting of the Yeadon and Guiseley Gas Company was held last Wednesday—Mr. W. King (Vice-Chairman) presiding. The Directors' report for the half year ended June 30 showed an increased consumption of about  $1\frac{1}{2}$  per cent. This was satisfactory, especially when it was considered that mild weather prevailed during January and February, and also that the mills were still almost practically closed, so far as the consumption of gas was concerned. The ordinary house and shop consumers continued to increase steadily; and during the six months 61 ordinary and 54 automatic prepayment meters had been added; bringing up the total number of "slot" meters now in use to 164. The average consumption of gas by these meters was equal to 10s. 4 $\frac{1}{2}$ d. per meter. The receipts for the six months showed an increase of £1089s. 1d. upon those of the corresponding period of last year, and the expenditure also showed a rise of nearly £400; this being mainly accounted for by the rebuilding of retort-benches. After the payment of the usual dividends there was left a balance of £110 13s. 7d. During the half year, 3424 tons of coal had been used, at an average cost of 10s. 10 $\frac{1}{2}$ d. per ton, as compared with 3500 tons, at 10s. 10 $\frac{1}{2}$ d., for the corresponding half of 1897. The gas made was 31,655,000 cubic feet. The report was adopted, and the maximum dividends—10 per cent. per annum on the consolidated stock, and 7 per cent. on the new shares—were declared.

#### Water Companies.

The Brompton, Chatham, and Gillingham Water Company held their half-yearly general meeting on the 11th inst.—Mr. John Baird, the Chairman of the Company, presiding. The report of the Directors stated that the gross income for the half year amounted to £10,252, of which £1212 had been returned to customers as discount and allowances. The aggregate number of tenants standing on the books was 17,434,294; new supplies, representing an annual rental of £235, having been connected with the mains during the half year. In order to meet the demand for water, the Directors had had to lay an additional 1906 yards of mains to the several building estates now being developed. The new covered reservoir had recently been tested, and found perfectly solidified; and the Directors thought the work reflected great credit on the Contractor (Mr. Herbert Weldon) and the Company's Engineers (Messrs. J. Taylor, Sons, and Santo Crimp) who designed it. The Directors also reported that the Bill for conferring further powers upon the Company had passed; and that the Company were treating for the purchase of extra land at Luton to extend their works. They recommended a dividend at the rate of 10 per cent. per annum, free of income-tax. The report having been adopted, and votes of thanks passed to the Chairman and Directors, Auditors, Secretary, &c., an extraordinary meeting followed, at which it was resolved to issue 2000 new 7 per cent. shares.

At the recent half-yearly meeting of the Stockport Water Company, the Directors reported that the profit amounted to £9390. This sum, with the balance brought forward, made up £10,550, out of which it was proposed to pay a dividend at the rate of 7 per cent. per annum. The Chairman (Mr. G. H. Hill) said the water-rents in the Stockport district showed steady progress; while in Alderley, where building operations were going on, there was also an increase. Two items of expenditure, amounting to about £300, had been charged to revenue which might have been placed to the capital account. The works had been maintained in good condition, and the revenues were steadily increasing. Both the dividend and the balance carried forward had augmented. The shareholders were not obtaining a 7 per cent. dividend by the manipulation of figures, but on a really sound and reliable basis. The Directors preferred making steady progress to having a fluctuating dividend. The report was adopted.

At the recent annual general meeting of the Wrexham Water Company, the Chairman (Mr. W. Overton, J.P.) stated that £4344 had been expended on capital account during the year; the greater portion—£3049—being on account of the new service reservoir and contingent works. The receipts from all sources continued to grow; £8031 having been received—being £214 more than last year. The working expenses were slightly higher than last year; being £1984, as against £1924. The excess of £60 is largely made up of the increase in rates and taxes, over which the Company had no control. Filtration charges were also slightly higher, owing to the larger quantity of water filtered, and the more frequent cleansing of the filter-beds. During the year, water had been laid on to 212 houses, making a total of 5276 houses supplied. The other items did not call for comment; being practically the same as in preceding years. The result of the year's working was that the Directors were in a position to recommend a dividend at the rate of 6 per cent. per annum upon the consolidated stock, as against  $5\frac{1}{2}$  per cent. last year. The *pro rata* dividend on the ordinary shares would therefore be £4 4s. per cent., being seven-tenths of that paid upon the consolidated stock. The report was adopted.



### LORD GREY ON THE ADVANTAGES OF INDUSTRIAL CO-PARTNERSHIP.

At the Crystal Palace last Friday, Lord Grey opened a flower show in connection with the National Co-operative Festival, and subsequently delivered an address as President of the Festival for the ensuing year. In the course thereof, he remarked that the co-operators of the Southern Section had supplied an example which those of other sections would do well to copy. They had now held for eleven years a festival of a character well calculated to impress the popular imagination, and to bring home to the hearts and minds of all co-operators the conviction that the efforts of true co-operation should not be confined to selfish attempts to increase the dividends of a distributive store, but should aim at developing the moral and social side of co-operative life. The promoters of the festival recognized that the sole object of co-operation was not to increase the dividends of distribution. That object was important; but it would take care of itself. The selfishness of human nature might be relied upon to look after a movement which secured last year for co-operators the magnificent profit of £6,617,000. That a purely working-class organization should have been able, within the limits of the present reign, to establish and conduct a business on lines which enabled its members to divide among themselves these enormous profits, was a fact which yielded to no other, even in this wonderful age, in either importance or hopefulness. It was certain that the annual profits would quickly grow from £6,617,000 to £12,000,000 and even more. It was therefore evident that co-operators, having, by the application of common sense to the business of distribution, effected a saving on their purchases which was equivalent to an increase of  $7\frac{1}{2}$  to  $12\frac{1}{2}$  per cent. upon their wages, could now afford to give some attention to the consideration of problems which had for their object the development of the individual character and social life of their members. The object of the festival was accordingly to focus the attention of co-operators, not on the commercial side of the movement, but on such arrangements as would enable the  $1\frac{1}{2}$  million co-operators to turn their attention to problems which had for their object the development of their individual character and social life. After enumerating the advantages conferred by co-operation, Lord Grey said the achievement of these results suggested the inquiry whether it would not be possible, by kindred organizations, to obtain permanent advantages of a similar kind for co-operators in every centre. He was satisfied that towns such as Leeds and Leicester, which were honourably distinguished for the vigour with which they were applying the principles of co-operation, would agree that Kettering at the present moment had the right to be regarded as the first co-operative town of the kingdom. It was a comparatively small town with about 25,000 inhabitants, of which number 5785 (which meant practically the whole male adult population) were members of co-operative societies. In addition to a most successful distributive store, it had six manufacturing co-partnership societies, the most important of which had succeeded, for some length of time, in paying out of profits an average interest of  $7\frac{1}{2}$  per cent. on the share capital, and a dividend to labour of  $7\frac{1}{2}$  per cent. on Trade Union rates of wages. The present weakness of the co-operative movement was that it had degenerated too much into a hunt after dividends. As practised by the English Wholesale Society, co-operation lacked the qualities which were necessary to stir the soul. If co-operation was to become a living force in moving the character of the nation along an upward plane, it must return to the spirit of its founders, and show that it had a soul above a shopkeeper's. They stood that day on the threshold of the movement. It was only now beginning to be recognized, both by labour and capital, that the principles of co-partnership, which insisted that labour should have an equal share with capital in the surplus profits that might remain after the initial obligations to capital had been discharged, were fair to all parties; and that the worker should be allowed the option of investing his profits in the shares of the company which employed him, and of thus acquiring the right to take his part, like any other shareholder, in the management of its affairs, was fair to all parties, and absolutely just; and, further, that expediency no less than justice demanded that these principles should be applied wherever possible to industrial enterprise, so that the non-interested hireling might become the interested partner. Let them look forward for a moment and consider the advantages they were justified in anticipating would result from the adoption of a system which divided the net profits between capital and labour in such a way that £1 of wages should receive as much as £1 of dividend, or, in other words, in proportion to the value of their respective services, and allowed the workers to invest their profits in the business which employed them. The first great result they might confidently anticipate from the movement was the establishment of a solidarity of interest between labour and capital, with, consequently, increased security against the recurrence of industrial wars. The fact that the employees of the South Metropolitan Gas Company had, during the ten years since the principle of co-partnership was adopted, invested £110,000 of their savings in the Company, coupled with the further fact that the stock of the Company was considered the best security of all the gas stock in the market—being bought at prices which yielded to the investor only £3 12s. to £3 16s. per cent., while none of the other Gas Companies' stocks were bought to yield a smaller return than about 4 per cent.—would appear to be conclusive evidence on this point. Mr. George Livesey informed him that the experience of the South Metropolitan Gas Company was that it was now the practice to discuss questions with the workers which formerly could not be discussed at all, because of the suspicion with which employers were regarded by the workers; and that the chance of a strike no longer entered into their consideration. In the Gas Company which Mr. Livesey was managing on co-partnership principles, 3 per cent. more gas was sold with 4 per cent. less coal used; and the reason for this greater efficiency obtained at smaller cost was that the worker, being a partner and not a hireling, had the heart of a friend and not of an enemy towards the work on which he was engaged. He (Lord Grey) therefore regarded the interesting exhibitions of products manufactured by co-partnership societies as the most important and significant feature of that festival. The example offered by the action of  $1\frac{1}{2}$  million working-men co-operators, in their collective attitude as employers of labour, could not fail to have the greatest influence. In which direction should that influence be used? Should it be said that the influence of the wholesale had been

used to stem back the inevitable change decreed by the resistless law of social evolution? or should it be said, in after time, that the working-men co-operators of England were the first to introduce into our industrial system principles which, if applied elsewhere as they were already successfully applied at Leicester, Kettering, Huddersfield, and Hebden Bridge, could not fail to improve the character, status, and efficiency of the worker, and consolidate the interests of labour and capital; thereby strengthening the nation both in character and wealth?

A vote of thanks to Lord Grey for his address was cordially passed.

### THE PLYMOUTH CORPORATION AND THE GAS COMPANY.

Further correspondence has taken place through the Plymouth daily papers between Mr. J. A. Bellamy, the Deputy-Chairman of the Gas Company, and Alderman C. H. Radford, respecting the policy of the Corporation in opposing the Gas Company's recent appeal for further parliamentary powers. Replying to the letter of Mr. Bellamy, which was summarized in last week's "JOURNAL" (p. 389), Alderman Radford contended that the opposition to the Company's Bill of 1894 was justified, not only because an increase of a candle in the illuminating power of the gas was obtained, but because the Company failed in their endeavour to obtain power for the supply of electricity in competition with the Town Council. With regard to the opposition to the Company's Bill in the last session, Mr. Radford says that, though a petition was lodged, a settlement was arrived at by interviews and correspondence between the Town Clerk and Mr. Shelly, the Solicitor to the Company; and Mr. Shelly did not support the contention of the Chairman of the Company that the opposition had put them to any considerable expense. In answer to this, Mr. Bellamy wrote: "My contention was that the ratepayers' money was wasted, and loss caused to the Gas Company and to the consumers, by the excessive eagerness of the Parliamentary Committee to fight, whereas all reasonable requirements of the Corporation as protecting the shareholders' interests could almost always be obtained by friendly negotiations. I have seen no reply to this. I am informed that in 1894 the Special Purposes Committee made no serious attempt to negotiate. The results obtained were ridiculously small, and could have certainly been obtained without any fighting and the incidental expense. The Gas Company withdrew the electric lighting clause without argument. They had been supplying 15-candle gas for years; and the Committee made it obligatory." With reference to the remark of the Chairman of the Company that the action of the Corporation cost the Company about £1000, Mr. Bellamy says: "I have made inquiries, and find that the opposition of the Parliamentary Committee was continued until after the Company's Solicitor had left for London in connection with the hearing of the Bill by the House of Commons Committee. Several expensive expert witnesses had been retained; their evidence prepared in Plymouth and sent to Parliamentary Agents; long briefs thereon prepared and handed to Counsel, with the corresponding fees; and some of the witnesses requested to be in London; consultation with Solicitors and Counsel with regard to all this evidence to meet the Corporation opposition. I may say that £132 10s. has been paid to one of these witnesses, which may be taken as a type of the other payments." Alderman Radford returned to the matter in a letter published last Friday, in which he repeated his contention that the action of the Corporation towards the Company has been neither factious nor unfair; and he claims that it is the duty of the Corporation to carefully watch the interests of the people as against the owners of a valuable monopoly. He suggests that the "question of costs and the misunderstanding as to the withdrawal of the petition may well be left to the legal gentlemen concerned." As the whole controversy has turned upon the question of these costs and the responsibility of the Town Council for their being incurred, this suggestion is remarkable, to say the least of it.

### THE PROPOSED PURCHASE BY THE CORPORATION OF THE FALMOUTH GAS AND WATER WORKS.

#### A Statutory Meeting of Ratepayers to be Called.

At the Meeting last Thursday of the Falmouth Town Council, the Gas and Water Purchase Committee presented a report, in which they recommended that the requisite statutory meeting of the Council be called forthwith, to consider and to decide as to the expediency of promoting in the next session of Parliament a Bill to enable the Corporation to purchase the undertaking of the Falmouth Gas Company, under the terms of section 69 and 70 of the Falmouth Gas Act, and either by agreement or otherwise to purchase the undertaking of the Falmouth Water-Works Company. The Committee were of opinion that the revenue from the two undertakings would be sufficient to redeem the purchase within a "reasonable period;" but if the Council desired more definite information on this point, they suggested that an expert should be called in.

The adoption of the report was moved by Mr. GROSE, and seconded by Dr. HARRIS.

Mr. Fox was not in favour of the purchase of the gas-works; and he could not say that he was in favour of the compulsory purchase of the water-works. At any rate, they ought to consult the ratepayers before committing themselves. He believed that the purchase of the water-works would mean an increase in the rates. They would either have to increase the present charges, or make an increase in the rates. Until he knew the wish of the ratepayers, he should oppose the scheme.

Mr. DUNNING observed that Mr. Grose had stated that the profits on the gas would defray the deficiency on the water; and he asked, was Mr. Grose aware of the sum that would have to be paid for the acquisition of the gas-works? They ought to go to the ratepayers first.

The MAYOR: The mode of procedure we propose to adopt to-day provides for that.

Mr. MEAD said he had facts and figures bearing on what Mr. Fox had alluded to; and he felt sure that if Mr. Fox would study them he would alter his opinion.

Dr. BANKS said he was strongly in favour of the water-works being acquired, even if a financial loss accrued, because it was very important



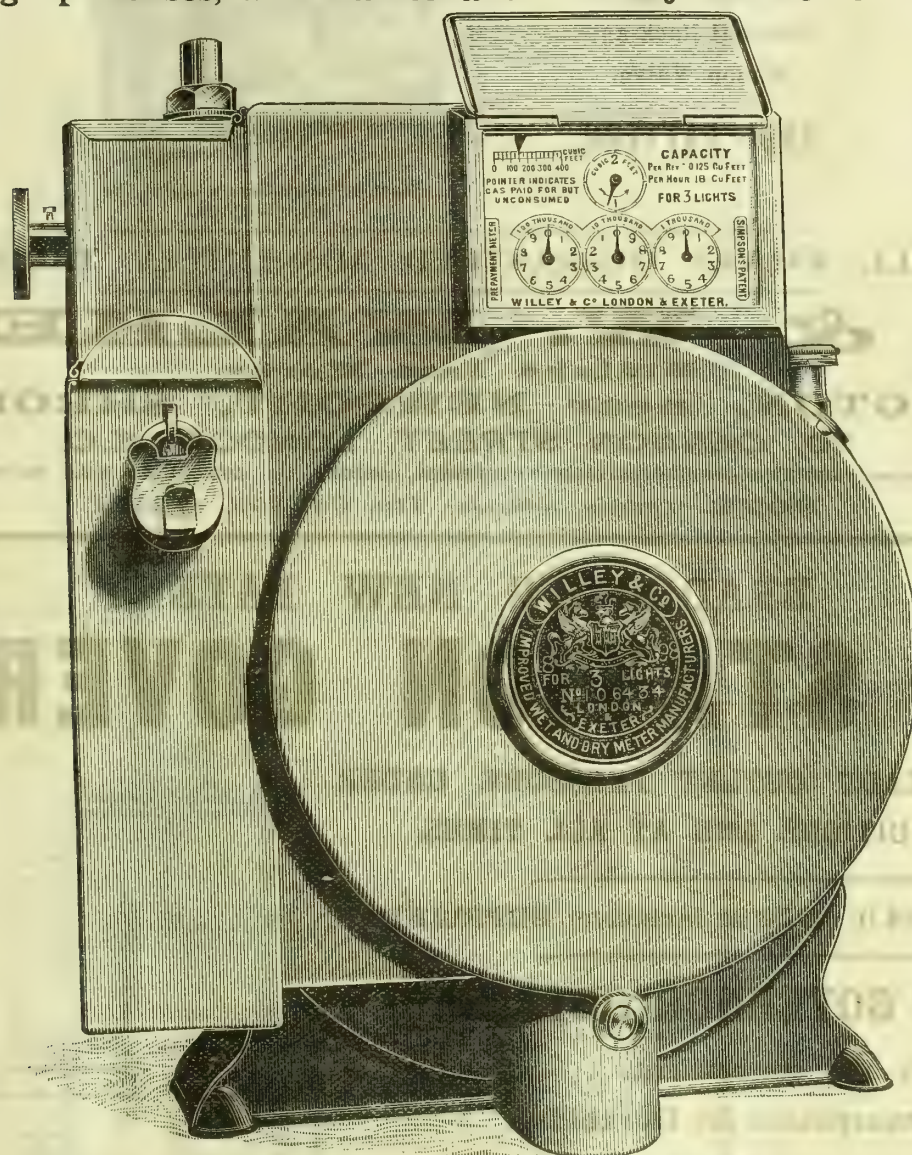
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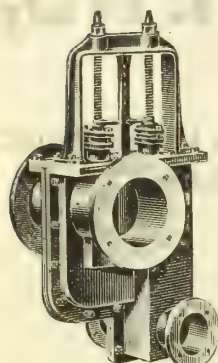
Thousands of these Meters in use. Continuous supplies to the London and leading Provincial Companies, giving the greatest satisfaction. Gas Engineers may fix them with the confidence that they will give no trouble. Returns for readjustment average less than 1 per thousand.



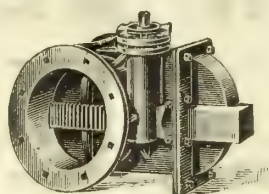
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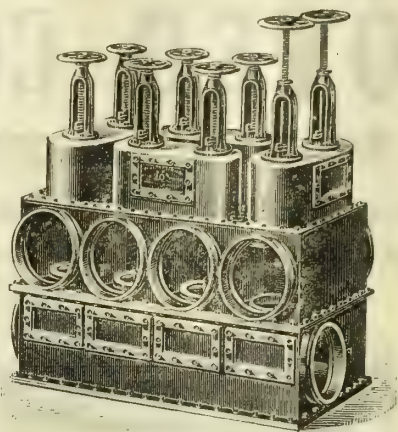


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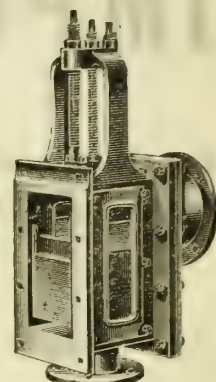


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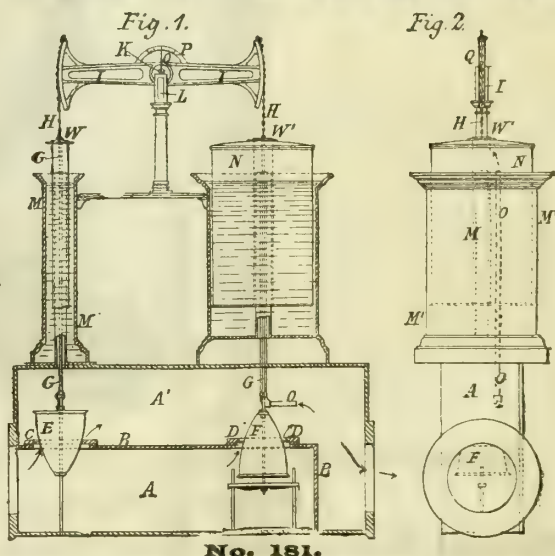
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that the town should control its own supply. As there was only one year left during which the ratepayers could exercise their option of compulsory purchase, he did not conceive that he had any right now to vote against it, and by so doing prevent the ratepayers from exercising their choice. They would have the right in future to complain if the Council prevented them from exercising their option. Without, therefore, expressing any views for or against the purchase of the gas-works, he should vote for a meeting being held, to give the ratepayers a chance of recording their opinion. He wished to know what the report really meant respecting the employment of an expert.

Mr. MEAD: The Committee wish to leave the matter an open question; the Council could appoint an expert or leave it to the Committee.

Mr. BOWLES expressed regret that the Committee had thought it necessary or advisable to include both undertakings in one form of resolution. If they had separated them, he should have voted for the purchase of the water-works. If the Committee wished to appoint an expert, they must first tell the Council who it was to be. He did not agree to the employment of Mr. Silverthorne. It would not be a wise mode of procedure to empower the Committee to employ an expert.

Dr. HARRIS said it was a very big business the Council were going in for; the question of choosing an expert rested entirely with the Council, and not with the Committee.

Mr. MACKENZIE pointed out that the Committee were distinctly in favour of the Council dealing with this question. He certainly favoured the employment of a gentleman who had already provided two reports. They were aware that the gas-works were owned by a certain number of shareholders who got large dividends; and two of the shareholders were members of the Town Council. Now, human nature was all the world over human nature; and these shareholders, being in possession of what was a little "gold mine," had no sympathy with the movement in favour of acquiring it. The raid on Johannesburg was much the same as the attempt to get the gas-works. That the concern was a profitable one, there could be no doubt; and the duty of the Council to the ratepayers was to purchase it. He had heard a great deal to the effect that the profits on the gas supply were not available for the reduction of the rates. They knew, however, that all interest on fresh capital could be handed over to the Finance Committee. In his opinion, they would be neglecting their duty if they allowed this opportunity to slip.

Mr. BOWLES said he should not vote against the proposal, if it were understood that no expense would be incurred except what was necessary to obtain the opinion of the ratepayers.

The motion was thereupon put, and carried by 9 votes to 2—with one councillor neutral.

Dr. BANKS next moved that the Committee be asked to consider and report to the Council at as early a date as possible what expert it was advisable should be employed. He favoured the employment of an expert, because he did not see how they could go to the ratepayers and put the matter before them unless they had some distinct information to give them. Mr. Silverthorne's last report would have to be altered, chiefly on account of the difference in the price of gas since the report was drawn up.

The proposal was assented to.

### THE RECENT ALLEGED IRREGULARITIES AT THE PERTH GAS-WORKS.

It may be remembered that some time since a Special Committee was appointed by the Perth Gas Commissioners to inquire into a claim by Mr. G. P. K. Young, architect, for £112 for work performed in connection with the new gas-works, and generally as to the management of the gas-works. The Committee had several meetings; and last Tuesday they came to a unanimous finding.

They are of opinion that both Bailie Wright, the ex-Convener of the Works Committee, and Mr. A. Wilson, the Manager, "have acted in a culpably careless, negligent, and unbusiness-like way; that they should be censured by the Commissioners; and, further, that Mr. Wilson be cautioned that in the event of his being guilty of similar laxity, or showing want of attention in the performance of his duties as Manager, he will be asked to resign." It is stated that, in connection with the inquiry, Mr. Young, Mr. James Easson, the late Assistant Gas Manager, Bailie Wright, Mr. Andrew Wilson, the Manager, and Mr. James Wynne were called before the Committee and examined. Mr. Young said that he received instructions from Mr. Wilson to prepare certain plans, sections, and specifications; and the work was executed according to them. He understood that he was doing the work for the Gas Commissioners. Bailie Wright asked him about the work several times, and urged him to get on with it. Bailie Wright admitted that, in a general way, he had given authority to Mr. Wilson to ask Mr. Young to check his levels and measurements; but he understood that this would not cost more than a pound or two, and would be paid by the contractor. He did not authorize the employment of Mr. Young to prepare plans, drawings, sections, or measurements of the intended works. Mr. Wilson said that while the staff in the drawing-office were busy with the plans for the levelling of the ground, and had completed one set of the sections, they were so pressed with work that he brought the matter under Bailie Wright's notice, and further mentioned that the work should be done by a surveyor rather than a gas engineer. Bailie Wright approved of a surveyor being engaged; and he authorized that Mr. Young should be asked to do the work. Acting on this authority, the work was put into Mr. Young's hands; and he prepared plans, sections, and specifications, which were accepted by the Gas Commission, and the work was carried out according to them. Bailie Wright often complained of delay. When the plans, &c., were finished, they were placed on the drawing-table of the gas-office for inspection. Mr. Wilson did not remember specially calling Bailie Wright's attention to them as Mr. Young's work. Mr. Wynne's evidence was similar to that of Mr. Wilson. Mr. Easson said that on one occasion, when some of Mr. Young's assistants appeared, Bailie Wright asked him what they were doing there; but he could not tell him.

The Committee say that, on a careful consideration of the evidence, they are willing to believe that Bailie Wright was not aware that in acting as he had done he had authorized anything further than the checking of

the plans, &c., which Mr. Wilson had prepared and shown him; but they could not free him from blame for not ascertaining more carefully and fully what was actually proposed to be done, and submitting the matter for the approval of his Committee. The Committee think that Mr. Wilson was remiss in not ascertaining what Mr. Young's charge would be for the work, and submitting the whole matter in a more complete and careful manner to Bailie Wright for instructions before actually employing Mr. Young. The Committee consider that Mr. Young's conduct in the whole matter has been perfectly straightforward and business-like; and the Gas Commission having adopted his plans, sections, and specifications, and carried out the work according to them, they cannot resist the conclusion that Mr. Young's account must be paid by the Gas Commissioners.

The report of the Committee will come up for the consideration of the whole Commission at their first meeting. But meanwhile rumours are current, says the "Dundee Advertiser," that another alleged irregularity is at present under consideration of the Commissioners, in connection with the expenditure on the annual trip to the employees.

### THE GAS SUPPLY OF SOWERBY BRIDGE.

#### A Local Government Board Inquiry.

On Wednesday last, Colonel A. J. Hepper held an inquiry on behalf of the Local Government Board respecting an application by the Sowerby Bridge Urban District Council, for permission to borrow the sum of £8500 for gas-works purposes at Sowerby Bridge and also for their gas supply to the Luddendenfoot district. It was given in evidence that the rateable value of the district was for poor-rate purposes £47,339, and for district-rate purposes £43,734. The present district-rate was 2s. 6d. in the pound; and the poor-rate, in which was included the school-board rate, was 2s. 8d. in the pound. The estimated population was from 11,500 to 12,000, as compared with 10,408 in 1891. The Council's unexhausted borrowing powers amounted to £18,296. The loans on the gas-works still unpaid were £34,612. The price of gas to district consumers was 2s. 3d. per 1000 cubic feet, and to outside consumers 3s. 1d. For the gas supplied from the Luddendenfoot works 3s. 6d. per 1000 feet was charged. In each instance a discount of 10 to 15 per cent. was allowed for cash. The works at Luddendenfoot (formerly owned by a private firm, Messrs. Whitworth) were acquired by the late Local Board under a Provisional Order in May, 1887. By the terms of the Order the Board were empowered to construct and possess gas-works outside the Sowerby Bridge district. The district was a growing one—buildings were springing up on every hand; and to remedy complaints that were being continually received about the inadequate supply of gas, it was necessary that extensions should be carried out. Some portions of the works had already been completed, at a total cost of £2132. Owing to the development of the Pye Nest estate, gas-mains would have to be carried there. The prospective works included in the application were intended to be carried out during the next two years. Included in these was an extension of mains to Salterhebble, which was at present supplied with gas from Halifax. At the Luddendenfoot Gas-Works the amount of gas manufactured was 17 million cubic feet per annum, as compared with 7 millions when the works were taken over in 1887. Some further evidence having been given by Mr. James Marsland, the Gas Manager, Mr. J. W. Lodge (a member of the Gas Committee) said that to put down plant at Luddendenfoot would be an absolute waste of money, since holder capacity and purifying capacity were both deficient there. He also objected to the proposal because when the mains were laid from Sowerby Bridge to Luddendenfoot the gas required there could be supplied direct from the Sowerby Bridge works. The Inspector said he would state Mr. Lodge's views of the position in his report; but he remarked that nobody present appeared to take Mr. Lodge's view of the matter. The Inspector visited the Luddendenfoot works at the close of the inquiry.

### THE PROPOSED REGULATIONS FOR LAMPS AND SIGNS.

As mentioned in the editorial columns of the "JOURNAL" on July 5, the London County Council purpose exercising the powers conferred upon them by section 164 of the London Building Act, 1894, to make bye-laws for "the regulation of lamps, signs, or other structures overhanging the public way not being within the City." At first sight it might not be thought that authority of this nature could be construed by even those possessed of exaggerated imaginations into a significance of any great import to manufacturers, engineers, and traders in general from all parts of London. But when consideration is given to the draft bye-laws, it will be found that some of the proposed regulations are of such a nature as to excite surprise. It is unnecessary to refer in detail to the bye-laws, of which there are twenty, since the selection of two relating to lamps and supports will be ample for the purpose of showing the manner in which the County Council intend to treat many thousands of firms and individuals outside the precincts of the City. The third bye-law provides that "no lamp, or structure supporting or carrying the same, shall, after the confirmation of these bye-laws, be fixed or retained so as to overhang the public way in such manner that such lamp or structure, or any part of the same respectively, shall be at a less height than a clear 10 feet above the surface of the footway immediately under such lamp or structure, or be nearer to the carriageway than 3 feet from the outer edge of the kerb." If this proposal be carried into effect, it will necessitate the removal of at least 90 per cent. of the existing lamps; while if read in conjunction with the fourth bye-law, fixing the size and weight of the lamp, the result will be either the entire abolition of many thousands of lamps at present in use, or the substitution of new ones at a heavy outlay. It is estimated that the enforcement of these regulations would entail an aggregate expenditure throughout the Metropolis of no less than £1,500,000; and if this assumption be correct, no surprise need be manifested at the repugnance exhibited towards them. The eighth bye-law provides that "the owner of every lamp sanctioned under these bye-laws shall keep such lamp lighted during such hours as he shall be required so to do under the sanction thereof, or under any renewal of such sanction." In other words, the owner must either himself remain, or keep an attendant in waiting, up to a stated hour at night, in order to extinguish the lamp. It



is not surprising to find that some of the Local Authorities, including St. Pancras and Lambeth, strongly object to the three regulations in question; and if information could be obtained as to the attitude of the remainder, it would no doubt be ascertained that they are equally opposed to them. The "curfew" regulation is regarded as being arbitrary and unnecessary, and should be expunged; and it is suggested that the bye-law respecting the height of lamps should be modified so as to fix either 7 ft. 6 in. or 8 feet as the minimum vertical height of the lamp from the footway. The views of the Vestries and District Boards of Works are being, or will be, communicated to the County Council, who may perhaps be disposed to introduce such modifications in the draft bye-laws as will meet the circumstances of the case. But even if they are approved in their present form, they must of necessity obtain the sanction of the Local Government Board before they can become operative. Moreover, the regulations must be administered by the Local Authorities, who in many cases have pronounced adversely to some of them. This of itself would, no doubt, diminish to a large extent the strength of the weapon which the County Council seek to place in the hands of apparently unwilling recipients.

### WATER SUPPLY IN THE DUKINFIELD DISTRICT.

#### The Greenfield Reservoir.

The Dukinfield District Council, the Hurst District Council, and the Ashton and Stalybridge Corporations, are joint owners of the very extensive water-works in the Greenfield Valley. These four bodies are therefore interested in the water undertakings in the locality; and any further expenditure upon the construction or extension of works has to be borne *pro rata* by each. About the year 1875, the Joint Committee entered the Greenfield Valley, and began to construct the present Yeoman Hey reservoir, and a flood tunnel to divert the drainage above Birchen Clough, of about 2000 acres, into Dovestone Clough, down which the water passes and forms the Greenfield Brook below the embankment of the Yeoman Hey reservoir. In 1876, the contract for the work was let for £88,500. The reservoir, aided by the flow of the streams from the drainage to it, gives a supply of about 1,100,000 gallons per day during a drought of about 150 days, after furnishing compensation water to the stream for the same period. The top-water level of the reservoir is 768 feet above Ordnance datum. The reservoir cost about £92,000. Last year the Committee decided to construct a second reservoir above Yeoman Hey, to be called the Greenfield reservoir; and the work is now in progress. The undertaking has lately been inspected by the members of the Dukinfield Council. On arriving at the site, the party were received by the Inspector of Works (Mr. Nowell) and the representative of the Contractors (Mr. Thorpe). The most interesting feature at this point is a puddle trench which is being constructed from one side of the valley to the other—a distance of 750 feet. It is 10 feet wide and upwards of 100 feet deep. The excavation for the trench is the most costly piece of work in the whole scheme. The Contractors have met with quicksands and other difficulties, which have compelled them to go down far below the original intended depth. The parliamentary estimate of the cost of the whole work was £32,840 exclusive of land; and the accepted tender was £39,812. The reservoir will be half-a-mile long; and it is calculated that it will hold 110 million gallons.

### THE DRY WEATHER AND WATER SUPPLY.

#### Curtailment of the Water Supply at the East-End.

The long continuance of dry weather which has been experienced this year has necessitated the issue in various places of notices to the consumers to be careful in the use of water; and a few weeks ago the Bradford Corporation, as mentioned in the "JOURNAL" at the time, were compelled to shut off the supply during the night. A similar measure of precaution has, from the same cause, been forced upon the East London Water Company, who last Thursday issued notices to the effect that, as from yesterday, the water would be turned on twice a day for about three hours each time, and at as nearly as possible the same hours; and consumers were advised to fill any available vessels while the water was on, to use it only for strictly domestic purposes, and to avoid waste in any form. Moreover, persons were especially cautioned against using water for garden or other similar purposes. The notice has been issued in all the districts served by the Company; and the result has been a great outcry in the papers, and a rush to the Company's offices for explanations. These were readily furnished. The Secretary (Mr. I. A. Crookenden) was away from town; but his representative stated that the Company had studied the interests of their customers as much as possible, but under existing circumstances it was impossible for them to go on emptying the reservoirs. But for the storage reservoirs which were completed last year, the Company would have been compelled to give notice some time ago. He thought the six hours' service of water quite long enough if care were exercised; and while the water was on, it could be stored in all kinds of vessels. The outlook was not so black as it appeared, for with a good storm or two the Company would be enabled to quickly revert to the constant supply. The three hours' supplies twice daily would be given at as convenient times to the consumer as possible, but they would not be given at night. The Company's officials would do everything in their power to minimize any inconvenience the inhabitants of East London might be put to; but they had had no other alternative, under existing circumstances, than to issue the circular.

The Company's Chief Engineer (Mr. W. B. Bryan, M.Inst.C.E.) states that the present drought is the worst he has experienced for many years. During the great drought of 1893, the average rainfall for the period was 23 inches, while this year it has only been 17 inches. The flow in the River Lea is now less than has ever before been recorded. The East London Water Company had last session obtained an Act to make very large reservoirs up the Lea to cover about 210 acres. Most of the land has been obtained, and the rest of it will be purchased under compulsory powers; and then the contracts will be let out as quickly as possible.

The new reservoirs will hold more than 1000 million gallons. The present reservoirs hold 1200 million gallons. If these new reservoirs had been constructed, the Company would have been able to supply an extra 10 million gallons per day for another hundred days. The Company are now pumping nearly 11 million gallons from deep wells, and are obtaining 10 million gallons from the Thames. The balance is drawn from the Lea and the reservoirs. The New River Company are supplying the East London Company with as much water as they can spare—amounting to from 4 to 6 million gallons. The New River Company are permitted to take first from the river about 22½ million gallons per day; while the East London Company have to take what they can get. The deficiency in water supply is not confined to London. A similar state of affairs is being experienced at Bradford, Edinburgh, Croydon, and other places; and these supplies are under the control of the Local Authorities. The downfall of rain on Wednesday night was altogether inadequate. The amount registered was only 0·03 inch—in other words, the amount would not have submerged a sixpenny-piece lying on its face. Summer rains are considered practically useless. At the present time there is no deficiency; but the reservoirs have been drawn upon to such an extent that it is prudent to conserve as far as possible what remains, in case of further prolongation of the drought. A great deal of rain is required to bring the distribution up to the normal standard. The rainfall in the Lea Valley from June 30, 1897, to Aug. 19, 1898, was only about 18½ inches, instead of about 27 or 28 inches; and only 6½ inches fell in the six winter months, October to March, instead of about 14 inches. The usual quantity of water allowed per person daily is about 33 gallons; but, under the new regulation, this will be reduced to about 25 gallons. The regulation will not be enforced a day longer than can be avoided.

The unusually slight rainfall has affected the Thames Valley as well as that of the Lea. In their last report on the Metropolitan Water Supply, Sir W. Crookes and Professor Dewar state that the rainfall at Oxford in July showed a serious deficiency—being only 0·53 inch. The average fall in July for the past thirty years is 2·68 inches; showing a difference of 2·15 inches. On the 1st of the month, 0·22 inch of rain fell; also on five other days, but never so much as one-tenth of an inch. The total deficiency for the year is now 5·49 inches.

### THE WATER SUPPLY OF CORK.

The City Surveyor of Cork (Mr. H. A. Cutler) has lately furnished the following particulars in regard to the water-works of the city. The water is pumped from the River Lee into two reservoirs. The high-level one has a capacity of 721,500 gallons, and supplies water to 17,760 persons; while the low-level one has a capacity of 3,404,000 gallons, and supplies water to 68,529 persons. The total pumping capacity is 403,767 gallons per hour; but with the exception of the two new American turbines, the whole of the pumping plant is wasteful and obsolete. The water at the intake is a good potable water, containing only 4·5° of hardness, and is an excellent water for domestic purposes; but in times of heavy rainfall large quantities of peat and decayed vegetable matter are brought down the river—causing great discoloration and deposits in the reservoirs, mains, and services. At the present time, plans are being prepared for the erection of filters. The quantity of water supplied for all purposes in 1896 reached the enormous amount of 71 gallons per head per day, with the result that the higher portions of the city were entirely without water except during the night and early morning. In 1897, most strenuous exertions were made to prevent waste with the result that at the end of the year the water supplied to the city for all purposes had been reduced to 48 gallons per head. The Deacon meter system was introduced, with satisfactory results; and an adequate staff of inspectors was engaged in inspecting house-services and serving notices. The valves were tested with the stethoscope, and noisy valves were located. The principal difficulties now encountered in further reducing the waste were the inadequacy of the service-pipes and house-fittings to withstand the increased pressure in the mains.

**Newcastle Gas-Works Extensions.**—The "Newcastle Chronicle" reports that the additions to the gas-works of the Newcastle and Gateshead Gas Company are now about to be proceeded with. The first contract—that for the gasholder tank—has been let to Mr. Walter Scott, of Newcastle.

**The Public Lighting of Ditton (Widnes).**—A recommendation of the Parish Council of Ditton, that arrangements should be made with the Widnes Corporation to light the roads of the district, being objected to by the ratepayers, was last Tuesday submitted to a poll. The result was a majority of 58 against the scheme.

**Richmond (Surrey) Public Lighting.**—The Richmond Town Council having complained to the Gas Company with reference to defective lights in the borough, a letter from the Company was received at the last meeting of the Council. They stated therein that they were not prepared to make any allowance with respect thereto. It was also pointed out that the evil complained of could not be due to the process of manufacture, which was in accordance with the latest and general practice. The Company considered that the Council could not be aware of the care and expense undertaken by them in order to minimize the number of defective public lights; and, further, that if a valid claim to an allowance could be made out, this would be met many times over by the improved lighting that had been provided in the most important parts of the town, for which no charge whatever was made to the Council. The Company represented that the number of lamps, or equivalent single lights, supplied by them exceeded by 80 the number actually paid for, which, at the statutory charge, would amount to £280 per annum; and the installing of the Denayrouze lamps in certain places had cost the Company about £150. The total number of defective lamps extending over the period mentioned was 349, of which the Brentford district accounted for 29; and it was further pointed out, as illustrating the comparatively infinitesimal money value of the lamps reported out and defective, that had the total number been 365 in twelve months instead of only 320 in thirteen months, it would at the most have only been equal to the charge for one lamp for twelve months—viz., £3 10s.



## NOTES FROM SCOTLAND.

**From Our Own Correspondent.**

*Saturday.*

The ceremony of laying before the Town Council of Glasgow the accounts of the Corporation Gas Department for the past year, which took place on Thursday, was on this occasion shorn of much of its importance through the absence, on account of indisposition, of Mr. R. M. Mitchell, the Convener. Mr. Mitchell is, however, so much in touch with his department, and has such a strong regard for it, that from his retirement he sent a few notes on the business of the undertaking, which were read by the Deputy Town Clerk. These were to the effect that the report of the Committee for the year 1897-98 demonstrated continued prosperity in the department; and, notwithstanding the extension of the supply of electricity, the consumption of gas steadily increased—being nearly  $3\frac{1}{2}$  per cent. over the previous year. It was thus demonstrated here, as well as in other large cities, that electric lighting and gas were by no means antagonistic. The works during the dark months had been taxed to the utmost; and the Committee were only sorry that the new gasholder at Dawsholm had not been executed so far in the manner expected, and that this delay might possibly deprive them of its use during the coming winter. The Council would observe that a new gas-works would be required to meet the ever-growing demand. The Committee hoped that suitable ground might be brought under notice very soon; but, of course, the Council would have every opportunity of criticizing and approving of everything connected with this large new undertaking. As explained before, the Dalmarnock Gas-Works were completely obsolete, and situated in what was now a densely-peopled locality. Besides, they were unsuitable for the introduction of modern labour-saving appliances; and economy in production in a new modern works, would go a great length to pay interest on their cost. Dalmarnock gas cost upwards of 2d. per 1000 cubic feet more than it did in their other works. Unfortunately, coal this year would cost a very considerable sum beyond last year's supplies; but, being anxious not unduly to burden the citizens, the Committee in the meantime had resolved that the price of gas should remain the same. Thanks were due to the Engineer for his continued attention to the works and general policy; also to the Works' Managers, Treasurer, and other officials. The Committee hoped that the record of prosperity in the Gas Department would continue, and even increase. Mr. W. Stevenson, Vice-Convener, moved the adoption of the report and accounts, which were agreed to without comment. The members of the Town Council, it is apparent, have every confidence in the Committee on Gas Supply.

The income of the Greenock Gas Trust during the past year amounted to £41,354; and the expenditure, to £40,019—leaving a surplus of £1335. Out of this the Police Board, as already mentioned, have appropriated £1000. On Tuesday, the Police Board approved of the accounts for the past year, and of the estimates for the current year, which show an expected surplus of £1040. Mr. Mitchell moved that the price of gas be reduced, as from the survey in May last, from 3s. to 2s. 11d. per 1000 cubic feet. Mr. Campbell, in seconding the proposal

said he thought they were entitled to congratulate themselves on the past year's working. Treasurer Anderson, seconded by Bailie Watson, moved that no alteration be made in the price, on the ground that the surplus was not sufficient to justify a reduction. The reduction was, however, carried by 14 votes to 6. This is a very suggestive incident. Where gas undertakings are managed by corporations with a free hand, the temptation to make profit for the municipality out of them is often too strong to be resisted. Where the corporations are restricted by statute to expending any surplus they may make from the gas supply on the undertaking itself, there is not this temptation; and, as a consequence, the gas-works have a better chance of success. The latter condition is mostly to be found where there are gas commissioners; and the former where the gas undertaking is controlled by a committee of the corporation. Such committees are less concerned with the prosperity of the gas undertaking than they are with the reduction of the police rates. Here, for instance, we have the Burgh Treasurer, who is the financier of the Corporation, seeming to bear a grudge against the Gas Committee that they had not a larger surplus. Complaint is often made that, as time goes on, legislation is becoming so grandmotherly that everything is regulated by Act of Parliament; and the subject is so hedged round by statutory regulations, that freedom is becoming a vanishing quantity. The control of the gas undertaking in Greenock furnishes an illustration of the need, in some cases, for stringent, and even microscopic, legislation, because it shows that where certain powers have authority, they do not scruple to use it minisiously. Gas committees, or gas managers, placed as they are in Greenock, have little encouragement to do the best they can in the working of their department.

It is not quite pleasant reading; but it would be inadvisable not to communicate that the Special Committee of the Perth Gas Commissioners, who were appointed to inquire into the claim by Mr. G. P. K. Young, architect, of Perth, for £112 in respect of work done in connection with the preparation of plans for the new gas-works, and generally as to the management at the works, have completed their labours, and have come to a unanimous finding. (See p. 439.) The import of the evidence I need not give. My reading of it is that the Commissioners have gone about the whole proceedings in connection with the transference of the Corporation gas-works in such a blindfold way that it is no wonder mistakes have arisen. I do not know that they are even yet out of the wood in the matter. The so-called irregularities have been trumpeted loudly by the alleged discoverers of them. With the exception of Mr. Young's account, these irregularities have been mere trifles. This one seems to have been the result of a misunderstanding. Even it, I daresay, would not have been heard of, if there had not been a spirit abroad in the Commission to depreciate the late Convener of the Works Committee (ex-Bailie Wright), and all his work. The action of those who are responsible for much of an unpleasant nature which has occurred recently, seems to have been directed against a general policy, and to savour very much of an endeavour on the part of the tail to wag the dog. The Committee have agreed to recommend that Mr. Young's account be paid. Their report has yet to be considered by the Gas Commission; and the action of the Commissioners, when it comes before them, should be watched.

## GAS AND WATER COMPANIES STOCK AND SHARE LIST.

Referred to on p. 424.

| Issue.    | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME.                      | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue.    | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME.                                | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|-----------|--------|-------------------|-------------------------------|----------------------------|-----------------|---------------------|------------------------|-----------|--------|-------------------|-------------------------------|--------------------------------------|-----------------|---------------------|------------------------|
| £         |        |                   | p. c.                         |                            |                 |                     | £ s. d.                | £         |        |                   | p. c.                         |                                      |                 |                     | £ s. d.                |
| 590,000   | 10     | Apl. 15           | 10½                           | Alliance & Dublin 10 p.c.  | 23½-24½         | ..                  | 4 5 9                  | 75,000    | 5      | June 29           | 6                             | Malta & Medn., Ltd.                  | 4½-5½           | ..                  | 5 14 8                 |
| 100,000   | 10     | "                 | 7½                            | Do. 7 p.c.                 | 16-17           | ..                  | 4 8 8                  | 541,920   | 20     | June 10           | 5                             | Monte Video, Ltd.                    | 14-15           | ..                  | 6 13 4                 |
| 300,000   | 100    | July 1            | 5                             | Australian 5 p.c. Db.      | 105-107         | ..                  | 4 13 6                 | 617,946   | Stk.   | Feb. 24           | 9½                            | Newcastle & Gateshead Con.           | 235-240         | ..                  | 4 1 3                  |
| 200,000   | 5      | May 26            | 6                             | Bombay, Ltd.               | 61-63           | ..                  | 4 8 11                 | 252,355   | Stk.   | Jan. 3            | 8½                            | Do. 3½ p.c. Db. Stk.                 | 113-117         | ..                  | 2 19 10                |
| 40,000    | 5      | "                 | 6                             | Do. New, £4 paid.          | 41-5            | ..                  | 4 16 0                 | 150,000   | 5      | May 26            | 8                             | Oriental, Ltd.                       | 7-7½            | ..                  | 5 6 8                  |
| 380,000   | Stk.   | Aug. 12           | 12                            | Brentford Consolidated     | 275-280*        | ..                  | 4 5 9                  | 135,000   | 5      | "                 | 8                             | Do. New, £410s. pd.                  | 6-6½            | ..                  | 5 10 9                 |
| 240,000   | "      | "                 | 9                             | Do. New                    | 210-215*        | ..                  | 4 3 9                  | 15,000    | 5      | "                 | 8                             | Do. do. 1879, £1 pd.                 | 1-1½            | ..                  | 5 6 8                  |
| 50,000    | "      | "                 | 5                             | Do. 5 p.c. Prf.            | 140-145*        | ..                  | 3 9 0                  | 60,000    | 5      | Mar. 11           | 7                             | Ottoman, Ltd.                        | 5-5½            | ..                  | 6 6 2                  |
| 159,375   | "      | June 10           | 4                             | Do. 4 p.c. Db. Stk.        | 130-135         | ..                  | 2 19 3                 | 500,000   | 100    | June 1            | 6                             | People's Gas & 2nd M. of Chicago Bd. | 103-108         | ..                  | 5 11 1                 |
| 220,000   | Stk.   | Mar. 30           | 11½                           | Brighton & Hove Orig.      | 268-273         | ..                  | 4 4 3                  | 848,070   | 10     | May 26            | 6                             | River Plate Ord.                     | 9-9½            | ..                  | 6 6 4                  |
| 128,820   | "      | "                 | 8½                            | Do. A. Ord. Stk.           | 195-200         | ..                  | 4 5 0                  | 250,000   | Stk.   | June 29           | 4                             | Do. 4 p.c. Db. Stk.                  | 97-99           | ..                  | 4 0 10                 |
| 933,500   | Stk.   | Feb. 24           | 5                             | Bristol, 5 p.c. max.       | 127-132         | ..                  | 3 15 9                 | 250,000   | 10     | Apl. 29           | 10                            | San Paulo, Ltd.                      | 15-16           | ..                  | 6 5 0                  |
| 420,000   | 20     | Mar. 30           | 11½                           | British                    | 53-55           | ..                  | 4 1 9                  | 250,000   | Stk.   | Mar. 30           | 10                            | Sheffield A.                         | 245-248         | ..                  | 4 0 8                  |
| 50,000    | 10     | Aug. 12           | 11½                           | Bromley, Ord. 10 p.c.      | 25-27*          | ..                  | 4 5 2                  | 135,000   | Stk.   | Mar. 30           | 10                            | Do. B.                               | 245-248         | ..                  | 4 0 8                  |
| 75,000    | 10     | "                 | 8½                            | Do. 7 p.c.                 | 20-22*          | ..                  | 3 17 3                 | 209,063   | "      | "                 | 10                            | Do. C.                               | 245-248         | ..                  | 4 0 8                  |
| 500,000   | 10     | Apl. 29           | 6                             | Buenos Ayres (New) Ltd     | 9-9½            | ..                  | 6 6 4                  | 447,427   | Stk.   | Aug. 12           | 5½                            | South Metrop., 4 p.c. Ord.           | 140-143*        | -1                  | 3 14 7                 |
| 98,122    | Stk.   | June 29           | 4                             | Do. 4 p.c. Db. Stk.        | 98-100          | ..                  | 4 0 0                  | 5,600,000 | Stk.   | Aug. 12           | 5½                            | Do. 3 p.c. Db. Stk.                  | 101-104         | ..                  | 2 17 8                 |
| 150,000   | 20     | July 14           | 8                             | Cagliari, Ltd.             | 29-30           | -1                  | 5 10 0                 | 1,460,000 | Stk.   | July 14           | 3                             | Tottenham & A.                       | 285-295         | ..                  | 4 1 4                  |
| 100,000   | 10     | June 10           | 7                             | Cape Town & Dis., Ltd.     | 15-16           | ..                  | 4 7 6                  | 60,000    | Stk.   | Mar. 11           | 12                            | Edmonton B.                          | 205-215         | ..                  | 4 3 9                  |
| 50,000    | 60     | May 3             | 6                             | Do. 6 p.c. 1st Mort.       | 58-60           | ..                  | 5 0 0                  | 60,000    | "      | June 10           | 7                             | Tuscan, Ltd.                         | 11½-12½         | -1                  | 5 12 0                 |
| 550,000   | Stk.   | Apl. 15           | 13½                           | Commercial Oil Stock.      | 315-325         | ..                  | 4 3 1                  | 182,380   | 10     | July 1            | 5                             | Do. 5 p.c. Dbs. Red.                 | 160-163         | ..                  | 4 17 1                 |
| 200,750   | "      | "                 | 10½                           | Do. New do.                | 252-257         | ..                  | 4 1 8                  | 149,900   | 10     | July 1            | 5                             |                                      |                 |                     |                        |
| 200,750   | "      | June 10           | 4½                            | Do. 4½ p.c. Db. do.        | 148-153         | ..                  | 2 18 10                |           |        |                   |                               |                                      |                 |                     |                        |
| 800,000   | Stk.   | June 10           | 12                            | Continental Union, Ltd.    | 207-212         | ..                  | 5 13 2                 |           |        |                   |                               |                                      |                 |                     |                        |
| 200,000   | "      | "                 | 9                             | Do. 7 p.c. Prf.            | 197-202         | ..                  | 4 9 1                  |           |        |                   |                               |                                      |                 |                     |                        |
| 51,600    | Stk.   | Feb. 24           | 14                            | Croydon A 10 p.c.          | 310-315         | ..                  | 4 8 11                 | 746,164   | Stk.   | June 29           | 10½                           | Chelsea, Ord.                        | 313-318         | ..                  | 3 6 0                  |
| 168,400   | "      | "                 | 11                            | Do. B 7 p.c.               | 255-265         | ..                  | 4 3 0                  | 150,000   | "      | "                 | 5                             | Do. 5 p.c. Prf.                      | 170-175         | ..                  | 2 17 2                 |
| 555,000   | Stk.   | Aug. 12           | 5½                            | Crystal Palace Ord. 5 p.c. | 125-130*        | ..                  | 4 0 9                  | 160,000   | "      | Aug. 12           | 4½                            | Do. 4½ p.c. Prf. Stk., 1875          | 148-152         | ..                  | 2 19 3                 |
| 60,000    | "      | "                 | 5                             | Do. 5 p.c. Ord.            | 140-145*        | ..                  | 3 9 0                  | 175,785   | "      | Mar. 30           | 4½                            | Do. 4½ p.c. Db. Stk.                 | 157-162         | ..                  | 2 15 7                 |
| 466,090   | 10     | July 28           | 11                            | European, Ltd.             | 23-24           | ..                  | 4 11 8                 | 1,720,560 | Stk.   | Apl. 15           | 8                             | East London, Ord.                    | 225-230         | ..                  | 3 9 7                  |
| 354,060   | 10     | "                 | 11                            | Do. £7 10s. paid           | 163-173         | ..                  | 4 14 4                 | 654,740   | "      | June 29           | 4½                            | Do. 4½ p.c. Db. Stk.                 | 157-160         | ..                  | 2 16 3                 |
| 6,922,230 | Stk.   | Aug. 12           | 12½                           | Gaslight & Coke, A, Ord    | 291-296*        | +3                  | 4 2 9                  | 390,000   | "      | June 29           | 3                             | Do. 3 p.c. Db. Stk.                  | 103-105         | ..                  | 2 17 2                 |
| 100,000   | "      | "                 | 12                            | Do. B, 4 p.c. max.         | 120-125*        | ..                  | 3 4 0                  | 700,000   | 50     | June 29           | 7½                            | G'd Junction, 10 p.c. max.           | 115-118         | ..                  | 3 3 7                  |
| 665,000   | "      | "                 | 10                            | Do. C, D, E, 10 p.c. Prf.  | 305-310*        | ..                  | 3 4 6                  | 310,000   | Stk.   | Mar. 30           | 4                             | Do. 4 p.c. Db. Stk.                  | 142-147         | ..                  | 2 14 5                 |
| 30,000    | "      | "                 | 5                             | Do. F, 5 p.c. Prf.         | 152-157*        | ..                  | 3 3 8                  | 708,000   | Stk.   | Aug. 12           | 14                            | Kent                                 | 364-369*        | ..                  | 3 15 11                |
| 60,000    | "      | "                 | 7½                            | Do. G, 7½ p.c. do.         | 230-240         | ..                  | 3 2 6                  | 160,000   | "      | June 29           | 7                             | Do. New, 7 p.c. max.                 | 212-217*        | +2                  | 3 4 6                  |
| 1,300,000 | "      | "                 | 7                             | Do. H, 7 p.c. max.         | 193-198*        | +1                  | 3 10 8                 | 1,043,800 | 100    | June 29           | 10                            | Lambeth, 10 p.c. max.                | 298-303         | ..                  | 3 6 0                  |
| 463,000   | "      | "                 | 10                            | Do. J, 10 p.c. Prf.        | 305-310*        | ..                  | 3 4 6                  | 406,200   | 100    | "                 | 7½                            | Do. 7½ p.c. max.                     | 227-232         | ..                  | 3 4 8                  |
| 476,000   | "      | "                 | 6                             | Do. K, 6 p.c. Prf.         | 182-187*        | ..                  | 3 4 2                  | 350,000   | Stk.   | Mar. 30           | 4                             | Do. 4 p.c. Db. Stk.                  | 140-145         | ..                  | 2 15 2                 |
| 1,061,150 | "      | June 10           | 4                             | Do. 4 p.c. Db. Stk.        | 131-133         | ..                  | 3 0 2                  | 500,000   | 100    | Aug. 12           | 13½                           | New River, New Shares                | 425-430*        | ..                  | 3 1 8                  |
| 294,850   | "      | "                 | 4½                            | Do. 4½ p.c. do.            | 148-153         | ..                  | 2 18 10                | 1,000,000 | Stk.   | July 28           | 4                             | Do. 4 p.c. Db. Stk.                  | 140-145         | ..                  | 2 15 2                 |
| 958,000   | "      | "                 | 6                             | Do. 6 p.c. do.             | 198-203         | ..                  | 2 19 1                 | 902,300   | Stk.   | June 29           | 6                             | Southw'k & V'xhall, Ord.             | 166-171         | ..                  | 3 10 2                 |
| 70,000    | 10     | May 12            | 8                             | Hongkong & China, Ltd.     | 133-143         | ..                  | 5 10 4                 | 126,500   | 100    | "                 | 6                             | Do. do. 7½ p.c. max.                 | 157-162         | ..                  | 3 14 1                 |
| 8,800,000 | Stk.   | "                 | 10                            | Imperial Continental       | 210-215         | ..                  | 4 13 0                 | 489,200   | Stk.   | "                 | 5                             | Do. do. 5 p.c. Prf.                  | 168-172         | ..                  | 2 18 2                 |
| 376,400   | 100    | Aug. 2            | 4                             | Do. 4 p.c. Dbs. Red.       | 98-101          | ..                  | 3 19 8                 | 1,019,585 | "      | Apl. 15           | 4                             | Do. 4 p.c. A Db. Stk.                | 141-144         | ..                  | 2 15 7                 |
| 473,600   | Stk.   | Aug. 12           | 3½                            | Do. 3½ p.c. Db. Stk.       | 101-104*        | ..                  | 3 7 4                  | 1,155,066 | Stk.   | June 10           | 10                            | West Middlesex                       | 300-305         | +3                  | 3 5 7                  |
| 560,000   | 100    | Apl. 1            | 5                             | Met. of Mel.- 5 p.c. Db.   | 111-113         | +1                  | 4 8 10                 | 200,000   | "      | Aug. 12           | 4½                            | Do. 4½ p.c. Db. Stk.                 | 162-165         | ..                  | 2 14 7                 |
| 250,000   | 100    | "                 | 4½                            | bourne / 4½ p.c. Db.       | 107-109         | ..                  | 4 2 7                  | 200,000   | "      | Mar. 11           | 3                             | Do. 3 p.c. Db. Stk.                  | 104-106         | ..                  | 2 16 7                 |
|           |        |                   |                               |                            | * Ex div.       |                     |                        |           |        |                   |                               |                                      |                 |                     |                        |



In pursuance of their policy of making things disagreeable for their Manager, the Forfar Gas Corporation held a meeting on Monday to consider the estimates for the current year which had been prepared by Mr. Waddell. These showed a total estimated expenditure of £5670; the estimate for the working and collecting department being £3922, and for funds, interest, annuities, &c., £1748. The gas-rate, at 3s. 9d. per 1000 cubic feet (less discount) was estimated to produce £5060; and residual products, £600—showing an estimated deficit of £10. A footnote states that, by the adoption of sulphate of ammonia plant, there would be an increased revenue from residuals of £130. The rate for gas last year was 3s. 9d. Bailie Patullo, Convener of the Gas Committee, moved the adoption of the estimates. They were providing in the accounts, he said, £270 for the sinking fund; £145 for the contingent fund; £90 for arrears to be written off; and £90 as the deficit upon the past year. The arrears for residual products were proposed to be paid off in two or three years. Mr. Esplin seconded. Mr. Christie said he found the estimate for coal was £70 less than last year; retorts, £14 less; furnishings and repairs, £296 less; and wages, £95 less. The reduction in the wages astonished him, seeing that they expected to make £91 worth more gas than they actually made last year. Bailie Patullo said that a great deal of the additional wages last year was eaten up in extras which would not occur this year. Mr. Christie attacked the system of financing, which, to tell the truth, has not so far been of the most approved description, as was admitted by Provost M'Dougall. Had Mr. Christie confined himself to an attack on the financial policy, there would have been no reason for calling his conduct in question; but he asserted that the making up of the accounts in a manner not to be commended was a work for which Mr. Waddell was personally blameworthy. It was in vain Mr. Waddell protested he had nothing to do with the making up of the accounts, which is the work of the Auditor; Mr. Christie was not to be turned aside in his demand for the appointment of a couple of qualified accountants "to make a full and complete investigation into the affairs of the gas-works." Mr. Waddell said that, for his part, he courted a full investigation into his books; and it was then resolved to appoint two accountants to make the inquiry suggested. How does this zeal on Mr. Christie's part, for purity of finance, appear when looked at in the light of Mr. Waddell's remark that his books at the gas-works were open to any member of the Corporation who chose to inspect them, but that Mr. Christie, who had made the attack, never glanced at them? This is not enlightened administration of a public department. Mr. Christie poses as an economist; but I venture to say that his agitations have an effect in the opposite direction. Where confusion is, there is always waste.

The Johnstone Gas Commissioners have, in consequence of the growth in the consumption of gas, resolved upon the telescoping of one of the three holders at the works, increasing its capacity by 120,000 cubic feet. The cost is to be about £1200. The make of gas last year was 32½ million cubic feet; and if the increase this year be in the same ratio, it will amount to about 36 million cubic feet.

The Huntly Gaslight Company, which is described as the oldest local joint-stock company, is reported to be in a very healthy and flourishing

condition. A dividend at the rate of 6½ per cent. has been declared for the past year; and the price of gas has been reduced by 5d. per 1000 cubic feet—the price for lighting being now 6s. 8d. per 1000 cubic feet, and for cooking and heating 5s. Oil gas is used.

The Portsoy (Banffshire) Police Commissioners, who recently acquired the undertaking of the local Gas Company, have resolved to borrow a sum not exceeding £1400, upon the security of the rates, at 4 per cent. interest, for the repair and renewal of the gas-works plant.

#### CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Aug. 20.

**Sulphate of Ammonia.**—The activity referred to in last week's report has continued throughout this week, and a further substantial advance has been established; the closing quotations being £10 to £10 2s. 6d. per ton delivered f.o.b. at the ports. A fair amount of buying has been done by consumers; but advanced prices are somewhat checking further business. In the forward position, too, makers have advanced their ideas, and £10 per ton is now generally required, delivered f.o.b. at the ports, October-March delivery.

**Nitrate of Soda** is somewhat firmer; and 7s. 9d. per cwt. is the closing quotation for fine quality.

LONDON, Aug. 20.

**Tar Products.**—Pitch is quotable slightly dearer; but it is doubtful whether any real business has been transacted at the higher prices. The demand for creosote continues; and picklers of timber are doing a larger trade this season than ever before. There is no change in the value of anthracene; but little outside lots are being hawked all over the market, seriously damaging the position. Disinfecting carbolic acid is moving off freely, as is natural at this time of year; while 60's carbolic maintains its value, there being little offering. Some high competitive prices have recently been paid for tar in the Lancashire district, which are certain to leave the buyer a loss unless products improve in value. Average values obtaining during the week are: Tar, 12s. to 16s. Pitch, east coast, 24s.; west coast, 20s. Benzols, 90's and 50's, nominal, 9½d. Toluol, 1s. 2d. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 1½d. Crude, 30 per cent., naphtha, 4½d. Creosote, 2½d. Heavy oils, 42s. 6d. Carbolic acid, 60's, 2s. Naphthalene, pressed, 55s.; drained salts, 30s. Anthracene, nominal, "A" 4d.; "B" 3d.

**Sulphate of Ammonia** has made a rapid advance in price during the past week, and is to-day quoted at all ports at about £10 to £10 2s. 6d., less 3½ per cent. There is an undoubted scarcity of sulphate, and those who have sold without covering themselves are finding much difficulty in implementing contracts.

**Another Acetylene Gas Company.**—A Company has lately been formed in Paris, with a capital of £80,000, to undertake lighting by acetylene gas. The title is La Compagnie Urbain d'Eclairage par le Gaz Acetylene.

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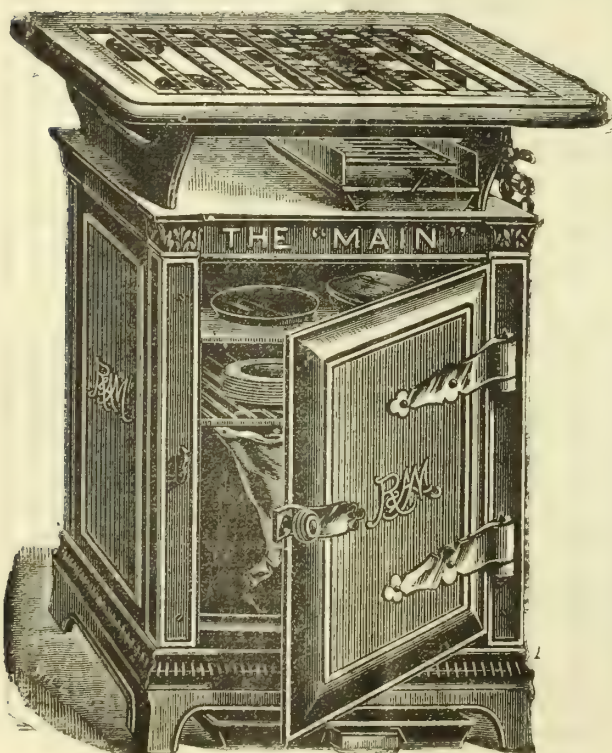
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## EDITORIAL NOTES.

## Multiplication or Unification in the Municipalization of London.

A NOTEWORTHY meeting of representatives of Metropolitan Local Authorities has recently been held to receive a report from a Committee appointed at a conference convened in June, to consider certain proposals for the creation of Metropolitan Municipalities. Bills to effect this purpose were promoted last session by Sir J. Blundell Maple and Mr. Thomas Lough. The Committee have examined the proposals of these measures, and have agreed upon a draft Bill embodying the best provisions of both, as well as introducing others. This is chiefly the joint work of the Chairman of the Committee (Mr. Wheeler, Q.C.) and the Honorary Secretary (Mr. Smith), aided by Sir J. Blundell Maple. The Bill is not put forward as a complete reform of the Metropolis Management Act, and all the Acts affecting local government in London. It is merely offered as an attempt to provide London with the opportunity of elevating its local administration from the existing grade of the "Vestry" to that of the "Municipality." The very notion of subdividing the Metropolis in this way for the sole purpose of local self-government is scouted by the "Progressives" of the London County Council, who deem themselves competent to do it all themselves—especially if they are first permitted to build a palace, and get control of the police. There are a few considerations peculiar to London, however, which Progressivism is apt to overlook. Possibly the party chiefly represented at the conference now under notice—which was presided over by Lord Onslow, who is the leader of the Moderate section of the London County Council—overrates these same considerations. The great thing is that they exist. First and foremost is the size and population of London. It is very difficult to realize the facts. One is prone to think of London as a great town, but not to remember that no other town of the Kingdom is to be named in the same breath with it as regards population. It does not help much to know that the area under the London County Council has a population equal to that of Portugal, and approaching that of Belgium. It is more to the point to observe that, with one or two exceptions, every one of twenty parishes scheduled as ripe for municipalization in the Bill is more populous than one or other of the thirty-three "great towns" of the Registrar-General's classification. Only three of the great English towns—Liverpool, Manchester, and Birmingham—surpass in rateable value the highest London parish total. The question is whether this statistical statement proves the case for multiple as against single municipalization. The view taken by "The Times" is that "these considerations alone are sufficient to show that the county itself is too unwieldy to be subject to a single Municipality, and that the somewhat discredited Vestries ought no longer to retain powers which in the past they have not always exercised with any marked degree of efficiency." The argument is not convincing. If the City of London had been reformed betimes, and had exhibited powers of natural growth in the same way as the Corporations of Glasgow or Liverpool, there would not have been this outcry against the unification of London municipal government on the score of the size or populousness of the area. The Lord Mayor would have served as the figure-head for all London as well as he now does for the City; and no London County Council would have been needed.

It is not the size of the one London local governing authority that is to be dreaded, but the artificiality of it. It is late in the day to make a local constitution for London, and then pretend that it is a natural growth. More than half the "Progressive" members of the London County Council have no natural connection with the constituencies which they are supposed to represent. It is the same with the other party. Would district Municipalities create that local patriotism which is so markedly deficient in the case of the existing Metropolitan Parish Authorities? It is impossible to answer such questions off-hand, or with any reference to *a priori* considerations of population and rateable value. St. Pancras may be richer and more populous than Rochdale; but this does not alter the facts that Rochdale is a self-centred town, while St. Pancras is only a name for a geographical division of a larger settlement which has its centre elsewhere.

The consideration that nobody proposes to disestablish the London County Council shows that, by common



consent, the London government must for some purposes be centralized. How far this centralizing principle can be usefully and economically carried, is a problem not easy of solution. Progressivism objects to the devolution of powers in Metropolitan self-government, because, for one reason, it would put a stop to the municipalization of the water and gas supply, the tramways, and many other services. But, on the other hand, it might be asked if an overweighted Central Municipality could be trusted to manage such enterprises successfully. Is it the fact that the London County Council has become nearly as officer-ridden as the Metropolitan Board of Works which it superseded, and for very much the same reasons? It is asserted of many of the functions of local government that, in so far as they have devolved upon the Council, they have been delegated to Committees, which have been so overloaded with work as to be in danger of getting through a good deal of it in a very perfunctory way, and of leaving to permanent officials, at the close of a protracted sitting, some of the matters which the members should have considered and decided themselves. This is the old story over again.

#### The Welsh Coal Strike.

SCARCELY had our last week's prognostication as to the duration of the Welsh coal strike seen the light, than we stumbled upon several local newspaper articles dealing with the subject, one of which was actually headed "Settlement of the Coal Trade Dispute." This looked as if our gloomy forecast had already been disproved; but perusal of the article showed that the writer only meant to indicate the means whereby, in his opinion, a settlement might be arrived at. Such a title is, in these circumstances, misleading. There is no sense in crying "Peace!" when there is no peace. It appears matters are moving towards a settlement; but still the old obstacle of divided counsels among the men stands in the way of an agreement between them and the masters. It is locally reported, probably with truth, that the ostensible differences between the parties are no longer the actual ones. One by one the strikers have dropped the crude Collectivist "principles" which they had been persuaded to take into action with them, and they are believed to be willing to accept something like the masters' terms, if only the latter are based upon a minimum wage. It is suggested also that their original demand for an independent umpire as chairman of a new Conciliation Board might be modified in the sense of making the chairman merely an adviser, or go-between, without compulsory powers.

At the beginning of last week, it was reported from Cardiff that unless the men made up their minds within a few days as to what they wanted, the masters would be obliged to post notices stating that work in the pits could only be resumed at a further reduction of wages. The committal of two of the strike leaders to prison for intimidation appears to have had a sobering effect upon the others. The emigration of a number of Welsh strikers to the neighbourhood of Chesterfield, where they attempted to do a bit of "blacklegging" at the Shirebrook Colliery, which is the scene of a small local strike, evoked an indignant protest from the Derbyshire miners' agent. The Welshmen were notified that whatever it cost to send these travellers back again would be stopped out of the Derbyshire donation to Wales. The latest news from South Wales is that the men's Provisional Committee held a full meeting at Pontypridd on Thursday, at which the great majority favoured the immediate reopening of negotiations with the owners on the basis of a sliding-scale with a minimum; the men's representatives being given a free hand as to the amount of the latter. The Committee thereupon decided to ask the employers to meet them in conference on Saturday. This request was immediately granted; the owners' Committee being in session at the time. Accordingly, there was a joint conference on Saturday, when the men's representatives urged the employers to recognize the principle of a minimum wage. This, however, they declined to do. They offered the renewal of the old sliding-scale agreement, to continue in force till Jan. 1, 1902, and to be terminable at six months' notice on either side; the abolition of the monthly holiday; and an immediate advance of 5 per cent. above the wages in force on the 31st of March last. They also consented to add a clause granting the workmen the right to give six months' notice of the termination of the agreement at any time after Sept. 1, 1899, in case wages are ever reduced below  $12\frac{1}{2}$  per cent. above the standard

of 1879. But, in view of this concession, they require that the terms of the agreement should be for four years from Jan. 1, 1898, instead of three years. The men were allowed until Thursday next to decide whether or not these terms should be accepted, which it is thought they will be.

#### Technical Instruction by the American Gaslight Association.

AN interesting experiment is being tried in the United States, in the name of the American Gaslight Association. There has been in existence—for two or three years—a Committee of this Association on Education. We learn from our contemporary the "American Gaslight Journal" that this Committee has done useful work in a quiet way by teaching the principles of gas manufacture to those employees in American gas-works who desired to fit themselves for occupying minor positions of responsibility. As usual, the burden of this work fell to one man who was willing to take it. This was Mr. Walton Clark, a gas engineer known beyond the limits of his own country—wide and elastic as these are—as a sound technician endowed with the gift of adequate powers of expression. Mr. Clark now feels that he cannot continue this labour; and the knowledge that he was about to give it up has aroused some of his professional brethren to make a fresh effort involving the organization of this important work upon a firmer basis. Accordingly, the other members of the Committee have issued a circular inviting subscriptions from gas companies and engineers to form an educational fund of not less than \$3000 per annum, for five years certain. Subscriptions are to be pledged for this period, not to the Association, but to a Board of Trustees chosen in the first place by the Association. The appointment of Lecturer on Gas Manufacture would rest with the Trustees; and it is suggested that if the same man is elected to the office of Secretary of the Association, the combined position might prove of sufficient attraction to secure a really able technician. The expectation is also held out that the consolidation of duties thus shadowed forth might lead to the establishment of permanent headquarters for the Association, "where a reference library" could be collected, and where special efforts would be "made to keep on hand all data as to the engineering, legal, commercial, and municipal branches of the business." It will be interesting to watch the effect of this appeal, and, if it succeeds in the initial stages, to follow the course of the movement. At the risk of giving offence to some of our worthy friends "on the other side," we venture to express the hope that the gentleman who may be appointed to teach the young American gas idea how to shoot, will be a man after the heart of the true native leaders of the profession in all respects, and not least in the liking for writing and speaking plain English. Somehow, many American technicians and men of science with university credentials fall lamentably short of the standard of plain, simple speech which really well-educated men enjoying the high privilege of using the English language for their own observe all the world over. Thus we get a writer on gas subjects, with a handle to his name, discussing "the apparent *antithesis* (?) between the wrecking "and incendiary power of an explosion." What has the name of a figure of speech to do with gas explosions? Or why, when a newspaper reporter wishes to convey the information that a certain gas manager is doing his duty to the satisfaction of his company, should it be thought necessary to characterize him as the "bow anchor" of the undertaking, and his conduct as "keeping the . . . gas "vessel well abreast of the tide of the day"? This sort of writing is irritating and wearisome to read, and it comes of want of a word of warning in the early days.

#### Profit-Sharing and Co-Operation.

AN interesting little discussion upon the mutual bearings of profit-sharing and co-operative production and dealing has sprung up after the National Co-operative Festival. Earl Grey, speaking at the festival, remarked that the great Wholesale Society had abandoned the principle of profit-sharing which was in vogue when it started; and he appealed to it to return to the earlier and better way. The present policy of the Wholesale Society is to restore all surplus profits to purchasers, for the reason that these are as a rule worse off than the Society's own well-paid staff. Lord Grey argues that by this exclusive regard for the purchaser, the Society deprives itself of the power of helping its employees to become co-partners, even as the South



Metropolitan Gas Company's servants are being elevated into shareholders. Lord Grey's arguments were flouted by a Mr. Ben Jones, who in turn was called to account by the veteran Mr. George Jacob Holyoake. It is a curious point. A well-argued contribution to the discussion, by Mr. George Henderson, has been published as a letter to the "Daily Chronicle." The writer asks, What is profit? And he finds the answer in the difference between the price paid for goods by the dealer and that which he receives for them. Out of this margin must come the charges for the dealers' capital, labour, and "leakage." Assuming the interest on capital and the wages of labour to be fixed, and the leakage to be amply covered, to whom does the balance of profit belong? "The co-operator's ideal is the interception of undue taxation in the distribution of goods. We have seen that, to be certain that just and equitable charges should be met without difficulty, a higher price than that paid for the goods was charged to the purchaser. If anything remains after discharging these claims, it is due to him that it be returned, and to each purchaser in the same proportion, as it would have been theirs if only the exact amount necessary for interest, labour, and leakage had in the first instance been put on as profit." From this point of view, a gas undertaking administered by a Scottish municipality is a true co-operative organization.

#### The Trades Union Congress Programme.

THE Trades Union Congress at Bristol promises to furnish some curious matter for the newspapers to report and comment upon. The full programme of the proceedings has been approved and issued; and as this contains 86 resolutions to be submitted to the congress, the cast-iron rule which forbids the introduction of unauthorized subjects of discussion at the meetings will be justified. Year by year the process of eliminating the less reputable hangers-on to the cause of "Labour" from these congresses has progressed, until now it looks as if those who will speak in the name of Trade Unionism at Bristol are to be actual working men. Yet one could wish these supposititious "practical men" were more practical. The resolutions to be disposed of by this year's congress are for the most part only the warmed-up remainders of old controversies, of the merits of which working men know no more than the rest of the community. What, for instance, can the Trade Unionists tell the world concerning the taxation of ground values? Why should they trouble themselves with the question of forced labour in Bechuanaland, or with bi-metallism? Then, we notice that the Gas Workers' Union propose that any fresh revenue derived from the taxation of ground values should be ear-marked for the purposes of promoting technical education, extending free libraries, baths and washhouses, and the erection of artisans' dwellings. This is greatly to the credit of the gas workers, who may be supposed to be professionally conversant with the merits of the bath, while their abundant leisure enables them to make full use of public reading-rooms. It is stated that the gas workers also desire the amendment of the Workmen's Compensation Act, on the lines of a Bill drafted by Mr. Edward Browne, barrister-at-law. We are unhappily ignorant of the terms of this scheme of legislation, but would suggest that the working of the present Act might well be watched for a year or two before any further patching of the law is attempted in the interest of sections of workpeople. From the Trade Union standpoint, the most important question to be submitted to the congress is that of the federation of Trade Societies. A Committee was appointed at the last congress to inquire into and report upon this matter; and there are three schemes in the field for dealing with it. The policy of the Parliamentary Committee in regard to the engineers' strike is to be criticized. This should form a piquant item of the proceedings.

**The Prizes of the Societe Technique.**—The last number of "Le Gaz" contains particulars of the prizes offered by the above-named Society. The two most important are each of £400—one being for a new incandescent burner of marked superiority as compared with those now obtainable; and the other the reward for some distinct improvement in appliances employed in the manufacture or use of gas. Prizes to the total amount of £320 will also be awarded for the best papers on any subject of interest to the gas industry; and premiums of £10 will be given to the authors of the best papers read at this year's congress. The next annual meeting will be held in Paris in June, 1899.

## WATER AND SANITARY AFFAIRS.

SO-CALLED "indignation meetings" and protests respecting the restriction of the East London water supply, may be very well disposed of by the remark of a morning contemporary that "the politics of the drought are rapidly developing." All the meetings and protests that agitators of the County Council school can possibly concoct, will not bring another drop of water into the Company's reservoirs, nor hasten the arrival of the rainy season. The distribution of storage jars, and the sending round of water-carts with free supplies, are good and practical measures. So also the visits of Sanitary Inspectors to see that a due amount of flushing is carried out. The distribution of disinfectants is likewise to be commended; and if there are to be any meetings, then such as take place between the Local Authorities, or other parties, and Mr. Bryan or the Directors of the Water Company, are likely to be of service. What help is to be obtained by an appeal to the Railway and Canal Commissioners, under the powers of Mr. Chaplin's Act, we are at a loss to conceive. No tribunal can compel the Company to supply water which does not exist. There seems to be an idea prevailing that the East London Company could get an enlarged supply if they would submit to have their dividends reduced by purchasing what is wanted from other Companies. There is thus an inveterate forgetfulness of the fact that, for the purposes of supply, there must not only be water but works. The East London Company are drawing water from the Thames at Sunbury; and there is plenty of water in the broad river. But the main through which the water has to flow will not transmit more than ten million gallons per day; neither is it legal for the Company to take more, except when the water is above flood-level, when of course the Conservators would be very willing to get rid of it, if the 36-inch main would take it. Recourse to the Kent Company simply results in getting as much as will flow through a couple of 4-inch mains in the Blackwall Tunnel. In the case of the New River Company, their contribution of 4 million gallons a day is readily obtainable through the medium of the River Lea. As for the other Companies, it taxes the wit of man to know how they are to render help, except by modes of communication which will be quite unavailable until the present crisis has passed away. Major-General Scott, of the Royal Engineers, who went over the ground last week in his capacity as the Official Water Examiner, must know if any engineering device can bring a further supply of water into East London; and if he has such knowledge, we should expect him to give the Company and the consumers the benefit of it.

At the meeting of the East London Directors on Thursday, it was unanimously resolved to "continue to purchase, as heretofore," all the water that could be spared by the New River Company, as well as any further supply that could be obtained from other Companies. This is action; and no clamour from outside, or pressure from the powers that be, can carry the matter further. There is, indeed, something more going on in the shape of distribution. The Company are putting up an enormous number of stand-pipes on the constantly-charged fire-mains; and these are found of immense service to the people. The Directors have also endorsed Mr. Bryan's promise to defray all the expenses incurred by the Local Authorities in assisting the people to obtain water and to store it. The effect of all this is that the population are receiving water at the rate of at least 26 gallons per head daily. How many towns and villages would be glad of such a supply! This is being accomplished—as shown in the admirable letter sent forth by Dr. Smee—with a rainfall nine inches short since last October, and while the water-level in the chalk is going down at the rate of about half an inch per day. Dr. Smee further shows that an East London "water famine" is equal to the normal supply of many towns and districts in England. But London has a County Council imbued with Progressive and Socialistic notions, and intent on persuading the inhabitants that the water supply will never be right until the Council supersedes the Water Companies. The dilemma of the East London Company—largely brought about by the Council itself—serves as a convenient basis for intensifying the agitation which is to sweep away all the Companies. If we only had a Parliament that was subservient to Spring Gardens, the question



of buying the Companies at County Council price would assuredly be "rushed;" the case of East London prompting the phrase "the time has now arrived." As it is, the utmost is being made of a restriction in the water supply which has been amply justified by the circumstance that all through last week the six hours flow was steadily maintained, and the peril of exhausting the reserve store has so far been averted, though it is to be feared the danger still exists. If only some further "restriction" could be brought to bear upon the waste of water which goes on in East London, there would be less occasion to "restrict" the supply; indeed, any such necessity might never arise. Even such a simple provision as the retention of house cisterns might have prevented the present distress, and such is the testimony of the correspondent of "The Times." As to the waste which is going on, the "Standard" describes much of it as "wanton and wicked," creating a necessity for a further limitation of the supply.

There is one point on which some explanation would seem to be most desirable. When receiving a deputation from the Hackney Vestry, Mr. Bryan is reported to have said that the River Lea was flowing at a lower level than had been known for years. Also, the experience of 1895-6 proved that all the experience of sixty years was not safe; the consequence being that the Company went to Parliament and got their Bill through last session. Of course, this signifies the session of 1897. Mr. Bryan, it is alleged, went on to say: "This experience will necessitate the 'Company looking further afield to extend its works.'" If Mr. Bryan had said "further ahead," we could understand his words to mean further on in order of time. But the expression "further afield" seems to imply a fresh locality; and this is the meaning which appears to have been attached to Mr. Bryan's words by Mr. Whiter, who headed the deputation. This gentleman stated at a subsequent meeting of the Hackney Vestry, in reference to the East London works, that it was generally admitted the present sources of supply were pumped out; and that, even if the Company continued the supply, they would have to go "further afield for the water." We cannot imagine that this is the case, or that Mr. Bryan intended any such inference to be drawn from his words. The phrase "further afield" has got into men's mouths, and may be taken to mean going to Wales or anywhere else where water may be found.

The Local Government Board report on the typhoid epidemic which visited Maidstone in the autumn of 1897, was received by the authorities of the borough last Friday. The three Inspectors who were appointed as Commissioners to conduct the inquiry into the cause of the epidemic are unanimous and unhesitating in ascribing the outbreak to the pollution of the water supplied by the Maidstone Company from their Farleigh springs. Yet a determination of the exciting cause scarcely covers all the facts. Three contentions which were put forward by the Company at the time of the inquiry receive consideration and introduce some special features. One contention is that, although the bulk of the fever cases occurred within the areas supplied with Farleigh water, yet there were many in localities outside these areas; and that these cases must have been due to other causes than consumption of that particular supply. The Commissioners say that no evidence was given either for or against this hypothesis; and that it is therefore impossible to decide whether the persons so attacked had contracted the fever by casually drinking Farleigh water, or, as suggested by the Water Company, in other ways. The second contention is that 357 cases of typhoid fever were notified after Oct. 10; whereas all the Farleigh supply, except the Ewell and the Big Church springs, was cut off from Maidstone sixteen days before that date. Hence the Company argue that these 357 cases cannot reasonably be attributed to that supply. The Commissioners consider that this contention is "in the main a just one;" and they admit that nearly all the cases notified after Oct. 18 (some 280 in number) are to be regarded as having had a cause other than the consumption of Farleigh water. According to the report, this cause is to be sought in the existence of defective drains and sewers; and the consequent fouling of the soil by leakage. The third contention of the Water Company is described as "probably in some degree admissible;" and it elicits from the Commissioners an expression of opinion that "many of the cases of typhoid fever in the 'borough of Maidstone were due to defects of drainage

"and sewerage, with consequent pollution of the soil under-lying the town."

It will thus be seen that the Farleigh water cannot be held entirely responsible for the disastrous epidemic under which Maidstone so signally suffered. The case is doubtless complicated by the consideration that infection from polluted soil and from defective drains was consequent on a previous reception of infective material; and the infection so set up could only have played a subordinate part in the earlier stages of the epidemic. One thing, however, seems to come out clearly—that the fever epidemic would never have assumed the dimensions it did, but for the insanitary conditions by which the town was characterized. The Commissioners charge the Town Council with having greatly neglected their duty in this respect, although the Medical Officer of Health had repeatedly warned them "in the plainest language" of the risks to which the health of the inhabitants was exposed by the insanitary conditions that were allowed to continue. The result of such neglect is indicated by the statement of the Commissioners, that the failure of duty in this respect on the part of the Town Council "led to the gravest consequences." Blame, therefore, does not seem to rest exclusively with the Water Company. The verdict of the Commissioners attributes the origin of the epidemic to the pollution of the Farleigh water; but the Town Council are evidently responsible for the extraordinary extent of the mischief which ensued.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 498.)

BUSINESS on the Stock Exchange last week was as quiet as it well could be; and it seemed as if the dead low-water mark of autumnal slackness had been reached. But in spite of this, the general tendency was decidedly favourable all round; and at any other time of the year, things would have been booming. As it was, some fairly good advances in price were made, although there was so little to stir them up; and hardly anything, except some rails which were out of favour, went back. There is no change or sign of change in the condition of the Money Market. The Bank rate is purely nominal; and "no reasonable offer refused" is nearer the correct quotation. In the Gas Market, business was just as quiet as in other departments. Occasionally it happens that from special causes Gas securities take a line of their own, apart from the ruling tendency in other markets; but the inactivity last week was universal. Movements in price were few in number, and slight in degree. They were also extremely irregular—moving in obedience to special influences; so that there was no general characteristic of the week. In Gaslights, very moderate business was done in the "A." The quotation was advanced a point; but the figures at which transactions were marked did not vary much all through the week. A few dealings in the secured issues seemed to indicate firmness, especially in debenture stocks. South Metropolitan was dealt in to a slight extent, and was fairly steady. Commercials effected only one or two transactions at middle figures. The Suburban and Provincial group exhibited their usual quiescence. Sheffield rose a couple of points, on the strength of the last accounts. British selling price went back a point. In Alliance and Dublin, the old stock which had been standing in advance of the new, fell back, while the new took its place in front. The Continental Companies were quiet and unchanged. Among the remoter undertakings, the only alteration was an advance in River Plate debenture. Dealings in Water were limited, and quite devoid of interest, except that East London receded a little through fear that measures rendered requisite to contend with the drought may prove costly.

The daily operations were: Business in Gas was of the lightest description on Monday; and quotations did not vary. There was a shade more animation on Tuesday; but it did not amount to much. Gaslight "A" improved 1; and River Plate debenture, 1; but British receded  $\frac{1}{2}$ . On Wednesday, the volume of transactions fell back to its smallest proportions. Sheffield rose 2; and Alliance new,  $\frac{1}{2}$ ; but ditto old fell 1. In Water, East London receded 2. Business remained almost stagnant on Thursday; and no change took place in Gas. In Water, East London fell 1 more. Friday and Saturday may be summed up together as quiet and unchanged.

### ELECTRIC LIGHTING MEMORANDA.

The Electric Lighting of Glasgow—Sound Electricity Supply Finance—More Alarms and Explosions.

THE development of the Glasgow Corporation electricity supply undertaking is worth watching by those who wish to know the truth about this class of business. The Glasgow Corporation



do not cherish any illusions respecting the place of electricity in the local resources. To hear the talk in some small towns, one would fancy that everything depended upon the answer given to the momentous question whether the local authority should undertake the supply of electricity, or leave it to a company. Glasgow has long passed this stage in the progress of municipalism. Whatever the city needs in the way of public service, is provided by the Corporation; and it is supplied at cost price. There is a "sweet simplicity" about this programme which commends it to the respectful admiration of those who hate the economical fallacy of "robbing Peter to pay Paul," which lingers in the affections of too many English municipalities. Glasgow does not go into the tramway business, or gas supply, or electric lighting in the supposed interest of the "ratepayers," as distinct from the whole body of the community. Neither does one Corporation Committee expect to be coddled by another, and its expenses covered up out of the public view. It is for this reason, among others, that Glasgow electric lighting is so interesting. There is plenty of money wherewith to carry on the business. Capital is not stinted where cause can be shown for laying it out; but every branch of municipal enterprise is expected to pay its way, or at least to stand upon its own bottom.

Glasgow has been supplying itself with electricity for six years, and yet finds a capital of considerably under £200,000 enough to employ in the undertaking. The capital expended at the end of the last municipal year, to be precise, was £188,034, upon which a gross revenue of £34,371 was received. The total working costs amounted to £16,900. The gross profit works out to 10.59 per cent. upon the capital, which is a very comfortable condition of affairs. After paying interest on loans, amounting to £4814, more than double this amount, or £10,482—being after the rate of 6.35 per cent. on the capital—was appropriated for sinking fund and depreciation. There is no other municipalized electricity supply undertaking that does anything like this. The majority of such undertakings listed in an electric lighting contemporary confess a deficit; and of those that show a profit only a handful make any provision at all for depreciation. Glasgow, at any rate, is not living in a Fool's Paradise, and does not mean to furnish a "frightful example" of municipal improvidence to a gaping universe. The Corporation will be all the more confident in embarking on the greater electrical ventures that lie before them in connection with tramway working, now that the technical and financial aspects of electricity supply for lighting purposes are so well known.

There has been a cessation of street-conduit explosions for so long that quite an air of novelty surrounds the incidents at Oldham and near the Regent's Park, where, as reported, coal gas and an electric spark again foregathered recently, with alarming results. The Oldham explosion was due to the unintentional combination of Corporation gas with Corporation electricity. Consequently very little fuss was made about it either in the electrical or general press. One of our electrical contemporaries, however, is very severe in its comments upon the conduct of the gas men (in the employ of The Gaslight and Coke Company) who had to do with the Regent's Park affair. The conduit in which this explosion occurred belongs to the St. Pancras Vestry. It blew off three heavy manhole covers, shattered several insulators, and displaced the copper strip over a distance of about 200 yards. "The cause of the explosion was undoubtedly an escape of gas from a faulty service-main, and its subsequent ignition; but how the latter actually took place is, as is usual in such cases, not absolutely certain." The fact of there being an escape of gas in the neighbourhood was discovered by a lamplighter; and men set to work to see to it. But they did not, report says, communicate the intelligence to the electric light generating station. It is suggested that the Gas Company's men were most likely still searching for the escape at midnight, "probably with lighted torches, as is their wont; and though the nearest manhole which was blown out was at a distance of some 70 yards from the gas escape . . . there is a possibility of the gas having been ignited at one of the test-holes made by the men, and that the flame travelled along to the site of the explosion." Of course, it was all the gas and the Gas Company's men. "The insulators in the conduits appeared to have been in good condition, and bore no traces of sodium."

One seems to have heard a good deal at one time and another about these St. Pancras electricity conduits—not always to their advantage. The explosion on this occasion hurt the electricity-works more than anything or anybody else. "The short circuit resulting from the explosion pulled up one of the generating sets completely; and the pressure dropped to a very low value. One side of the three-wire system had to be shut down for about an hour and one half (*sic*), until the supply was cut off from the sections directly affected. No time was lost in reconnecting the houses on this section through temporary cables; and by Saturday evening every house was again supplied. Some of the feeders appear to have been seriously affected by the excess of current they had to carry momentarily. At 3.30 on Tuesday morning, another short-circuit occurred, of a less serious character." St. Pancras is one of those Local Authorities that do not see the necessity of making provision for the depreciation of their electric lighting plant. But some of their plant appears, from the circumstance above referred to, to be depreciating itself with inconvenient haste.

## THE REPORT OF THE PETROLEUM COMMITTEE.

### FIRST NOTICE.

THE report of the Select Committee on Petroleum has been issued; and, in view of the magnitude of the interests concerned directly or indirectly with the subject of this inquiry, we now propose to give an abstract of, and commentary on, the findings of the Committee. We shall treat the matter with regard to the paramount consideration of public safety, without much respect for the particular interests of the oil or lamp trades, but with due reference to the points of contact of the mineral oil and gas industries. Rarely has a Committee of Parliament been charged with a more difficult and thankless duty than this investigation; and there has hardly ever been a similar instance of so barefaced a capture of a body appointed to serve the public, and its misdirection to subserve the ends of a particular branch of a trade. The Committee were ordered to "inquire into and report upon the sufficiency of the law relating to the keeping, selling, using, and conveying of petroleum and other inflammable liquids, and the precautions to be adopted for the prevention of accidents with petroleum lamps." In the pursuance of their duty, the Committee held 53 sittings and examined 85 witnesses; they were present at various experiments made by certain of the witnesses; and they inspected a petroleum tank-steamer.

The sufficiency of the existing law relating to petroleum is the first point to be considered. There are Petroleum Acts dated 1871, 1879, and 1881. These Acts define petroleum, and set forth that the only kind of petroleum to which the restrictions of the law apply is that which gives off, when tested by the Abel close test, an inflammable vapour at less than 73° Fahr. (Act of 1879). The carriage of such statutory petroleum by ship is made subject to regulation by harbour authorities; but beyond this there is no provision in the Act as to the safe carrying of petroleum, except a power to local authorities to annex conditions to licences for storage, which conditions may include some as to the mode of carrying such petroleum within the district of the licensing authority. All statutory petroleum stores must be licensed, except when the aggregate quantity kept is less than 3 gallons, and when it is all kept in stoppered pint bottles. Hence all carburetting spirit required in gas-works comes under the law as to licensing; but not the store of pentane kept for photometrical purposes. Keepers of petroleum are not exempt from proceedings for nuisance. A desultory agitation for the amendment of the law relating to petroleum dates from 1883, which eventuated in the appointment of the present Committee.

The reference to the Committee divides itself naturally into the two heads of the *oil* and the *lamps*. By the existing law, petroleum is of two classes—petroleum flashing at 73° (Abel close test) and under; and petroleum with a higher flash-point. For the sake of simplicity, the Committee call the first division petroleum *spirit*, the second petroleum *oil*. The first thing that strikes one upon inquiring into the sufficiency of the law of petroleum in this country is the fact that the existing Acts only apply to petroleum *spirit*. Petroleum *oil* is subject to no statutory regulations whatever. This was a somewhat startling discovery for the Committee, who learnt that this country stands almost alone in this respect; other countries having regulations more or less stringent for the control of petroleum *oil*.

It is not singular for this land of comparative freedom to occupy an exceptional position such as is here indicated. The fact, however, seems to have impressed the Committee, who turn their attention first of all to the question whether the exemption of petroleum *oil* from control should continue. They admit that "many witnesses, some of them of great experience in the petroleum trade, have strongly contended that there is no need for legislation; that, after many years' trial, petroleum *oil* has been proved to be a safe article of commerce; and that demands for public safety are amply satisfied by the law as it stands." On the other hand, the official element, and representatives of the public authorities charged with the administration of the present law, have contended for "the absolute necessity of subjecting the storage, sale, and transport of petroleum *oil* to legislative control and legislation."

The chief support of this plea comes from the retail oil-shop. The retail trade in oil is often carried on in a careless manner, on premises altogether unsuited for the purpose. The occurrence of terrible fires, frequently resulting in loss of life, in these oil-shops has arrested public attention. The Committee received a mass of evidence which showed conclusively that petroleum *oil*, as distinct from petroleum *spirit*, was responsible for 30 per cent. of the petroleum accidents which have occurred in this country since the commencement of the trade. The Committee were placed in possession, by the late Sir Vivian Majendie, of full particulars of every accident; and they report that "in a large proportion of them, involving great loss of life and property, the petroleum was petroleum *oil*, and in some cases oil of a high flash. The evidence shows that when a fire is once established, the dangers do not differ to any appreciable extent, whatever may be the flash-point of the oil, and it further shows that a high-test petroleum cannot be relied on, so far as handling and storage are concerned, as a security against accidents." Thus two conclusions emerge: First, that some legislative regulation



of petroleum oil is necessary in the interest of public safety; secondly, that the flash-point of the oil is immaterial, so far as this necessity extends.

After carefully weighing the whole evidence brought before them, the Committee formed the opinion "that, in the interests of public safety, legislation is necessary for the control and regulation of petroleum oil as far as storage, transport, and sale are concerned," and that with regard to petroleum spirit also the present law is not adequate for the public safety, and should be amended. In order to carry out this recommendation, the Committee advise that the following provisions should now be made: "(1) To secure legislative control for petroleum generally, and admixtures of the same with other substances, certain heavy oils being exempted. (2) To adopt a flash-point—namely, 100°, Abel close test—as the dividing-line between petroleum oil and petroleum spirit. (3) To provide that, with the following exemptions, petroleum oil shall be kept only on premises registered or licensed under the Act, and petroleum spirit only on premises licensed under the Act." The exemptions are, spirit not exceeding 5 gallons; when oil and spirit are kept together, not exceeding 5 gallons of spirit and 40 gallons of oil; or 130 gallons of oil for private use only.

So far the report is all clear going. At this point, however, we begin to come upon debatable ground. Leaving for a moment the question of the alteration of the flash-point, let us consider the Committee's provision 4: "To provide that registered premises shall be at safe and suitable distances from protected works, such as dwelling-houses, churches, schools, or any such building or place as the local authority with whom the premises are registered may specify in a notice served upon the occupier of the premises, and required to be treated as a protected work; to limit the amount of oil (subject to the exemption in No. 3) on registered premises; generally to make regulations for registered premises." It is safe to say that legislation upon these lines, unless drafted with great care and knowledge, and administered with unusual circumspection, might prove extremely troublesome and hampering to many industries, including gas manufacture, which regularly or occasionally require large supplies of petroleum oil.

The other proposals in the report comprise the establishment of a system of licensing for the storage of petroleum spirit, and for the storage of petroleum oil in cases where it cannot be conveniently kept under registration; to regulate the keeping and use of petroleum for the purpose of motive power; to provide for an efficient system of testing; for the prevention of oil overflows; and for the investigation of petroleum accidents. This finishes the part of the report relating to oil. On the second part of the inquiry—namely, the precautions to be adopted for the prevention of accidents with petroleum lamps, the Committee state that the evidence received has been upon two main points: (1) As to the flashing-point of petroleum to be used for illuminating purposes; (2) as to the prohibition of the keeping or exposing for sale lamps which are not made in accordance with a legalized standard of safety. This will be a convenient place to interrupt our story, as it will now enter upon a totally different branch of the subject.

### THE WORK OF THE PATENT OFFICE.

SOME curious reflections are aroused by the lately-issued report of the Comptroller of Patents, when read in conjunction with other recent illustrations of the working of the patent law. More than 30,000 applications for patents were filed last year; and if it is computed, as seems reasonable, that there are at least five persons occupied in "inventing something" to every one who goes the full length of applying for a patent, there is a vast crowd of people ceaselessly endeavouring to benefit their kind in this way. The number of applications has greatly increased of late years—a result which at the first glance seems to indicate that the Act of 1883 has encouraged people to take out patents. It was supposed that this would be the case, and that the reduction of the Patent Office fees, and the simplification of the procedure, would result in the patenting of a large crop of trivial or altogether worthless inventions. It is satisfactory to learn that this fear has not been justified. There might be a difficulty in determining the exact proportion of the increasing number of applications for patents rightly ascribable to the facilities of the new law; but it appears to be very fairly proved that the high quality of British inventiveness has not fallen off from the old standard. The only good test of the value of a patent to the holder is his behaviour in keeping it alive or letting it drop. The Comptroller reports that the actual number of patents continued for the full term is considerably larger than heretofore. This is eminently satisfactory. It appears from this fact and others that suggest themselves in the same connection, that the character of a people, as regards mechanical inventiveness, is but little affected by their national patent system. If, for example, the popular mind runs largely upon mechanical "notions," there will be a considerable number of patent applications, for inventions which will mostly prove to be worthless. It is highly desirable that where the patent system encourages the patenting of trifles, there should be some automatic arrangement for extinguishing the useless patents after a reasonable lapse of time. This is the case in the

United Kingdom. It is not so in the United States; and for this reason the system of the latter country is to this extent defective as compared with the British plan.

The Comptroller again has occasion to draw attention to the occurrence of fashion in invention. At one period, as "The Times" puts it, "there is immense fertility with regard to new metallurgical devices and methods. At another time lamps and gas-burners engage the attention of scores of ingenious minds." The remarkable fact that one gas-burner patent has proved to be more fruitful than almost any other issued under the new system is not recognized. Yet what does the Patent Office owe to the Welsbach master-patent! It is certain that one such invention not only opens up a new field of enterprise and industry, but it also sends people off into all sorts of investigations which otherwise might have been left alone for years. This reflection brings us to the conclusion that the increased activity of the English Patent Office since 1883 is probably less caused by the "encouragement" offered to patentees by the new Act than by the example of successful invention in many fields. In that of gas lighting, there are the incandescent burner and acetylene. The inspiring influence of the many ideas associated with these things is deep, widespread, and persistent. The rush of inventors who have come under the attraction of these ideas has been unaffected by the consideration that incandescent gas-lighting is covered by a master-patent, while acetylene lighting is open. The salient feature of these and other fashions in invention is the indication they give of the truth that there is room for improvement even upon the best mechanical achievement. Why do so many ingenious and persevering persons continue hammering away at incandescent burners or acetylene generators? Simply because the very crowding of patentees into one field shows that nobody has yet attained perfection; and every new applicant fondly imagines he has made one step further towards it.

Certain pertinent questions are asked by the "The Times" respecting points of Patent Office experience not disclosed by the Comptroller's report. "Are there, practically speaking, as many separate applicants as applications? Or do the same persons, in the course of one or two years, file many different applications? From what classes do inventors mainly come? Are they chiefly mechanics? . . . Do 'rank outsiders' often solve problems which have baffled the experts?" A little knowledge of the industrial world would have enabled the inquirer to answer these and other questions of the same order. When it is remembered that the born pioneers and leaders of industry—the Bessemers, Siemenses, and Maxims—take out hundreds of patents during their laborious lives, and this without regarding the "encouragement" offered by one national patent system as compared with another, it is obvious that the man of one patent application, although he may be most numerous, is really only the amateur of invention. The professional inventor knows full well that it is impossible for anybody to tell in advance what may be a meritorious invention; and, accordingly, having begun patenting he goes on. With regard to the classes from which inventions chiefly spring, it is certainly not the case that the majority of them are mechanics, strictly so called. Not even every invention is mechanical. The moment one leaves the mechanical and enters upon the chemical or electrical fields, the amateur gives place to the professional. It is hardly possible to conceive of a "rank outsider" as the true and first inventor of a new coal-tar derivative or an induction motor. Anybody, on the other hand, might be the inventor of a mouse-trap or a fly-catcher; but the ideas of what constitutes an "inventor," suggested by this comparison, differ widely for each case. A new chemical product, or a new motor, once formed or designed, remains for the world to use and for other inventors to reckon with. The other things are but toys.

The question as to whether outsiders "often solve problems which have baffled the experts" is a very familiar one. Stated in this precise form, however, it can be answered squarely in the negative. If varied to bring in the idea not of the solving of a recognized problem, but of striking out a new departure, the answer will be different. The first point to settle in regard to a question of this kind is, What is an "expert," and what an "outsider"? Not everybody who follows a particular calling is expert in his trade. On the other hand, a man who is an "outsider," in the sense of not being a tradesman, may yet, by his training in science, or even in clearness of thought, see more of what is wanted in a trade than those who are kept tied to the counter. Indeed, even an expert in a particular line of industry may be so engrossed with the thousand-and-one duties of every-day work as to confess his inability to conduct experimental research in directions which he may recognize as promising. It may be taken as true in the main, however, that the problems which have baffled the experts in an industry remain insoluble by mere uninstructed mother wit. An expert may have as much of this inestimable quality as the most uninstructed heaven-born genius of them all. We abide in the position of maintaining that where real experts are baffled—as, for example, in attaining the ideal in gas-engine design—the difficulty is likely to remain. It is a mistake for young inventors to assail these frowning citadels.

On the whole, the Comptroller's report conveys the impression that the British public are well served by the Patent Office. So far as the conduct of the officials is concerned, from the



Comptroller himself downwards, this is an opinion from which few reasonable persons who have had dealings with the Patent Office will dissent. Inventors, like poets, are an irritable genus; and not a few of the order are simply mad on the subject of their invention. The officials of the Patent Office, however, are courteous, patient, and painstaking; and they do a great deal of work for which they never get thanks, at a rate of remuneration which outside experts would scorn. The larger question of whether the English patent law is the best that could be made, in the interests of the public and the patentee, is not so easily disposed of. As already recorded in the "JOURNAL" (see *ante*, p. 197), the subject of granting compulsory licences under the Act has been dealt with by the Board of Trade not altogether unsatisfactorily; but it is complained that "the Board of Trade ought to see to it that an inquiry of eleven days and a large expenditure of money are not needed in order to give a manufacturer that which under a rational patent law ought to be given almost automatically." This is one point.

There is another matter in regard to which the system of Patent Office practice might, in the opinion of some competent critics, be improved. Mr. Charles D. Abel defends the English system generally, maintaining that "patents that have passed the severe ordeal of the German Patent Office are not one whit more secure than those granted under the liberal system of England," as tested by the upshot of subsequent litigation. There are "examiners" at the English Patent Office, as there are in Germany and the United States. According to a witty remark of Sir F. Bramwell, the chief merit of our own Patent Office examiners is that they do not examine. This is precisely what Mr. Abel would have them do, for the instruction (if he will receive it) of the intending patentee. In his opinion, "the only thing wanting in the English system is that the Patent Office should undertake the duty of finding out for the inventor whether or not his invention is new. After putting him in possession of this information (by pointing out to him the prior patents that may be supposed to more or less anticipate his invention), it should be left to him to decide whether he has an invention worth patenting." The suggestion is worth considering. Probably the Patent Office could fall in with it without any fresh legislation, if a grant to meet the necessary expense could be obtained from the Treasury.

#### OBITUARY.

Mr. GEORGE SOMERTON, the Chairman of the Portishead District Water-Works Company, died at Clifton Downs, on the 20th inst., aged 72.

The sad news reached London yesterday of the death, as the result of an Alpine accident, of Dr. JOHN HOPKINSON, the eminent electrician. The unfortunate gentleman was accompanied by his son and two daughters; and the entire party fell down a precipice.

The death is announced, at the age of 74, of Mr. DANIEL EVANS, who was some years since Manager of the Brymbo Water Company, and subsequently of the Rhos Gas and Ruabon Water Companies. He held the latter position for upwards of thirty years; retiring about three years ago upon a pension.

#### PERSONAL.

Mr. W. POVEY has been appointed Secretary of the Uttoxeter Gas Company.

Mr. J. SWARBRIGG has been entrusted with the management of the Cootehill (Co. Cavan) Gas-Works.

Mr. and Mrs. ANDREW WILSON, of Stewarton, Ayrshire, have just celebrated the sixtieth anniversary of their wedding-day. The marriage of the aged couple was solemnized at Kirkford in August, 1838; and, with the exception of six years spent in Airdrie, all their lives have been passed in the same place. Mr. Wilson came of an old and respected Stewarton family, who for generations were engaged in the manufacture of Scotch bonnets, for which the town has long been famous. He was born at Kirkford in the year 1812, and his wife, Annie M'Crae, sister of the late Mr. Boyd M. M'Crae, Manager for many years of the Dundee Gas-Works, and formerly Manager of the Airdrie Gas-Works, was born in the parish of Symington, in the Upper Ward of Lanarkshire, in the year 1818. Mr. Wilson continued in the bonnet trade till 1854, when he removed to Airdrie to become foreman of the gas-works there. In 1860, he was appointed to the management of the gas-works in his native town, in which capacity he acted till the year 1895, when he retired on a pension granted to him by the Directors of the Gas Company. Their family consisted of six sons and five daughters, five of whom still survive. The eldest son John is a school-master under the Stranraer School Board; and the second is Mr. Thomas Wilson, Manager and Secretary of the Coatbridge Gas Company, who presided at the recent meeting of the North British Association of Gas Managers. The youngest is in business in Kilmarnock. There are living 29 grandchildren, and one great-grandchild. As a proof that gas management "runs in the blood," it may be mentioned that there is a third generation represented by Mr. Andrew Wilson, at present the Gas Manager at Perth.

#### NOTES.

##### Locating Obstructions in Pipes by Sound.

A remarkable instance of the application of pure science to a strictly practical use is described in a paper by Mr. B. C. Batchellar, read before the Franklin Institute, on recent developments of pneumatic despatch-tubes. The particular subject of the application is not of much direct interest for readers of the "JOURNAL;" but the idea is noteworthy for its ingenuity and the successful issue of the trial. It appears that in a line of 8-inch pneumatic despatch-tubing, which was made of cast-iron water-mains specially bored out to the required dimension to take the "carrier," a settlement of the subsoil caused a break at which eventually a carrier lodged; thus blocking the whole of the tube. There were no means of knowing where the break was situated; and to excavate the entire distance between the stations would have been a troublesome and expensive business. In this emergency, Mr. Batchellar decided to try and locate the spot by the velocity of sound. The plan was to disconnect the terminal apparatus at one of the stations, fire a pistol into the tube, and note the time that elapsed between the discharge of the pistol and the return of the sound as an echo reflected back from the obstructing carrier. Then, knowing the velocity of sound, a simple calculation would give the distance from the station to the carrier. It is unnecessary to describe in detail the chronographic appliances devised for this experiment, which included a tuning-fork arranged to trace a wavy-line on a smoked drum. A mean of five determinations gave the time, and this was converted into a certain distance of travel, at which workmen were ordered to uncover and cut the pipe. "Before reaching the tube, air was heard escaping from the break, and the carrier was found almost exactly where it had been located by the instrument." This result must have been highly gratifying.

##### Uselessness of Cross Tubes in Boiler Furnaces.

A correspondent of the "Practical Engineer" calls attention to the comparative merits of two different systems of boiler inspection. By one system the inspector works from headquarters, is liable to be sent all over the kingdom, and may not see the same boiler twice in a number of years. In the alternative system, every inspector has his own district, every boiler in which he gets to know, and also the men connected with it, so as to have by heart, in course of time, the history and vicissitudes of the boiler. The writer avows his preference for the latter system. It is remarked that inspection of a modern factory boiler is a far easier matter than the examination of one of the boilers of thirty years ago, set with low bottom flues and narrow side flues. The standard 8-feet Lancashire boiler of the present day, free of such useless encumbrances as cross tubes in the furnace flues, can be inspected almost without the inspector dirtying his clothes, if the sweep has done his duty. Probably inspectors are better aware than anyone else how useless the cross tubes in a boiler flue really are, and how very much freer of soot are the flues of a boiler which has no such cross tubes. The addition of the once highly-commended cross tubes means an extra charge of about £2 each to the cost of a boiler; and the money is worse than thrown away. The tubes are absolutely useless as an aid to water circulation, the connection of which phenomenon with that of steaming is doubtful anyway. They are most detrimental to good combustion, are a very serious hindrance to inspection and the sweep's work, and injure the draught. At the same time they are not a source of strength to the flue tube; and, in short, there is not a good word to be said for them on any account. Even granting that the cross tubes help to support a flue tube, they leave the furnace portion of it unstiffened; and it is here, and nowhere else, that extra strength is required, if at all. Thus they are "at most like so many  $\frac{3}{8}$ -inch links in a  $\frac{1}{2}$ -inch chain," and should be condemned once for all.

##### The Theory of Elastic Masonry Arches.

The availability of breeze and other light or cheap materials for making portland cement concrete at low cost in most localities has re-awakened engineering interest in the problems arising in the designing of masonry arches. It is a remarkable sign of the times that both upon the Continent and in this country, the fashion of iron and steel girder bridges and viaducts is yielding before the revival of the more durable and graceful masonry construction illustrated by the Monier and other concrete systems. Mr. D. A. Molitor has contributed a paper to the "Proceedings of the American Society of Civil Engineers" upon the modern theory of the elastic arch, and its application to masonry construction. This is a discovery which obviates the worst of the trouble of this kind of arch construction. The idea is stated to have been introduced by Köpcke, of Dresden, in 1880, by making a masonry arch with open joints at the crown and haunches. Few things in the whole range of engineering studies perplex the student more than the classical theory of the arch, as elaborated by Coulomb and his followers. There was always a considerable element of uncertainty in the demonstrations of the strength of arches based upon this theory, chiefly in connection with the location of the line of pressure at the abutment, and its variation under a moving load. The theory of the elastic arch has been fully tested upon full-sized examples by the Austrian Society of Engineers, and its reliability has been established. From these



trials, Mr. Molitor argues that all the harassing doubts in the matter of masonry arch design are overcome by the introduction of hinges at the crown and abutments; thus permitting a rigid analytical treatment, and affording almost absolute safety against cracks. Karl von Leibbrand, of Stuttgart, inserted cast-iron hinged bearings in a masonry arch built in 1893. The greatest triumph of this principle of bridge design is the Munderkingen arch over the Danube, of 50 metres span, with a rise of only one-tenth the span. This is a concrete bridge, by Leibbrand, and is rightly held to herald a new era of viaduct construction.

#### The Reported Synthesis of Albumen.

Publicity has been given to the claims ascribed to Dr. Leon Lilienfeld, of Vienna, for having prepared artificial albumen, of absolutely the same nourishing quality as that derived from organic life-processes. It was announced (as recorded in our "Editorial Notes," p. 299) that Dr. Lilienfeld had succeeded in preparing "pepton" from certain coal-tar derivatives; and from this the successful preparation of albumen was argued—somewhat inconclusively, as was suspected at the time. It now appears that the sensational report of Dr. Lilienfeld's triumph was at least premature. Experts looked in vain in the list of the raw materials of this synthesis for the sulphur, without which albumen, properly so called, does not exist in Nature. From the authentic report of the International Congress of Applied Chemistry, at which Dr. Lilienfeld's synthetical operation took place, it is to be gathered that what was prepared was "pepton" only. Whether this artificial pepton was really identical with the substance originally so called, which is a product of the digestion of albumen, is not proved to demonstration. And it is certain from the report that the pepton was not reconverted to its parent substance. No sooner had the newspaper report of Dr. Lilienfeld's doings appeared, than several English specialists published narrations of what had been previously accomplished in the same department of chemistry. From these accounts it is to be understood that Dr. J. W. Pickering and Professor Halliburton have actually carried the synthesis of proteids further than Professor Lilienfeld. These preparations answered to the reactions supposed to be characteristic of the natural products; but it was never claimed by their authors that the artificial substances in question were really proteids, only that they bore a striking resemblance to the real thing. Mr. Sidney Williamson, writing in "Nature," remarks that elementary analysis fails to indicate the essential characters of the proteids. "When, in addition, it is remembered how extremely complex and mobile the proteid molecule must of necessity be, and the readiness with which changes in its constitution are brought about, something more than a few empirical colour and physiological tests will be required to convince chemists that pepton has been actually synthesized."

**Institution of Mining Engineers.**—The ninth annual general meeting of this Institution will be held in the Mason Science College, Birmingham, on the 13th prox., under the presidency of Mr. A. M. Chambers. Among the papers to be submitted on the occasion will be one by Mr. Gilbert Little, of the New Conveyor Company, on "The Automatic Manipulation of Coal and Coke." A paper by Mr. J. Emerson Dowson on "Gas Power," and another by Dr. C. Kroseberg on "The Otto Coke-Oven," presented at previous meetings, are down for discussion.

**The Protection of Water Supplies.**—In the Chemistry and Meteorology Section of the Congress of the Royal Institute of Public Health, held last week in Dublin, Dr. John C. Thresh, Medical Officer of Health to the Essex County Council, and Lecturer on Public Health in the London Hospital Medical College, read a paper on "The Protection of Urban and Rural Water Supplies." In the course thereof, he said that year after year outbreaks of typhoid fever had occurred which had been traced to the use of polluted water; and in nearly every instance it had been shown that pollution could easily have been foreseen and prevented. He put forward the following suggestions as a basis for future legislation: (1) That sanitary authorities should have power to close any shallow well which could be proved to be liable to pollution; (2) that no shallow wells should be made until the site selected had been approved of by the Medical Officer of Health for the district; and (3) that sanitary authorities should be empowered to make bye-laws. He maintained that water companies should not be placed at the mercy of vindictive persons or a local authority who wished to cheapen the water-works with a view to ultimately purchasing them. Where water supplies were derived from rivers, the county council should be responsible for the condition of the stream, and should see that the pollution of it was reduced to a minimum. A resolution was passed to the effect that legislation is urgently needed for securing the supervision of all public water supplies. In the Municipal and Parliamentary Section, Dr. C. Porter, the Medical Officer of Health for Stockport, read a paper on "The Supervision by Sanitary Authorities of Public Water Services in the Hands of Private Companies;" and a resolution was passed expressing the hope that during next session the Government will introduce a Public Bill embodying the proposals submitted by Mr. Chaplin to the House of Commons last June.

## COMMUNICATED ARTICLE.

### OFFICIAL GAS TESTING.

By "VERITAS."

The conditions for the official examination of gas for public supply seem almost every year, at least in London, to be a fluctuating quantity. Many years back it was considered amply sufficient for the protection of the public to test the gas on a leading main at a distance of not less than 1000 yards from the seat of manufacture. At a later date, testing-stations were located at any place on any company's district, irrespective of fair sampling or free circulation.

In the rural districts, though power is given to the local authority to have the gas tested by an impartial scientific expert, the question is, I believe, optional, and not compulsory; and if not compulsory, the protection to the public is evaded, presumably on the ground of a saving in the rates—a pretext which is utterly fallacious. The amount which would have to be paid to a competent expert to examine the gas supply at intervals—the times of visitation being chosen by himself, of which the gas company were ignorant—must surely ensure a greater saving to the gas consumer as to his having good and pure gas, than the saving of neglecting this common-sense precaution by the local authority. However, we have to consider that it takes a large amount of coercion to knock common-sense into the head of the average vestryman, or (in modern language) the urban district council. The worst of all these bodies is that, in these times of democracy, the tendency is that the best educated classes, and those presumably having the best judicial discrimination, are a limited amount in proportion to their socialistic allies. The average local authority will spend any amount of public money on side issues, but neglect what (from their point of view a side issue) might effect a material saving to the ratepayers, if they had the clear brain power to regard things in their true light and with just views.

These are simply comments as to the action of ordinary local authorities, and the general administration of Acts of Parliament. In some cases, of course, tests can only be taken by due notice to the gas company of a definite period of, I believe, three hours; and in this event the testing is an absolute farce, as the company have ample time to prepare for the visit of the gas examiner, especially as the test has to be conducted on the works, and not at an independent and authenticated testing-station. In London proper, and in some of the suburbs, we have, it is true, a certain fixity of tenure, though there is much to be added that might be considered desirable. The London Gas Companies are, like urban districts, working under distinct definitions of respective Acts of Parliament; but the methods of testing under the authority of the London County Council have now developed into almost exaggerated condition. The Council are not satisfied with the *status in quo*. Their late Chemist did not consider that a proper check on the public gas supply was effected at the existing duly certificated official testing-stations; and there is not the slightest doubt that his opinion was corroborated by his (at least) semi-socialistic directors. The scheme of the so-called perambulating photometer was duly sanctioned, by which gas could be tested at any portion of a particular district, irrespective of its representing the average gas supply. This attempt at sneaking (I know no better English word to express my meaning) possibly inferior samples of gas, and publishing the results as a fair statement of the gas supplied to the whole of the district, has fortunately not become legalized, and one must hope that every person possessing an unbiassed mind will wish that such an event may never occur.

Whatever changes in public gas testing may take place in the future, at the present time there are mainly two elements to be considered with regard to London. In the first place, that the Gas Companies must comply with their respective Acts of Parliament; and, in the second place, that the methods of testing are absolutely under the control of a body of three gentlemen known as the Gas Referees. A further complication ensues in that the salary and conditions of work of the gas examiner is controlled to a large extent by the London County Council. We thus have a curious arrangement. The Companies have to make gas of a quality in compliance with their Special Acts. The quality is not a fixed quantity, but depends on conditions of testing. The Gas Referees prescribe all these conditions; and the County Council control the appointment or dismissal of the gas examiner, his salary, and what times he attends either for testing for illuminating power or for taking the pressure on the public lamps. Is not this what might be called (I hope without the slightest irreverence) a trinity of authority somewhat unnecessarily complicated?

The Gas Referees are a curiously constituted body. One of them is supposed to have a practical knowledge of gas manufacture. Many changes have happened of late years; and which of the three conforms at present to the prescribed conditions, I am unable to determine. Everybody knows that they take large salaries for comparatively trifling duties—not an uncommon circumstance in this world. They are supposed to periodically investigate the capacities of purification at the different gas-works. Have we any evidence that they have, for



many years past, exercised any practical energy in this direction? Their main idea seems to me to revolutionize photometrical methods, possibly what was in their minds conducing to scientific accuracy; all changes being to the disadvantage of the Gas Companies. They have modified photometers. They have also tried to modify the standard candle, but have landed themselves in an erroneous position—viz., that while they gave the most accurate definition of what a standard candle should be, they still certify the old Miller candle made on the old lines. Surely this attitude is inconsistent. If the Referees considered that the old Miller candle gave erroneous results, and that it was necessary to prescribe distinct and different methods of manufacture, why do they still officially certify the same candle which they previously condemned?

A minor matter is the modification as to the conducting of the official sulphur and ammonia tests, which must now be started and finished at certain hours. This may be a necessity of legal formality; but it certainly does not conduce to increased scientific accuracy, and the introduction of the aerorthometer in place of the usual correction for temperature and pressure by the well-known "tabular number," is totally unnecessary, except that it possibly gives a previously comparatively unknown scientific instrument an official recognition which would under other circumstances be absent. It is noteworthy that under the new regulations the accuracy of the aerorthometer has to be periodically checked; whereas no such provision is necessary with regard to the barometer and thermometer upon which the ordinary correction is founded.

The most extraordinary development with regard to official testing is of very recent date; and this is the introduction of a new pentane standard of light of an alleged 10-candle value, prescribed *absolutely* by the Referees as a legal standard. We have here a very radical change. On the institution of the Standards of Light Committee, it was the general opinion, not only of the public authorities but of the Gas Companies that no alteration could be made from the standard of sperm candles of six to the pound, burning at the rate of 120 grains per hour.

Now the Referees have suddenly and unexpectedly prescribed a new standard as a substitute for the candle. I take it that they founded their action on the presumption that, though any gas tested should be of a definite illuminating power of so many candles, an actual candle need not be employed in the testing. This new view is one which will undoubtedly have to be fought out to the bitter end, if necessary. Their action has two aspects: The first is that they have presumably the power of prescribing a new standard of light irrespective of appealing to Parliament; and the second involves a more important factor—that they can arbitrarily fix this upon the Gas Companies without consultation or consent.

The whole idea of the creation of a neutral body—namely, the Standards of Light Committee—was to prescribe a new standard of light subject to parliamentary sanction, with the acceptance of both parties that the standard candle gave erratic, and consequently unsatisfactory, results. If the Referees have the power of prescribing a new standard, why was this not done before? and why should all the expense have been incurred over the Standards of Light Committee, and the labour which was involved in complex investigations? The only explanation is that the Referees have suddenly discovered that they have powers of which they were previously in ignorance. Why such a presumably astute body should have had such a lapse of intelligence, is a matter beyond my powers of criticism.

One thing is definite—with the prescription of a new standard of light, the old candle standard will be wiped out; and the controversies as to its value will probably cease. This will be a comfort to many disputing parties. A standard which will give constant and reliable results must be universally acceptable. The only question is whether the new standard of an alleged 10-candle value is actually a multiple of the Miller candle at present in use. To employ a common expression, the "missing link," is whether the new method will afford the manufacturers of gas who have to do justice to the public interests as well as to their own, to preserve the *status quo*.

We have also to consider that the new standard has to be used in connection with the table photometer, in which the gas is burnt up to 16-candle value instead of (as under existing regulations) being rigidly confined to a consumption of 5 cubic feet per hour. This would give an advantage to the gas of less than 16-candle value on the old lines, and would therefore be a distinct gain to the Gas Companies, without apparently effecting any injury to the public.

**The Sutton Gasholder and Tank.**—In view of the interest evinced in the series of articles on the above subject recently communicated to the "JOURNAL" by Mr. F. S. Cripps, Assoc. M.Inst.C.E., they have, as notified in an advertisement which appears elsewhere, been reprinted, with the accompanying plates, in book form. In calling attention to these articles when they appeared, we omitted to state that the holder alluded to as the one to which the Sutton holder is similar in design, was the large one designed and carried out by Mr. Cripps in 1893 for the Bournemouth Gas and Water Company, to which Company he has acted as Consulting Engineer for the past eight or nine years; and to his designs all the extensions of the gas-works during that period have been executed.

## TECHNICAL RECORD.

### MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

#### Quarterly Meeting at Warrington.

The One-Hundred-and-Fifteenth Meeting of the Institution was held on Saturday, when the members—by invitation of the Gas Committee of the Corporation of Warrington, conveyed through the President (Mr. W. S. Haddock), who is their Gas Engineer—journeyed to Warrington for the purpose of inspecting the Longford Gas-Works. Considering the prospect of a wet day held forth by the threatening look of things early in the morning, there was a very fair number of members to be received by Mr. Haddock while partaking of the "light refreshments" thoughtfully provided directly on the party reaching the works. After this, an hour and more was occupied in a thorough examination of the plant designed, and to a large extent completed, by the Corporation's late Gas Engineer, Mr. James Paterson, and now being considerably modified and extended by Mr. Haddock.

A succinct account of the works as at present existing had been prepared by Mr. Haddock, and was in the hands of the members at the time of their visit. It appears that the works date from 1820; having been built in that year by Messrs. Barlow Bros., who had the management entirely in their hands until the cost of construction had been paid off. The town was first lighted with gas in 1821; and the price then charged for it was 15s. per 1000 cubic feet. The first record available as to the annual make of gas shows that in 1839—the price being then still as high as 15s. per 1000 cubic feet—the make was between 13 and 14 million cubic feet; and eight years later (in 1847, the year when the original Gas-Works Clauses Act was passed) the make had only increased by about 3 millions, though the price had been brought down to the then low rate of 4s. 6d. per 1000 cubic feet. The purchase of the works took place in 1877, by which time the make of gas had increased to 128 millions, and the price had been reduced to 3s. 3d.; while now the make is 282 millions and the price 2s. 10d. The original works were constructed on what was known as the Mersey Street site; and this was only given up last year as a manufacturing station. It had meanwhile been rebuilt several times; but in 1879, as it had become necessary to make further extensions, the Corporation were forced to select a new site. This was found at Longford; and 16 acres of land were purchased. A siding from the London and North-Western Railway Company was brought on to the land; and the coal-trucks are now run alongside the retort-house on an elevated railway—the coal sliding out of the trucks, by releasing the trap-doors, into the coal-store. At the present time, alterations are being made in the retort-house, which is 74 feet wide and 190 feet long. The retort-settings comprise two benches, each containing six beds of eight D retorts, 22 in. by 16 in. The settings are on the Klönne system, as modified by Mr. R. O. Paterson, of Cheltenham. They are capable of producing rather over 1½ million cubic feet of gas per day. The retort-house is arranged for West's manual stoking machinery; and each setting is provided with a separate hydraulic main, so that any one section can be closed off at will. It is intended to pull down the old retort-benches, and double the new arrangement. The condenser is vertical, consisting of four rows of 12-inch cast-iron pipes. Each row contains fourteen lengths of pipe, about 30 feet high. The exhausters are of Messrs. Donkin and Co.'s manufacture, and comprise two 40,000 cubic feet drums driven by a separate engine, and two 60,000 cubic feet drums and engine combined. The tar washer is by Messrs. C. & W. Walker, and is designed to remove the tar when passing 2 million cubic feet of gas per day. There are two scrubbers, each capable of purifying 500,000 cubic feet of gas per day. The tower scrubber is 90 ft. by 9 ft., and was made by Messrs. Ashmore, Benson, Pease, and Co. It is fitted with Green's patent screens and water distributor. At present, it is used for concentrating the weak liquor from the other washers. The washer-scrubbers are of the Kirkham, Hulett, and Chandler "Standard" and the Clapham "Eclipse" makes. The purification of the gas is finished in six boxes, 47 ft. 3 in. by 20 ft., made out of two 20-foot square boxes. As at present working, one box is arranged as a catch purifier. The material for charging the boxes is lifted by chain-elevators from the ground floor, and deposited into barrows in the boxes, and so spread over the grids. Each purifier has four 16-inch shoots, through which the foul material is discharged on to the ground floor. The covers are raised by a winch, driven by belting from a steam-engine. The station meter is one of Messrs. J. & J. Braddock's manufacture, and is capable of passing 70,000 cubic feet of gas per hour. The two holders are telescopic; and when filled they contain about 1½ million cubic feet of gas. There are also three small holders at Mersey Street, which contain ½ million cubic feet of gas when filled. They are supplied with gas from the Longford works; a special main and exhauster plant having been put down for this purpose. The gas is distributed from Longford through a 20-inch and a 16-inch governor, both of Messrs. Braddock's manufacture. At Mersey Street, there are two 12-inch governors and one 16-inch. The sulphate plant consists of one of Messrs. C. & W. Walker's continuous stills and heaters, capable of working up from 25 to 30 tons of liquor per day. The saturator is designed for a Wilton



discharger, by which all the salt is raised on to the draining-floor. The tar plant at the works consists of a primary still for working 10 tons of green tar. The vapours from the primary still pass through one of Ellison's patent heaters, by which the green tar is heated, and to a certain extent dehydrated. The cistern for storing the oils is arranged to act as the roof of the press-room and anthracene store. Much interest was evinced in the working of a Wells pneumatic painter in operation in the purifier-house.

The members soon after midday were driven to the Lion Hotel, and there entertained to lunch by the Gas Committee. The chair was occupied by Mr. Alderman Fairclough, J.P., the Deputy Mayor, and Chairman of the Gas Committee; the vice-chairs, by Mr. R. Heaton, the Deputy Chairman of the Gas Committee, and Mr. John Evans. At the conclusion of the luncheon a few toasts were proposed; and then Mr. W. R. Chester proposed, and Mr. R. G. Shadbolt seconded, a hearty vote of thanks to the Corporation Gas Committee for their hospitality during the day.

At 2.30 conveyances started to take the members and a few friends to Knutsford, *via* Arley—a magnificent drive, and one that would have been most enjoyable but that the miserable state of the weather compelled the use of closed coaches, which afforded anything but a pleasant means of locomotion on a warm August afternoon. Arriving at the George Hotel, Knutsford, tea was served; and then the merely formal business of the day was transacted.

The Hon. Secretary (Mr. S. S. Mellor) read the minutes of the previous meeting held at Morecambe, and the qualifications for membership of the two gentlemen applying for admission: Mr. James W. Wynne, of Ambleside, and Mr. Henry Froggatt, of Bollington. They were duly elected.

The party then broke up—part returning by train to Manchester, the rest by coach to Warrington—after a day the full enjoyment of which was only marred by the wet weather prevailing during what would otherwise have been the best part of the time the members were together.

#### PACIFIC COAST GAS ASSOCIATION.

##### Sixth Annual Meeting at San Francisco.

This Meeting was held on the 19th and 20th ult. The President, Mr. FRED. H. EICHBAUM, of San Francisco, occupied the chair; and there was a good attendance. The report of the Secretary and Treasurer was satisfactory, and showed that the list of members has now reached 112.

The report of the Committee on Standard Dimensions recommended the standard heaped bushel of 2747.7 cubic inches, as the unit of measurement for coke, lime, oxide, and all other dry materials (except coal) used in gas-works. Recognizing the difficulty of heaping to the standard cone, the Committee also recommended the use of a measure 14 inches in diameter and 17.8 inches deep, which would contain the bulk of a standard bushel by strike measure. The report was adopted after some discussion, in the course of which Mr. Jones stated that the standard bushel had been adopted by the American Gaslight Association, the Society of Gas Lighting, and the New England Association of Gas Engineers; and further that it was not proposed for buying and selling, but simply as a convenient unit for use when preparing papers, &c. Mr. Adams expressed a preference for weighing, instead of measuring; and he thought the pound avoirdupois answered every requirement.

The President, in the course of his Inaugural Address, said that the great need in their district was an increase of population, which for various reasons had not been so great as might be expected, looking at the salubrity and natural wealth of the district. Land was more difficult of acquirement than in other States; and they were a long way from the places where emigrants first touched the shores. He considered the immense discoveries of gold in Alaska, and the war with Spain, would have an important effect on the future of their district. Then there was the marvellous development of the Japanese Empire, the opening up of China, and the completion of the great Trans-Siberian Railway, which would probably force on the completion of the Nicaragua Canal. These events would lead to a rapid influx of population, not only in California, but in all the Pacific States. The enterprise directed to the utilization of water power in California might lead to the supply of electric current; but as regarded acetylene, its cost was prohibitive.

A discussion on the proposed amendments of the Association so as to include the generation, distribution, and consumption of electricity in the objects, and to render active officers of electric undertakings eligible for membership, was the next item on the agenda. Mr. Clements held that the proposed amendments were a mistake, and not in accordance with the consensus of opinion among the members. Gas and electricity were not kindred subjects, but rather in opposition; and, therefore, while he would be glad to support an electric association, he did not see how the two could be combined. When gas and electricity did fraternize, it was merely by force of circumstances; and as a general rule they were in active opposition to each other. The gas field was broad enough, as the experiences of the last five years showed; and they would not add anything to their

glory by altering their sphere of operations. Mr. Crockett said there was no idea of changing the name of the Association. Many of the members were concerned with gas and electricity; both would be largely used in the district in the future; and there could be no more harm in discussing electricity than in discussing gas. But he was quite prepared to accept the result of a vote—and, indeed, would not vote against a majority. Mr. Jones said they already included electrical subjects in their agenda; and it was understood that electricians connected with the gas industry were not out of place in their roll of members. He thought, therefore, that no amendment was required. Mr. Burrows wished to keep the society entirely a Gas Association. While there was nothing to be gained by the proposed change, he could see that the result of its adoption might be very detrimental. Electricians were pushing men; and they might get control of the Association, and put gas in a very minor place. Mr. Clive agreed that the present rules were sufficiently wide, and that no enlargement was needed. After some further discussion, a vote was taken by roll call, with the result that the proposed amendments were unanimously rejected.

Mr. J. Clements, of Red Bluff (Cal.), read a paper on "Experiences," which dealt with matters of purely local interest.

Mr. A. Gutsch, Superintendent of the Fresno (Cal.) Gas and Electric Light Company, followed with a contribution on "Gas in Competition with Electricity by Water Power." He explained that his undertaking—already supplying gas, and electricity generated by steam power—was menaced by an opposition company started two years ago, to supply cheaper electricity by the aid of water power. His rates were 8s. 4d. per 1000 cubic feet for gas, and 7½d. to 15d. per unit for electricity by meter; and he at once inaugurated a liberal policy of supplying stoves, Welsbach gas-burners, and electrical fittings on hire. The new company adopted contract rates, ranging from ½d. to 1¼d. per 16-candle light per 24 hours, and 7s. 3d. per month for arc lamps. After six months, he shut down his electrical plant, and went on to gas entirely; thus saving a source of loss. He was now selling, at times, more gas than he sold before. The plant put down by the opposition company, though very costly, was not a success, and did not prove equal to the maximum demand; and the irregular voltage rendered the glow lamp far more delicate and costly than the Welsbach burner. The large capital called for a large interest; and they had to increase their prices, and also forbid the use of power during the maximum lighting hours. The Company could not, in fact, supply at prices that would compete with gas-engines and Welsbach burners.

Mr. Cardiff said that at Santa Cruz he bought electricity in bulk from a water-power company, who conveyed it some 18 miles. But gas was entirely replacing glow lamps, not merely because it was one-third the price, but owing to the fact that the electric current failed several times. Mr. Aldrich said that at Spokane there was an electrical plant driven by water power; but the Gas Company continued to exist and to prosper. The water power was right in the heart of the city; and no place enjoyed better facilities for supplying cheap electricity. He had 1300 consumers, and had increased the output of gas 100 per cent. in three years. Mr. Rice said that at Riverside he experienced the competition of a municipal water-power plant that had to transmit 27 miles. Their loss last year was about £1600; but he was doing remarkably well, having shown a record increase during the past year. A properly-conducted gas company could beat any electrical enterprise, municipal or otherwise.

A paper on "Lubrication" was read by Mr. O. M. Gregory, of San Jose, who pointed out the advantage of periodically painting all ironwork exposed to corrosive fumes—such as in the neighbourhood of seal-boxes or lutes—with petroleum. He recommended sight-feed lubricators for steam cylinders, and preferred lard oil to coal oil for the exhausters. He also preferred lard oil for coating the sides of the lids of purifier-boxes, as it did not contain so much volatile matter as petroleum. Valves should be attended to once a month; and it was not sufficient to merely apply the lubricant, but they should be opened and closed a sufficient number of times to ensure working the lubricant into every part.

(To be continued.)

**The Kerbs Incandescent Gas-Burner.**—Considerable interest is being manifested in Milan (writes a correspondent of the "Pall Mall Gazette") in the results of experiments made with a new type of incandescent gas-light which has been tested for street and internal lighting purposes. It is claimed that the new burner invented by Signor Kerbs, of Milan (described last week), effects an economy of 25 per cent. in the consumption of gas when compared with an Auer incandescent gas-lamp of the same illuminating power. This result has been confirmed by tests made by the Continental Union Gas Company at Milan, by the Auer Incandescent Gaslight Company of Rome, and by others; and the latter Company have already entered into a contract for the supply of the new type of burner. The economy realized in the consumption of gas is claimed to "be due to an improved method whereby the admixture of air with the gas is so regulated as to result in the complete combustion of the gas." Another advantage is that the durability of the mantle is said to be considerably prolonged—thus effecting still further economy to the consumer.



### DR. STRACHE'S IMPROVEMENTS IN LIGHTING BY WATER GAS.

We referred briefly to the paper on "The Latest Advances in Lighting by Water Gas," which Dr. H. STRACHE, of Vienna, read before the recent meeting of the German Association of Gas and Water Engineers, in our report of the proceedings at that meeting (see *ante*, p. 201.) The paper contained, however, a large amount of matter of great interest technically, which we were unable to reproduce until after its publication in the official organ of the German Association—the "Journal für Gasbeleuchtung." In the following abstract-translation of Dr. Strache's last communication, we omit references to many facts recorded in earlier notices of his system in our pages.\*

The aim of the recent improvements in the production and use of water gas has been to increase the yield of gas from the fuel. But at the same time an attempt has been made to employ coal or lignite in place of coke; while, for the sake of convenience and purity, the production of bye-products has been discontinued, and as far as may be all constituents of the fuel have been converted into water gas. The principles on which the generation of the water gas from coal takes place are substantially those set forth in Dr. Strache's specification, No. 3487 of 1895.† The generator is in the first instance charged with coke, which is raised to incandescence by an air-blast; and the resulting producer gas is consumed by means of a secondary air supply in a regenerating chamber, which is packed with fire-brick. The heat thus imparted to the fire-brick is utilized to superheat the steam which is blown through the chamber to the generator when the gas-making commences. Coal is added from time to time through an opening at the top of the generator. The superheated steam enters the generator near the same point, gasifies and carbonizes the layer of coal, and passes downwards with the gas and tarry products into the highly-heated coke in the lower part of the generator. The steam there forms water gas with the incandescent carbon, while the coal gas and tar are broken up into hydrogen and carbon. The carbon is deposited on the fuel; and the hydrogen passes away with the water gas. Ammonia is broken up into nitrogen and hydrogen. The processes which are carried out in this system of making water gas are three—viz.: (1) Gasification and carbonization of the coal; (2) decomposition of the products of distillation into carbon, hydrogen, and a small quantity of nitrogen; and (3) conversion of the coke formed by the carbonization of the coal into water gas.

The decomposition of the coal gas and tar yields a very large volume of hydrogen; thus one ton of coal produces 16,150 cubic feet of that gas. The coke—amounting to about 60 per cent. of the weight of the coal—drops down to the lower part of the generator, and serves for the production of water gas, of which the make per ton of coal varies from 10,765 to 43,060 cubic feet, according to the temperatures of the blast and the steam, and the radiation from, and the capacity of, the generator. The water gas consists of about equal volumes of hydrogen and carbonic oxide; and therefore a ton of coal yields in all from 26,915 to 59,210 cubic feet of a gas which is richer in hydrogen than ordinary water gas. The decomposition of the tar and ammonia is so complete that no trace of tar and no smell of ammonia can be detected in the water of the scrubbers through which the gas passes on leaving the generator. The water is, however, clouded by fine particles of soot resulting from the decomposition of hydrocarbons and carried forward by the gas.

It has long been recognized that superheating the steam leads to a great yield of water gas; but the superheating apparatus formerly tried had not a sufficiently great capacity to be of much value. The steam was, perhaps, raised about 100° C. in temperature; and complications in the working of the plant were introduced. The present apparatus admits of the steam being heated to 1000° to 1500° C.; and thus the generator is not so rapidly cooled by the admission of the steam as is ordinarily the case, and the "run" or period of gas-making may be greatly extended. It has also been recognized that superheating the air of the blast reduced the duration of the "blows," or periods of blasting, and diminished the consumption of fuel during that time. But a suitable apparatus for superheating the blast has not hitherto been constructed; and only in the present blast-heater, the structure of which cannot yet be made public, are the advantages of superheating the blast realized without undue complication of the apparatus. In a small apparatus even, the blast is heated 300° C., and the gaseous products of combustion from the regenerating chamber are reduced to 200° to 300° C. The following table shows the extent to which the consumption of fuel is diminished by superheating the air-blast and the steam. It refers to a generator nearly 2 feet in diameter internally, and a regenerating chamber 31½ inches in diameter internally; and a total radiation of heat amounting to 1000 calories per minute. The supply of primary air for the blast is taken at 353 cubic feet per minute; and the quantity of steam injected, at 2·2046 lbs. per minute.

Pounds of Coke Consumed per 1000 Cubic Feet of Gas Made.\*

| Temperature of the Air-Blast in Degrees Centigrade. | Temperature of the Steam, in Degrees Centigrade. |       |       |       |       |       |       |       |      |      |      |
|-----------------------------------------------------|--------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|------|------|------|
|                                                     | 0                                                | 100   | 200   | 300   | 400   | 500   | 600   | 800   | 1000 | 1200 | 1500 |
| 0                                                   | 128·6                                            | 126·7 | 124·2 | 121·1 | 118·0 | 114·9 | 111·1 | 103·6 | 93·0 | 82·4 | 63·0 |
| 100                                                 | 101·9                                            | 108·0 | 105·5 | 103·6 | 101·1 | 98·6  | 95·5  | 88·6  | 80·5 | 71·2 | 55·6 |
| 200                                                 | 95·5                                             | 94·2  | 92·4  | 90·5  | 88·0  | 86·8  | 83·0  | 78·2  | 71·2 | 63·0 | 49·9 |
| 300                                                 | 85·5                                             | 84·9  | 83·0  | 81·8  | 79·3  | 77·4  | 74·9  | 70·5  | 64·3 | 57·4 | 45·6 |
| 400                                                 | 78·2                                             | 76·8  | 75·5  | 74·3  | 72·4  | 70·5  | 68·7  | 64·3  | 58·7 | 53·1 | 42·4 |
| 500                                                 | 71·8                                             | 70·5  | 69·3  | 68·0  | 66·8  | 64·9  | 63·0  | 59·9  | 54·9 | 49·3 | 39·9 |
| 600                                                 | 66·8                                             | 65·5  | 64·9  | 63·7  | 61·8  | 60·6  | 59·3  | 55·6  | 51·2 | 46·2 | 38·1 |
| 1000                                                | 53·7                                             | 53·1  | 52·4  | 51·2  | 49·9  | 49·3  | 48·1  | 45·6  | 42·4 | 38·7 | 33·1 |

\* 62·4239 lbs. per 1000 cubic feet = 1 kilo. per cubic metre.

The consumption of coal in a small apparatus of 1766 cubic feet capacity amounted to 50 lbs. per 1000 cubic feet of gas made; but it is hoped that this consumption will be reduced to 31·2 lbs. in an apparatus having ten times the above capacity. The gain in economy experienced with increase in the size of apparatus arises from the fact that the radiation is relatively much less from the larger plant. The employment of a small relief gasholder, to receive the gas as it leaves the scrubbers and distribute it in a uniform stream to the purifiers and storage gasholder, is only necessary when the installation is large. With small installations the cost of a relief gasholder would be prohibitive; and the gas may in such cases be taken direct from the scrubbers to the purifiers. Or, the purifiers may be arranged posterior to the storage gasholder, so that the gas is purified as it leaves the holder for distribution to the places of consumption. The purifiers should be charged carefully, in order that silica carried in suspension by the gas may be removed from the latter. In early installations, deposits of silica frequently caused stoppages of services and burners.

The process for the removal of the gaseous iron compound from water gas by means of sulphuric acid has been so far perfected that 1600 cubic feet of gas are now purified by 1 lb. of acid. Another method (which cannot at present be described) of removing the iron impurity has been devised; but, when it is used, sulphuric acid or some other desiccating agent is also employed to dry the gas. The purified gas must not pass over unprotected iron surfaces, as it thereby is able to acquire the iron impurity afresh. New iron pipes for the distribution of water gas should therefore be tarred or galvanized; but old gas services do not injure the gas, as the iron is coated with a crust of oxide and sulphide which sufficiently protects the gas from contact with the iron. Mercaptan, which was formerly employed for giving an odour to the gas, has been discarded, because it was expensive and its smell was not sufficiently characteristic. In place of it, carbilamine is now used. Dr. Jahoda has devised a process for producing the substance in a concentrated condition (50 per cent. strength) at a cheap rate; and an odour may therefore be imparted to the gas at a very low cost.

(To be continued.)

### TEST OF A PIPE DISTRIBUTION SYSTEM.

The Annual Meeting of the American Water-Works Association was held a short time since at Denver (Col.). One of the papers prepared for the occasion, but not presented, was by Mr. J. S. HARING; and the author gave therein a description of an important test of a pipe distribution system recently carried out under his supervision. The following particulars are taken from the "Engineering Record."

In 1896 a new system of pipes, ranging in size from 12 to 4 inches, and in length about 10½ miles, was constructed. At the time the contracts were made, several open questions as to the choice of the source of supply caused delay in coming to a decision as to where it should be taken from—it was, indeed, months after the work was done before a conclusion was arrived at. The work of laying the pipes began in May and was completed in the following December. At the time the work was progressing, provision was made for placing hydrants; but they were not then contracted for, and their T connections were closed by temporary plugs, as were also some dead ends.

The pipe contract was awarded to one of the most reliable pipe companies. The specifications were the usual provisions for a test of 300 lbs. hydraulic pressure per square inch, the pipe to be sharply rapped with a hammer while under such pressure. No inspector was placed at the foundry; the pipe being taken under the company's guarantee. An inspector examined the pipe while it was being unloaded, and he again went over the pipe while it was hauled to its position in the street. Finally it was inspected by the contractor's men when being laid. The inspector selected for this work was a practical foundryman, who was thoroughly familiar with foundry practice and cast metals; and in order that he might more fully familiarize himself with this pipe, Mr. Haring and he visited the foundry and examined the method of manufacture. The same course was pursued with regard to the manufacture of the valves; each being tested at the factory to 300 lbs. internal pressure. This method proved

\* See "JOURNAL," Vol. LXIII., pp. 527, 568; Vol. LXV., p. 218; Vol. LXVII., p. 1217; Vol. LXIX., p. 24; and Vol. LXX., p. 897.

† *Ibid.*, Vol. LXVII., p. 567.



to be of advantage to both the city and the manufacturers, as they were able later on to discuss defects which were found with far greater intelligence than if no positive knowledge of the methods of manufacture had been had. The inspector's examination of the valves covered everything in connection with them, and particularly the setting up tight of the dome and packing-gland nuts. About 175 valves were used in the mains, and 70 in setting hydrants as supplemental valves. Nearly the whole of the valves for the mains were delivered in May; the hydrant valves in October. They were inspected and stored in a warehouse until used.

In March, 1897, a contract for setting the hydrants was made, and the work thereunder began in April, and was completed in June. During the whole time between the beginning of pipe laying and the completion of setting the hydrants, no test of the distribution system could be made. Immediately following the setting of the hydrants, all temporary plugs were removed and solid permanent plugs put in, so that a test of the system could be carried out. The contracts for laying the pipe and setting the hydrants had specified that a test of 200 lbs. per square inch should be made. The territory covered was that of a hill-side, ranging in elevation from 0 to 250 feet; the reservoir being at an elevation of 352 feet. A temporary connection was made between the main leading from the reservoir and the system tested, by means of a  $2\frac{1}{2}$ -inch fire-hose connected with a hydrant nozzle.

The test was under the charge of a foreman who had been an inspector on the pipe laying and hydrant setting—a man of more than ordinary intelligence, carefulness, and honesty in the performance of his work. The pipes were filled with great care. About two weeks were taken to accomplish this, so that no "hammer" or compressed air would occur. Each hydrant was opened and left open to allow the escape of air as it was found the water was rising to near its level, until it ran out at the hydrant. Blow-offs were opened, and all dirt and accumulations taken out of the pipes until those in charge were satisfied that every precaution had been taken to make a proper test.

The means of testing were those usually employed—a boiler feed-pump set in a galvanized sheet-iron 10-gallon can, bolted through the bottom to a plank; the pump being connected with an inch galvanized iron pipe and valve by a union to a special hydrant nozzle cap. Water was supplied to the can from a barrel filled from the hydrant before connecting the pump. Attached to the other hydrant nozzle was a test-gauge registering up to 200 lbs. pressure. This was afterwards changed to a gauge registering up to 400 lbs., for the peculiar reason that the contractor who set the hydrants claimed that the engineers were going over 200 lbs. in their test, and were thereby causing the various leaks which appeared in his work, and were violating the terms of his contract by excessive pressure. The sensitiveness of this gauge was not very great, and caused some annoyance in use.

The test was begun at the bottom in small sections, and from this proceeded slowly over the whole system. There being no service connections, the work was very much simplified. First the reservoir test was made by shutting off all supply. The pressure was noted for a few minutes, when the pump would be applied and a pressure maintained by closing the globe valve from the pump. As all defects were sought for and corrected in each section as found, the work of testing was slow; and Mr. Haring, who began the test personally, soon found that, other duties pressing upon him, he had to delegate the matter generally to his foreman.

By the liberal use of valves in the system, the ability to cut off small sections and to locate defective valves (generally from some obstructions under the disc) was very interesting. At the beginning, considerable trouble was experienced on one section. The action of the gauge convinced Mr. Haring that it was not a leak, but must be a defective valve. After manipulating numerous valves, he located the trouble at one immediately on the corner where the test was being made. After digging up the valve and taking off the dome, fully 1 lb. of gravel, sand, and a part of a tin can were found in it.

As a charge was to be made against the various contractors doing the work of furnishing materials, each was notified of the test to be made and the date when it would begin. Only the contractor who set the hydrants—a local man—responded. The test demonstrated only nine minor defects in pipe laying, the cost of repairing which amounted to \$89.39. But the pipe demonstrated the peculiarities of the situation, and it in turn was surpassed by the defects found in the valves. Three breaks occurred in the 12-inch pipe, two in the 8-inch pipe, and two in the 6-inch pipe, the cost to repair which amounted to \$237.49. The fracture in this pipe was, in every instance, shown by the pipe to be due to inherent foundry defects, "cold shorts," honey-comb shrinkage, and foundry imperfections.

After the foundry test, the care of inspection, and every precaution, why should these pipes fail under a 200-lb. pressure test? Naturally the pipe company demurred to the charges made against them, and argued from their foundry test that such results were impossible; but that they actually occurred cannot be disputed.

Mr. Haring required in the valves supplied for the mains the use of sheet rubber gaskets; but in the hydrant valves this provision was not made, and the ordinary oiled paper was used for gaskets. Of the 175 valves employed in the mains, 19 were

found to be leaking around the packing-gland gasket. Of the 67 hydrant valves then placed, 13 gaskets were defective; the total cost of making good the defects being \$152.33. The engineers claimed that the general cause of the leaks was that the gaskets were too thin, the iron surfaces were compressed together without sufficient elastic material to shut off fully the space between their faces, and in two instances the follower of the packing gland was too large to enter the casting.

The valve manufacturers made a careful examination of the claims, and disputed their liability for the damage. They claimed, in the first place, that the engineers had not properly conducted the test, having compressed air in the system which had found its way out through the gaskets of the valves as the points of least resistance. Secondly, that if the air had not been compressed in the system, it had been in the domes of the valves, thereby causing the gaskets to blow out, and that the air pressure would amount, under such conditions, to more than 200 lbs. Thirdly, it was claimed that if the packing-gland nuts were tightened up when they were inspected in May, 1896, the gaskets had shrunk, and the nuts again needed tightening.

When the gaskets were produced, in each case marked as to locality, and none of them showed the least signs of having been blown out, no explanation made by them seemed to account for the cause. That the leaks were very large from this cause was demonstrated at the personal examination of a representative of the company who happened to be present when one of the leaks made itself evident. It is claimed by the makers of these valves that no similar experience had ever come to them in a matter of this kind. Of the many thousands of valves sent out by them, none had ever been found defective in the two ways discovered in this case. They claim that, with their shop practice and system of testing valves, no such defects could be afterwards found; yet they were, and they are indisputable.

#### TARRED MACADAM FOR ROAD MAKING.

At the Annual Meeting of the Association of Municipal and County Engineers recently held in Edinburgh, Mr. A. H. CAMPBELL, the City Surveyor of Canterbury, read the following paper as to the use of tarred macadam in the construction of roadways in urban districts:—

The Committee of the last International Congress of Hygiene and Demography, held at Buda-Pesth, adopted the following resolution: "That the paving of streets should be smooth, and as far as practicable impervious, to facilitate cleansing, and also to prevent contamination of the subsoil." The text of the resolution comprehends in a sentence all the essentials of a good roadway. These may be briefly summarized under the following heads: (a) Durability, (b) the minimum of noise, and (c) the minimum of first cost, consistent with the foregoing.

The attainment of the first of these essentials is best realized by the adoption of granite setts, as may be witnessed more or less in all large cities, and nowhere to a greater proportionate extent than in the city where the Association are now assembled. This kind of paving, however, is not smooth. It is most noisy; the truism of "empty vehicles (not vessels) making the most sound," receiving abundant illustration on this form of road. And, further, unless laid on a bed of concrete and jointed in pitch, it is not impervious, and the facility of cleansing is much impeded, due to the numerous joints wearing open and rounding off, holding the dirt and dust of roadways. It is, moreover, costly—probably nearly as costly in construction as wood pavement; and its only claim for use is its durability. Allied to this material for road formation is the use of blue brick setts for carriage-ways, which are having experimental trials in a few places.

The attainment of the second head—i.e., minimum of noise—is best realized by one or other of these descriptions of materials: (1) Gutta-percha, (2) compressed asphalt and concrete macadam, (3) wood paving, and (4) macadam.

The first named is mentioned only as the ideal of noiselessness, and not as entering into comparison with any of the well-known materials of road construction. It is in a very experimental stage as yet, and has hardly come within the scope of practical consideration. It is to be seen in small short sections in Glasgow, and at the entrance to Euston Station, London.

Compressed asphalt, also concrete macadam, is clean, impervious, and durable; and, saving for the clatter of horses' feet, it may be described as comparatively noiseless. Involving, as asphalt does, the underlying bed of concrete, the first cost renders it prohibitory in all save large centres of population. It is, moreover, slippery, and unsuited to inclined roads upon a hill.

Wood paving comes next in the fulfilment of the necessary conditions of the text. It is smooth; is probably the least noisy of any of the descriptions of hard pavement; it is of moderate durability; and, if of the hard wood description, practically impervious to moisture. Its first cost, however, and the unreasonably short periods allowed for repayment, render the general adoption of wood pavement in moderate-sized towns, or even in the suburban parts of large cities, very unlikely, if not prohibitory. The class of town or urban district to which allusion is made, is that of moderate size and limited financial resource,



which are restricted therefore to the use of macadam in the construction of their highways.

As it is from moderate-sized towns or districts that so many members of the Association come, the consideration of any improved form of macadam paving acquires special interest and importance; and there is no improved form which is coming so much to the front, and demanding that attention which its merits unquestionably deserve, as that now known by the name of "tarred macadam"—that is, a composition of any of the stones, gravel, or clinkers commonly used in the making of macadam roads with a mixture of tar. It appears a composition simple enough; but its preparation and laying, so as to turn out a success, bristle with delicate detail. When properly made, and on roads suited for it, this construction of road complies most nearly—compressed asphalt perhaps excepted—with the conditions laid down in the resolution set forth at the outset of this paper. It is a smooth and noiseless road, it is non-absorbent, it is cleanly in itself and easily kept clean, and its first cost is within the capacity of the most reasonably restricted finance of small towns and districts.

With all the advantages enumerated, it appears remarkable that tarred macadam has not yet been adopted except on the most limited scale. It is true that tarred gravel or limestone footpaths have been in use for a great number of years, and have now obtained a deservedly wide adoption; but the extension of this same composition, only of a larger gauge metal, to the construction of roadways has been most limited. As accounting for this, these reasons may be suggested: The failures which frequently attend a first trial; uncertainty as to the properties and action of tar, and how it will unite with the aggregate which it is designed to incorporate. The author can speak from personal experience of its failure and of its success too—failure where success was expected, and success where failure might be anticipated; and this is evidence of the fickle character of the composition. In its preparation, storage, and laying the author has had special opportunity for its study; the composition, as used by him, being prepared by the workmen in his department.

There is here submitted in tabular form an epitome of particulars of several streets laid by the author during the past three years:—

| Name of Street.                | Width of Carriage-way. | Nature of Traffic.                                                     | Date when laid. | Thickness, Aggregate.                                         | Cost per Superficial Yard. |
|--------------------------------|------------------------|------------------------------------------------------------------------|-----------------|---------------------------------------------------------------|----------------------------|
| 1.—Stour Street                | ft. in.<br>8 2         | Heavy continuous traffic, three traction trains passing daily          | July, 1895.     | 6 inches of Kentish rag                                       | About 4s. 6d.              |
| 2.—Turnagain Lane (cul-de-sac) | 8 2                    | Light van traffic                                                      | Nov., 1895.     | 4 inches of gravel on the old natural road formation          | 3s. od.                    |
| 3.—Orange St.                  | 17 0                   | Medium thorough traffic, carriers' wagons, carts, and tradesmen's vans | March, 1897.    | 4 inches of gravel underlaid by 3 inches of hard broken brick | 4s. 6d.                    |
| 4.—King Street                 | (1) 16 6<br>(2) 8 2    | Ditto                                                                  | May, 1897.      | 3 inches ditto                                                | About 4s. od.              |
| 5.—Guildhall St.               | 15 9                   | Heavy through traffic, omnibuses, and general town traffic             | Sept., 1897.    | 4 inches ditto                                                | 4s. 6d.                    |

*Experience.*—1. Failure. Quite unable to support the constant action of the traction-engine traffic. 2. Satisfactory. 3. Most satisfactory. 4. Moderately satisfactory. Centre of way along horse track commenced to disintegrate, due to the tar being overboiled, and the material hardening or setting before using. 5. Generally satisfactory. Superficially softens on parts in sun heat, but otherwise is doing well.

Besides the foregoing list, a number of lanes in Canterbury have been partially laid with this composition; and at the present time St. Margaret Street, about 700 feet long, with a carriage-way of only 12 feet, and in the centre of the city, having heavy vehicular traffic, is in process of laying.

The preparation and laying embrace these details: (1) The nature of the aggregate and its preparation. (2) The tar, its nature and treatment. (3) The mixing of these two together. (4) The storage. (5) The laying down upon the road. (6) The cost.

As regards the nature or description of the aggregate, the author has tried Kentish rag-stone, surface picked flints, pit gravel, and Guernsey granite. The stone is prepared for the tar by burning in the open. It is laid out first of all in a flat bed about 12 inches thick, and of rectangular plan. On this is spread a layer of coke and breeze about 3 to 4 inches thick, with a little wood to assist the fire; this is then overlaid so as to form a stack of stone about 5 feet in height from the ground. In the meantime, as the last addition to the height is made, the

fire of wood and coke has been kindled, and it is allowed to penetrate the stack. About 1½ chaldrons (54 bushels) of coke are consumed in a stack of 60 cubic yards. As regards the length and size of the stack of stone, this may be made endless by laying out the stack so as to describe a circle; thus following, in the process of mixing, a circular course, with certain obvious advantages. Other makers of tarred stone composition in the author's district arrange the stack in the form of a cone, close it up at the top, fire it in the centre, and, allowing the fire to penetrate the mass, leave the stack of stone untouched while this process of firing proceeds. This operation may take any time between seven and ten days. The stack is then opened up, and the hot stone applied to the prepared tar.

In either of these methods of firing the stone, a great deal of loss by disintegration occurs; the stone succumbing to the influence of the fire, and tending to get reduced to a coarse-grained powder. Particularly so was this the case with a trial of granite exposed to fire, which quickly produced the condition above described. For this reason the author would much prefer the heating of the stone in an oven or kiln. The temperature would be more equable; and the severe firing causing the disintegration described would be avoided. On the subject of "heating," one or two remarks may be submitted. The author believes it to be the practice with some makers not to heat the stone at all, but, being sure that the stone is dry and free from moisture, apply it in the cold, but thoroughly dry, state to the prepared tar. This condition of the stone, in the author's opinion, resembles the risk attached to laying the tarred mixture in position in cold instead of hot weather. The tar refuses to "work," the temperatures being so unequal; and when the sun (particularly that of the sunny South) beats upon such a road, it is not improbable that this defect will discover itself in the liquefied tar bubbling and spewing itself up over the surface.

The temperature of the stone when the tar is applied should be such as the palm of the hand can bear with comfort. If too hot, the tar will be destroyed as a cohesive; if too cold, the tar will go on too thickly, and under the rays of a hot sun will soften. The hot stone, when ready to be mixed with the prepared tar, is sifted through two gauges graduated to 1 and to ½ inch, giving three sizes of material—1 to 2 inch gauge for the body material, ½ inch to 1 inch gauge for the intermediate or fining coat, and ¼ inch to ½ inch gauge for the skin or top dressing. These three sizes are placed in layers as follows: 3 to 4 inches thick of the coarse, about ½ inch thick of the intermediate, and the top dressing in the thinnest layer possible, with a view only to filling all interstices. Thereafter a dressing of fine ¼ inch granite or limestone siftings is scattered broadcast, and the traffic at once allowed on the road; working this top dressing in, and assisting in the consolidation of the road formation. The weight of the roller employed by the author is nominally 10 tons; and each of the three layers is rolled separately.

Considerable importance is attached to the state of the weather at the time of laying. It should be done in the sun by preference, and to assure a good result. If laid in a cold temperature, and with any defects present in the composition, disappointment and possible failure will result. The weather being normal, any time between May and September (inclusive) may be regarded as suitable. One word as to wet weather. Operations, both of mixing and of laying, should be suspended in time of "wet," where they are conducted in the open, as nothing so corrupts the composition as the presence of moisture.

In constructing a road of this tarred composition, the old surface is removed to a depth of 8 inches, and re-made with a 4-inch thickness of dry hard broken stone, furnace clinker, or brick. This is rolled smooth, and finished to the required camber of the road. The author's reasons for this underlying ballasting of dry material are twofold: (1) To separate the tarred composition from any damp substratum; and (2) to economize in the thickness of tarred material. In the author's practice, the tarred composition is only 4 inches thick (finished). This by itself would be an insufficient surface formation to bear the traffic and resist the damp; but underlaid by the dry ballasting of hard material, well rolled, and preferably grouted with cement or brushed with well-boiled tar, it appears to answer the requirements for which it is introduced.

One sentence is necessary as to having the tarred mixture all in a fresh or "live" state when being laid, otherwise cracking and disintegration of the road will rapidly occur; also as to keeping off all traffic during the progress of the work—not because the traffic in itself is an injury, but because of the dirt, dust, and other matter foreign to the mixture being imported, and destroying the binding together of the layers in one corporate mass. This hint is one to which the author attaches considerable importance, as the effects of this occurrence have been painfully present to his sight upon portions of two roads which he has laid down.

The quality of the tar employed is no less important than the other details of the work. Some trading firms making this material use the refined or distilled tar, and excellent results are thus obtainable; but more commonly it is the ordinary gas tar that is employed at a cost of about 2d. per gallon. This tar should, as far as possible, be free from water, and of a stiff dense consistency, any defects of this character having to be counteracted in the boiling operation. The lighter the tar, the longer it must boil, so that all light oils are driven off. To each 50 gallons of tar is added a small proportion of pitch (about



half a bucketful), and these are boiled together. The author would not assert the necessity of introducing even this small proportion of pitch. But the cost of doing so is almost infinitesimal; and as a counteractive to bad quality of tar it is good, and worth introducing.

The life of this description of road paving may be taken at seven years. So that, divided over that term, the annual cost of a road so paved will work out at 77d. per super yard. During this term, it may become necessary to lay out certain small amounts in repairs, so as to maintain the surface smooth, whole, and impervious. This, estimated at 2d. per yard per annum, will give a grand total of 97d. per super yard per annum for this description of roadway. This rate for a good street pavement in urban districts, for heavy vehicular traffic of the ordinary sort (that is, including traction engine traffic, for which it is unsuited), is most moderate. Compared with any of the other descriptions of paving, even with ordinary macadam, it is rather less; and side by side with any of the improved harder pavements—wood, compressed asphalt, or setts on concrete bed—it is incomparably less costly. The author does not, however, suggest that this description of pavement should enter into competition with these superior materials of road construction. Each and all of them—stone setts, wood, asphalt, tarred macadam, and ordinary macadam—have their respective places. All, save tar macadam, have had their field and play; and it is for a fair field, devoid of any favour, that the author presents to the Association a plea on behalf of tar macadam. On the leading streets of smaller provincial towns, in the secondary and suburban thoroughfares of large towns, where in many cases stone or granite setts are used, of heavy cost, tarred macadam, properly prepared and laid, would form a welcome, valuable, and economic substitute.

In the discussion on the paper, Mr. Smith Savile, of Darwen, said he had always been accustomed to mixing the tar with cold macadam, instead of heating the stone in the way adopted by Mr. Campbell. Mr. Wike, of Sheffield, said he had had comparisons made of the cost of granite and tar macadam, and found the former was 50 per cent. cheaper than the latter. Mr. Baker, of Middlesbrough, said he believed the most important matter in connection with the use of tar macadam was the proper boiling of the tar, so as to get it of the same consistency. It was also important, in the making of the road, to get a good sound foundation under the tar macadam. He did not consider the burning of the stone to be necessary, providing it was thoroughly dry and the tar properly boiled. Mr. Lemon, of Southampton, remarked that there was nothing particularly new about tar macadam. He had seen it in a number of towns, and had noticed a good many failures. He considered it best to convert old macadamized roads into tar macadam roads, rather than start with the latter material on an entirely new road, so as to avoid the very heavy cost for foundations referred to by Mr. Campbell. If this plan were adopted, they could get a good tar macadam road for 3s. per yard super. He, however, advised surveyors, if they had no experience with the material, to put the work into the hands of a contractor, or of someone with experience. The tar itself varied considerably in quality, even from the same works; and there were many other details about it which made for success or failure.

**Another New Gas, "Etherion."**—The New York Correspondent of the "Standard" reports that at a meeting of the American Association for the Advancement of Science, Mr. Charles Brush made a preliminary announcement of the discovery of a new gas—a constituent of the atmosphere, and absorbed in many instances. Its chief characteristics are low tension and conductivity of heat surpassing those qualities in hydrogen one hundred times when impure, and, theoretically, a thousand times if pure. The discovery resulted from a search for secluded hydrogen. Mr. Brush calls his new gas "Etherion," because its attributes forbid its being confined to the earth's atmosphere, and indicate its interstellar distribution and relation to ether-filling space. He calculates its molecular velocity as over a hundred miles per second; its density one-thousandth of that of hydrogen; and its specific heat six thousand times that of hydrogen. He thinks it analyzable into several gases, forming a periodic group of new elements.

**Progress of the Staines Reservoirs.**—Our readers will remember that the important scheme of reservoirs designed by Messrs. Hunter and Middleton, the Engineers of the Staines Joint Committee, was commenced on the 30th of April last, when the Chairman of the Committee (Mr. E. Boulnois, M.P.) cut the first turf. We learn from the Engineers that the works, of which a description has been given in the "JOURNAL" (Vol. LXXI, pp. 996, 1065), are making very satisfactory progress. Nearly 2½ miles of stripping for the banks, or about 50 per cent. of the whole length of the bench, has been done. Some 2200 yards of the excavations of the puddle trench have been opened, and about 1100 yards bottomed and filled with clay—700 yards being filled to the ground-level. Excavations have been commenced for the inlet and outlet towers of the reservoirs; and a start will be made immediately with the inlet from the Thames and the aqueduct. The Contractors for the works are Messrs. John Aird and Sons, who have about 1200 men upon the ground, together with four steam-navvies, four pugmills, and several locomotives and steam-cranes.

## REGISTER OF PATENTS.

**Safety Appliances for Gasholders.**—Hacking, L. A., of Blackburn. No. 17,854; July 30, 1897.

This arrangement is more especially applicable to acetylene holders; its object being to provide means whereby, when holders become overcharged with gas, the surplus (instead of escaping through the water-joint) "is conveyed to some distance or place of safety, or to another gasholder for storage, thus preventing liability of explosion."



Fig. 1.

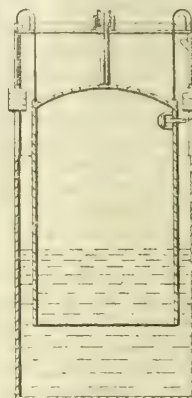


Fig. 2.

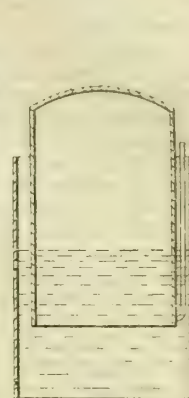


Fig. 3.

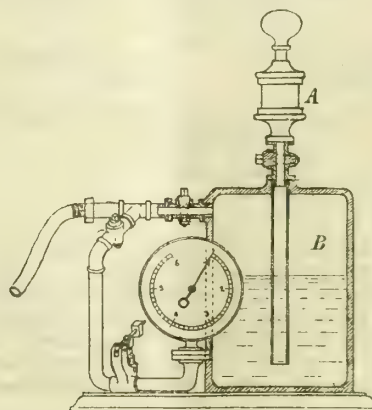
According to the arrangement shown in fig. 1, in the bell of the holder is fixed a vertical pipe or tube, one end of which protrudes from the dome, and the lower end dips into the water in which the holder floats. When it contains an ordinary charge of gas, the lower end of the pipe is sealed; but when the bell is overcharged, it rises until the lower end of the pipe is above the water-level, and the gas escapes by the pipe.

Instead of the long pipe, in some cases a valve A (fig. 2) is used, fixed in the top of the bell or to a short pipe in same; and when the latter or the dome rises to beyond a given point, the valve is opened by coming into contact with a stop-piece, and the surplus gas escapes and may be conveyed to a point of safety or storage.

The escape-pipe can, however, be attached to the floating bell (fig. 3) at such a height that the opening into it, under an ordinary charge of gas, is below the level of the water; but when surplus gas is driven into the holder, the opening rises above the level of the water, and allows the gas to escape. The pipe referred to can be attached to the outside of the bell, and between the latter and the water-container.

**Tracing Leakage in Gas-Pipes.**—Jensen, G. J. G., of Victoria Street, S.W. No. 20,421; Sept. 6, 1897.

The patentee proposes to test gas-pipes for leakage "by pumping fumes or gases into the pipes and tracing their escape by the reagent of the fumes or gases," concerning which he says: "I am aware that a somewhat similar apparatus is already used for charging pipes with fumes or gases under pressure, any leakage in the pipes being detected by sight or smell. My apparatus can be used in the same way; but, in addition to this, it provides a means of detecting leakages which are too minute to be discovered by sight or smell. I am also able to employ a light gas in place of the dense fumes generally used, which fumes are liable to temporarily stop up minute leaks and prevent their detection."



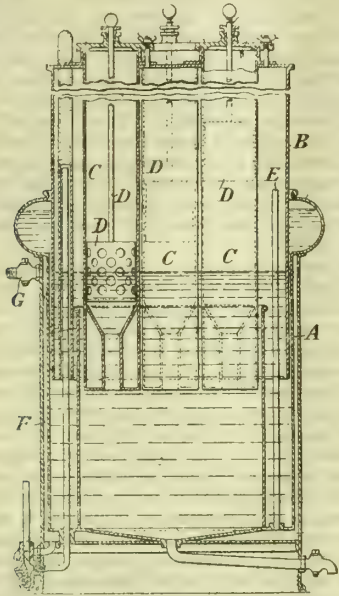
The arrangement, as shown, consists of a force-pump or similar appliance A, wherewith the pipes are charged with the gases or fumes generated in the chamber B. In this chamber is placed any chemical capable of generating fumes or gases traceable by a reagent—such as termeric, in the case of ammonia. If termeric test paper be passed over the surface of the pipe tested, its yellow colour will be turned brown if it passes over a leak in the pipe through which the ammonia gas is escaping. To the apparatus is attached a gauge to indicate any alteration in the pressure within the pipes.

**Generating Acetylene.**—Bean, H. R., of Plaistow, and Ringwood, H., of Poplar, E. No. 21,114; Sept. 14, 1897.

This is a modification of patent No. 5756 of 1897—designed to make the apparatus referred to a continuous working machine. The generator A is provided with a bell or sliding gasholder B, which rises or falls according as the supply of gas increases or diminishes. C are a number (three are shown) of gas-generating chambers or cylinders, secured to the cover of the holder. Their covers are hermetically secured in position by thumb-nuts, so that they can be easily removed for recharging with carbide; and each cylinder is placed in communication with the interior of the holder by a pipe controlled by a cock. D are perforated



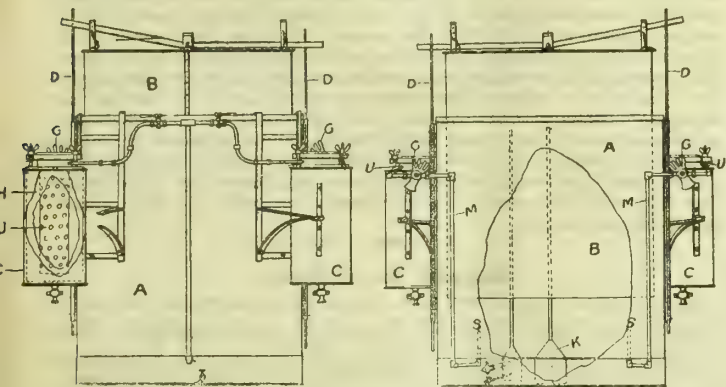
baskets, for containing the carbide, attached to the lower ends of rods which pass up through the cylinders C and out through stuffing-boxes in the covers; the upper ends of the rods being provided with handles to limit the extent to which they can be lowered. The baskets are arranged at different heights in their respective generating chambers, in such a manner that when the contents of the first basket are exhausted the next highest basket is brought into operation by the sinking of the holder caused by the consumption of the gas.



After the apparatus has been filled with water, and the baskets D have been charged with carbide, one of them is lowered until its contents are immersed in the water; the other baskets being also arranged at the proper heights to ensure continuous operation as above described. The gas as generated passes into the holder, from which it travels down the pipe E into the condensing chamber F surrounding the water-container, and from which it is drawn off as desired for consumption through the cock G. When the carbide contained in the first basket is exhausted, the gradual consumption of gas will cause the gasholder to drop until the second basket reaches the water, and so on.

**Generating Acetylene.**—Benjamin, J., of Swansea. No. 27,065; Nov. 19, 1897.

In this arrangement there is an outer water-tank A, in which a holder B can rise and fall. On the outside of A are fixed one or more water-jackets C, in each of which are cylinders H, containing the carbide-baskets J. The water necessary to generate acetylene in these cylinders is supplied from A by the pipes M. It enters at S, and passes into the cylinders at U. The gas generated enters the holder at the bottom by the well K. To the top of the holder are fixed rods D, which slide in



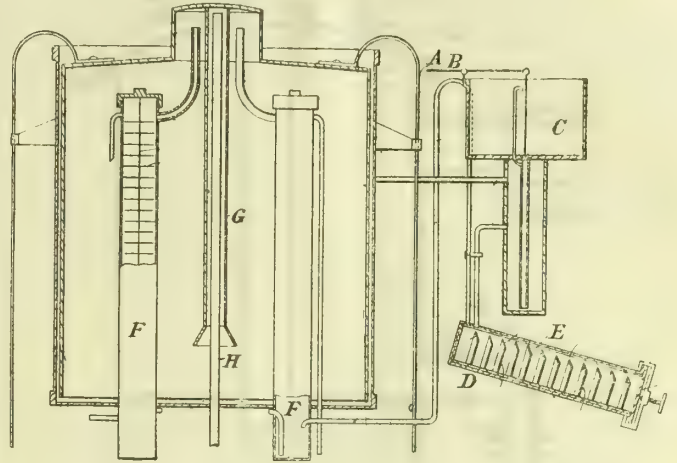
grooved tubes by the side of the carbide cylinders. In certain positions on these rods are projections or teeth, which act on the cogs of the crank G, and open or shut a cock in the pipe M. The gas passes out by the well L to the outlet-pipe. The holder and rods then gradually fall by their own weight; and the points on the rods again coming into contact with the crank G (but this time being the reverse motion), it opens the cock in the pipe M and lets in fresh water upon the carbide, when a repetition of the movements takes place, with a continuous supply of gas.

**Manufacturing and Storing Acetylene.**—Owens, W., of Pontardawe. No. 1625; Jan. 20, 1898.

In order to supply water to the calcic carbide employed in proportion to the consumption of the gas, there is mounted upon the moveable part of the holder shown in the engraving a projection—such as a bent spring A. This is caused to engage a lever B operating a valve between the cistern C or other source of water supply and the generator proper D. When, therefore, the holder descends to such an extent as to cause the projection to engage with the lever, the valve is opened, and a definite amount of water allowed to pass to the generator. Between the cistern and the generator there may also be a hand-valve (to be opened and maintained open to any desired extent), and a water-trap for the purpose of preventing any back-passage of gas from the generator to the cistern. The carbide holders E are cylindrical in shape, and are fitted with trays or partitions for holding the carbide. The trays with their upturned edges are designed so as to form compartments for the carbide; and to these

compartments water passes, by a longitudinal duct or opening in consecutive order as decomposition takes place. The generator opens at the bottom, so as to prevent the escape of gas; and it is placed at a considerable angle.

From the generator pipes pass to the holder, and preferably to the lower part of one or more purifiers F. These purifiers consist of vertical cylinders or pipes fitted with condensing baffle-plates, attached to a central rod so as to be easily removed when desired. The purifiers are fitted with screw-caps at the top; and pipes are led from any source of water supply to the upper part, so as to discharge a stream of cold water over the baffle-plates for purposes of increased condensation.



The holder (surrounding and enclosing the purifiers) is provided with a dome at its highest point, to which the gas from the purifiers is led; and from the dome depends a pipe G to a position near the bottom of the holder, and containing within it a safety-pipe H, through which excess of gas passes when the moveable part of the holder has been raised to its highest position.

Assuming that the bottom of the purifiers, gasholder, and the cistern have been supplied with water, the cover taken off the generator, and the lever depressed so as to allow water to pass to the generator, the hand-valve is closed and the carbide holder with its charge of carbide is placed in position in the generator. The cover of the generator is now put on; and the apparatus is ready to commence work. The hand-valve is next opened to the desired extent; and the lever controlling the regulating-valve is slightly opened, so as to allow water to pass into the first compartment of the carbide holder. Acetylene is at once evolved, and passes through the purifier into the holder, raising it and bringing the projection away from and above the lever actuating the regulating-valve. When sufficient gas has been consumed to cause the holder to descend so as to make the projection engage with the lever actuating the regulating-valve, water is again supplied to the generator; the holder, by further evolution of gas, is again raised; and the same cycle of operations is gone through. The water passes through the compartments of the carbide holder in succession until the whole of the carbide has been decomposed.

**Revolving Continuous Purifier.**—Yeadon, A. E. N. & S. N., of Leeds. No. 2444; Jan. 31, 1898.

This invention relates to the use or application of a revolving horizontal cylinder for the purification of gas by hydrated lime, oxide of iron, or other analogous materials, as described in an illustrated article which appeared in the "JOURNAL" for the 19th ult., p. 152.

**Gas and Oil Engines.**—Bennett, J. F., and Moorwood, H. S. & T. P., of Sheffield. No. 13,130; June 11, 1898.

This invention relates to an improved construction of the cylinder and water-jacket of gas and oil engines, so that there may be no water-joints between the jacket, the combustion chamber, or the working barrel of the cylinder. Also to an arrangement of valve-box by means of which the valve-box or cover with the valves, the valve arms or levers which actuate them, and their appurtenant fittings may be taken off the cylinder for examination or repair without interfering with the gas and exhaust pipes or their connections, or any other motive parts of the engine.

**Generating Acetylene.**—Abel, C. D.; a communication from P. Lipcke, of Charlottenburg, Germany. No. 13,387; June 15, 1898.

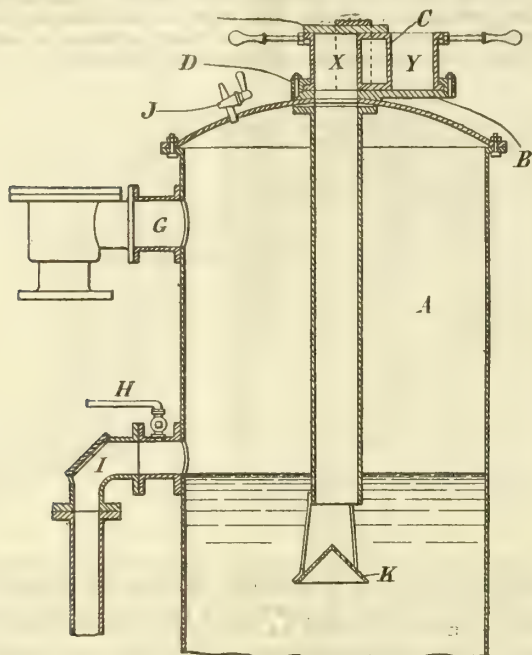
The patentee proposes to obviate certain enumerated dangers and disadvantages in many forms of acetylene generators, by the provision of both a mechanical closure and a water-seal for the supply tube or channel, whereby any "escape of acetylene gas and the danger of explosions is practically obviated." For this purpose, there is employed at the upper end of the charging channel a slide having one or more cavities for receiving the charges of carbide. The slide can be so moved that at one time the cavity is exposed so that it can be filled with a charge of carbide; and at another time it is brought with its lower opening over the charging tube or channel, the lower end of which is immersed in the water of the generator, while its upper opening is closed by a covering plate.

As shown on the next page (the upper part of the apparatus only) there is fixed on the top of the generating chamber A a plate B, on which the slide C is made to work air-tight; being held firmly down by the guide-ring D.

The slide has two charging-cavities X and Y, so arranged that in the one position of the slide one of the cavities is situated with its lower opening over the charging-tube E, the lower end of which is immersed in the water, while the upper opening of the cavity is closed by a covering plate, secured to the ring D by a bridge-piece. The second cavity, on the other hand, is not covered by the plate, and can consequently be charged with carbide. Then, when so charged, it is brought by the rotation of the slide over the charging-tube E, and the charge falls down into the water in the generator. When this has been done, the slide is turned so



as to bring the solid part between the two cavities over the opening of E, thus effectually closing it; while the lower end of the tube is immersed in the water, forming a water-seal. If now some of the carbide remains floating on the water within the tube, so as to generate acetylene therein, the pressure of the gas will effect the depression of the water-level in the tube until the gas contained therein escapes into the generating chamber, and passes away with the main body of gas generated therein to the holder through the discharge-pipe G.



For expelling the air contained in the generator on first starting, the chamber A is connected with the acetylene holder by a small pipe H, with stopcock, which is connected to the overflow-pipe I for maintaining the water-level. Thus, on starting, acetylene is introduced into the chamber A through the pipe H; and a cock provided at the top of the chamber is opened to allow of the escape of the air driven out by the entering acetylene. By this means the danger of the ignition of phosphoretted hydrogen in the generator is prevented, "as phosphoretted hydrogen can only exist in gaseous form in acetylene gas, and under these conditions will only explode at a temperature of 100° C. in the presence of air."

Below the lower immersed end of the charging-tube E is provided a distributing shield K, by means of which the descending charge of carbide is uniformly distributed in the water.

#### APPLICATIONS FOR LETTERS PATENT.

- 17,531.—BARRATT, F. W., "Acetylene gas generators," Aug. 15.  
 17,575.—BUHLMANN, G., "Self-igniting incandescent mantles for gas-light," Aug. 15.  
 17,581.—MOELLER, J., "Incandescent oil-lamps," Aug. 15.  
 17,609.—SHERBURN, W. H., "Stoves for use with gaseous, liquid, and other incandescent fuel," Aug. 16.  
 17,612.—GILLET, E. W. & C. R., "Acetylene gas generators," Aug. 16.  
 17,629.—BERTRAND, P. H., "Gas cooking-stoves," Aug. 16.  
 17,661.—MABILLE, A., "Indicating the pressure of gases," Aug. 16.  
 17,700.—STENDEBACH, C. F. P., "Automatic gas-igniter," Aug. 16.  
 17,718.—FORD-LLOYD, A., and MONDEY, A. E., "Acetylene gas apparatus," Aug. 17.  
 17,731.—BUTTERFIELD, J. B., "Taps for steam, water, or gas," Aug. 17.  
 17,734.—DRIVET, H., and BRIBIE, J., "Acetylene generators," Aug. 17.  
 17,753.—TALBOT, H., "Gas-lamps," Aug. 17.  
 17,754-5.—PINKNEY, C. W., "Internal combustion engines," Aug. 17.  
 17,800.—BELL, J. R., "Generating acetylene," Aug. 18.  
 17,817.—KIRSTEN, C. P., "Signalling deficient flow of water and increase of temperature in liquids flowing through tubes and the like," Aug. 18.  
 17,824.—LITTLE, G., "Coke conveyors," Aug. 18.  
 17,825.—LITTLE, G., "Gas-retort settings," Aug. 18.  
 17,838.—YEADON, A. E. N. & S. N., "Washer or scrubber for purifying gas," Aug. 19.  
 17,840.—THORP, T., "Acetylene generators," Aug. 19.  
 17,885.—TROBACH, K., and SCHULTZE, K., "Incandescent gas-lamps," Aug. 19.  
 17,887.—SPENCER, J. T., "Utilizing the waste heat given off from gas burners or stoves," Aug. 19.  
 17,892.—LORRAIN, J. G., "Acetylene gas generators," A communication from L. Ward, Aug. 19.  
 17,920.—BUFFINGTON, A. L., "Acetylene generators and lamps," Aug. 19.  
 17,922.—FORD-LLOYD, A., and MONDEY, A. E., "Acetylene gas apparatus," Aug. 19.  
 17,928.—SOUTHALL, J., "Gas and oil engines," Aug. 20.  
 17,940.—PARKER, T., "Preventing the pollution of the atmosphere by the escape of combustible oil vapour or gas from oil or gas engines," Aug. 20.  
 17,956.—MELHUISH, J. B., and TEMPLE, F., "Production of acetylene gas," Aug. 20.  
 17,963.—O'BRIEN, J. O., of the firm of W. P. THOMPSON AND CO., "Producing acetylene gas," A communication from P. P. H. Macé and P. J. de Burgue, Aug. 20.  
 17,986.—TWER, C., "Improvements in manufacturing wrought-iron gas-pipes," Aug. 20.

## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### The "Water Famine" at the East-End.

SIR,—A great outcry is being made in the Press, charging the Directors of the East London Water Company with incompetence because they have, notwithstanding an exceptional drought, reverted temporarily to an intermittent (in place of a constant) service. The rainfall since last October has been 9 inches short; and consequently the rivers and springs throughout the South of England are abnormally low—lower, in fact, than they have been since 1874. At the present time, the water-level in the chalk is falling at the rate of something like half-an-inch per day, and must continue to fall for at least the next month or six weeks, even if we have the ordinary amount of rainfall. Some idea of the effect of this short rainfall may be gathered from the River Wandle. The amount of water passing down the river has continually decreased since April, 1897—that is, for more than 16 months. From the 21st of July to the 21st of August the amount of water passing down the Wandle fell over 2 million gallons per day; and the river is at the present far below its minimum summer flow.

It is absurd for persons to call a water supply reduced from 45 gallons to 25 gallons per head a "water famine." There are many towns and districts in England that never exceed this quantity. The inconvenience of an intermittent supply has been caused solely from the want of adequate house storage. It is the jerry-builders who, to increase their own profits, neglect to put proper cisterns into the houses they build. No house should be permitted to be inhabited which did not contain at least one galvanized iron cistern (protected against dirt) capable of holding 200 gallons, which would be sufficient with care for two days' supply for five people in an emergency. It is little short of criminal folly for school managers to build schools without providing adequate water storage. Children attending schools should never be placed in a position of being without water because of a temporary failure of a supply which may occur at any time from a burst main, frost, or other cause.

On the Continent, the authorities compel householders to provide themselves with a tank of very large dimensions. The constant service leads to waste; for it is impossible to prevent thoughtless people leaving their taps running. A garden sprinkler under ordinary pressure will waste 10,000 gallons of water in 24 hours. Few people have any idea of the amount of water which is daily wasted. If only one tap were left running full bore in each house in London, it would require a daily supply of no less than 8600 million gallons—a quantity which the Thames and the whole of the rivers south of the Humber combined at the present period would be unable to provide.

A. H. SMEE,  
Chief Medical Adviser, Gresham Life  
Assurance Society, Limited.

Aug. 26, 1898.

## LEGAL INTELLIGENCE.

### The Ventnor Gas and Water Company Fined for Deficient Water Supply.

The Ventnor Gas and Water Company have been fined by the Isle of Wight County Justices, sitting at Newport, for neglecting to furnish Ventnor with a sufficient supply of water. Mr. H. C. Damant, who prosecuted for the District Council, stated that during the latter part of July and the commencement of August the Council had not been able to obtain enough water to flush the sewers. Ventnor had been rapidly increasing in population and in favour with visitors; but for twenty years the Company had practically done nothing to augment their water supply. Mr. Wilton, who defended the Company, called Mr. J. S. Ineson, the Company's Manager and Secretary, who attributed the alleged default to the continued drought, and to the Council having neglected to provide cisterns for storing the water. The Bench held that the case had been proved; and they fined the Company the maximum penalty (£10) for the first day, and 1s. for each of five additional days, with £5 costs. Leave to appeal was granted.

### Unlawful Use of Water.

At the Cinque Port Police Court, Margate, a few days since, Mr. A. R. Camus, of the Western Esplanade, Broadstairs, was charged by Mr. W. J. Latchford, on behalf of the Broadstairs Water Company, with having unlawfully used water supplied by the Company for other than domestic purposes—viz., for watering a lawn and garden. Mr. J. Emery appeared in support of the charge, and said in the latter part of July, owing to the water supply at Broadstairs becoming scarce, and as there were many instances of people wasting the water, it became necessary to take steps to prevent persons using water for watering lawns, &c., without having paid for it. The Company made a charge for water used for the purpose; but even this did not cover the cost. On the morning of the 25th of July, Mr. Latchford visited defendant's premises and found on the lawn a sprinkler at work using about 120 gallons an hour. He again went to the place in the afternoon with Mr. Williams, one of the Company's inspectors, and the sprinkler was still at work. He saw the defendant, and told him that he had not made any arrangement for using water in this way. The charge would have been £2 a year. At the time the wells and adits were getting low. He told defendant that if he did not stop using the water he would have to proceed against him; and defendant replied that he could do what he liked. Defendant said that as he did not use the water for domestic purposes in the winter, but had to pay for it, he thought he was entitled to employ it for his garden in the summer. Alfred Williams, inspector in the employ of the Company, gave corroborative evidence. Defendant protested against being charged with stealing the water, and said he told Mr. Latchford he was willing to pay for it. Last summer he informed the collector that he intended to use a sprinkler, and he was told that he would have to pay for it. He pointed out that he only used the water three months in the year, and the collector said no charge would be made for the use of a sprinkler. He was always willing to pay for the water. The Bench fined defendant 10s., and 13s. costs.



## MISCELLANEOUS NEWS.

### CROYDON COMMERCIAL GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the offices, Katharine Street, Croydon, last Friday—Mr. C. HUSSEY, J.P., in the chair.

The SECRETARY (Mr. W. J. Russell) having read the notice convening the meeting, the report and accounts, the principal features of which were dealt with in the "JOURNAL" last week, were presented.

The CHAIRMAN, in moving the adoption of the report, remarked that naturally the first thing the Directors referred to therein was the increase in the sale of gas. He had pleasure in noting that the total quantity of gas sold in the first half of this year showed an increase of 2.93 per cent. on the corresponding period of 1897. In comparing this with the returns of other gas companies, it came out very favourably indeed. Some were higher, and others were lower; but he thought, taking into consideration the very mild January and February—exceptionally mild as those months were—and also bearing in mind the fact that the Corporation were extending the electric light all they possibly could, by laying it on in the main roads—the increase must be regarded as exceedingly satisfactory. The receipts for residuals showed a reduction of £1432, arising partly from the still further fall in the market value of tar, and also from a reduction of 7208 tons in the bulk of coal used, and the consequent diminution in the quantities of residuals made—coke being 4324 tons less. Tar, as they knew, had been a great drug in the market for a considerable time. It was a residual which gave a good sum to their income; and had they made as much in the last half year as previously, they would have had an additional £900 to go to revenue. The price of coke had been augmented, consequent on their having less to dispose of owing to using less coal, and also to employing coke as fuel in the manufacture of carburetted water gas. The loss on the short supply was not so great, because the average price had been 2s. 6d. per ton more in the past half year than it was in the corresponding period of 1897; so that it was lucky for them that they were able to get a better price. Though the quantity of gas sold was greater than in the first half of last year, the expenditure upon coal, oil, &c., had been £2145 less; and there had been a saving also of £579 in wages. They considered this to a very large extent had been brought about by the introduction of carburetted water gas, which they thought had been a splendid success, as it had not only benefited the shareholders but the consumers also, because the Company had actually been supplying gas of higher quality than before this gas was introduced. There could be no doubt, he thought, that the money expended in erecting the water-gas plant had resulted in a very good return indeed. Large numbers of additional gas cooking and heating stoves had been fixed; and 324 small houses had been fitted up and supplied with gas under the weekly prepayment and automatic meter systems during the half year. They had supplied 412 extra meters; and the total number of consumers was now no less than 12,446. The shareholders would remember that on the last occasion Mr. Dalziel stated, or strongly hinted, that it was quite time the proprietors stopped the Directors spending further capital. Mr. Woodall at the time pointed out the consequences that would follow if such a course were adopted—viz., that they would have to shut up shop; and there was not the slightest doubt they would have to do so. Let them consider what the consequences would have been in the past half year if Mr. Dalziel had persuaded the Directors to adopt his view of the matter. They would have had to say to every one of the 412 additional persons who applied for gas that they could not supply them, because the proprietors had stopped the Directors spending more money. They would have wanted this number of meters, and been unable to furnish them. He did not think it was the desire of the proprietors to prevent the Directors spending capital in a proper way; and he did not believe they would ever do so. They had no less than 4891 stoves on hire; and though the electric light, as he had already mentioned, was spreading in all directions, and they had had to remove several lamps from the roads, they had still an increase of five public lamps over the number in the previous half year. They had now a total of 2086; so that the Corporation were still friendly with them in certain districts. The capital expended during the past six months had amounted to £7907, the greater portion of which was for laying new mains and services, and purchasing gas stoves and fittings. All these things brought in a good return; and he was sure the proprietors would never stop the Directors spending money in this direction. They had also paid what they had contemplated for the water-gas plant. They sold £2500 of 5 per cent. perpetual debenture stock, and £5000 of consolidated "B" ordinary stock of the Company in February last. The former realized £4000, or an average of £160 per £100 stock; the latter £13,511, or an average of £270 4s. 4d. per cent. This was not quite so high a sum as they had previously realized; but it was very good indeed. The sale resulted in a premium of £9885 11s. 10d., on which they would pay no dividend. The accounts for the half year showed that, after placing £500 to the reserve fund (which they would always look after as much as they could, because they believed it to be the backbone of the Company), the amount available for division was £15,405, and there was a balance of £594 to be carried forward after payment of the usual dividends. He thought that when the proprietors took into consideration the fact that their plant was good—and everything, Mr. Helps assured him, was kept up to the highest point—and that they had charged everything to revenue which could be legitimately charged thereto, they would agree that it was most gratifying they had had so satisfactory a half year. They had one great advantage in an excellent contract for coal which was still running. Some companies had been obliged to make fresh contracts at 1s. 6d. per ton more than the Croydon Company were now paying. If they had had to do this, they could not have shown so excellent a balance-sheet. They could only hope that, when their present contract was run out, they would be able to secure equally good terms as now, and to show the proprietors an equally good balance-sheet. He would only say, in conclusion, that he knew some had thought they had been spending capital a little more freely than they ought to have done; but the Directors had always aimed at meeting the demand, for they considered this the only wise course to adopt. Let them take for a moment the argument as to spending capital. If they went

back to 1884, when the Company charged 3s. 6d. per 1000 cubic feet for gas, and took the present price of 2s. 8d. per 1000 cubic feet, there was a difference of 10d. Supposing they were selling gas now at 3s. 6d., there would be an addition to their revenue of £26,000 per annum. He thought this was most satisfactory to the proprietors as well as to the consumers, for they must not forget the object they had in view in reducing the price of gas, which was to induce people to go in for heating and cooking by it. This must not be lost sight of by the proprietors; the reduction in the price of gas having produced great results in increasing the number of consumers.

Mr. LAMBERT seconded the motion; and it was at once carried.

Mr. CORBET WOODALL proposed that the usual dividends at the rate of 14 per cent. per annum on the consolidated "A" ordinary stock, 11 per cent. per annum on the "B" stock, and 9 per cent. per annum on the "C" stock and Carshalton capital ordinary shares, be paid. He said he had great pleasure in proposing this, as the dividends had been earned.

Dr. THOMPSON seconded the motion; and it was agreed to.

A vote of thanks having been accorded to the Directors,

The CHAIRMAN replied, and proposed a similar vote to the Manager (Mr. Helps), the Secretary (Mr. Russell), and to the staff generally for the interest they took in the affairs of the Company. He alluded to the admirable way in which their work was done, and to the good understanding which existed among the workmen.

The motion having been carried unanimously,

Mr. HELPS and Mr. RUSSELL responded, and the proceedings closed.

### TOTTENHAM AND EDMONTON GAS COMPANY.

The Ordinary General Meeting of this Company was held at the Offices, Willoughby Lane, Tottenham, last Saturday—Mr. CORBET WOODALL in the chair. There was only a small attendance of shareholders.

The report and statement of accounts for the half year ending June 30, noticed in the "JOURNAL" last week, having been taken as read,

The CHAIRMAN, in moving their adoption, said that upon the accounts he had not much to say. He hoped the small attendance was evidence that the shareholders generally had read the report and accounts, and had found them so satisfactory that it was not necessary for them to attend to ask questions. The half year had been a very successful one. It was quite true they did not show a balance of profits sufficient to pay the dividends they recommended. They drew from their undivided balance a little more than £600. But the first half of the year was usually the least profitable; the expenses in proportion to the revenue being heavier than in the second half. They had spent within a pound or two of £2000 more upon repairs, maintenance, and renewals of works than they did in the corresponding half of 1897. A very simple calculation would show that if they had expended the same amount as then, they would have had a balance of £1400 to the good. He repeated what he had so often said—that, in his opinion, it was the falsest economy to consider too carefully the amount of money to be spent on repairs, and the upholding of the fabric and apparatus of the Company. They kept their works in thoroughly good order, and were very careful not to charge anything against capital account that could be fairly and legitimately charged against revenue. No doubt the effect of this in some half years—as, for instance, in the six months just passed—was to hit the revenue rather heavily; but the effect in the long run was not only beneficial to the Company but also to the gas consumers of the district. If they were tempted to spend out of capital account, it was a permanent and continuing charge, the interest upon which had to be borne by the consumers. The growth of the Company was eminently satisfactory. There had been an increase in the quantity of gas sold of more than 7 per cent. over the corresponding half of last year. This was largely due to the continued increase of the prepayment system of supply. The number of meters of this character fixed during the half year had increased some 30 per cent. as compared with the first half of last year. It was evident that the consumers were satisfied, because only a few discontinued the supply. The Directors would do their utmost to increase this part of the business, because the number of houses to be supplied was so enormous that the field was a vast one to deal with. Notwithstanding the fact that they had not earned their dividends for the half year, they had, during the whole year up to June 30, added to their balances—whether reserve, insurance, or undivided—something like £1450, after paying the dividends. With regard to the Act of Parliament which since the last meeting had received the Royal Assent, the proprietors were aware that the Bill had two objects; the first being to authorize the Company to raise a considerable amount of additional capital, and to convert several classes of their stocks into a new denomination. It was their intention, when the Bill was drafted, to make only one class—viz., a 5 per cent. stock; but difficulties of a very serious character presented themselves in regard to the payment of dividends upon the altered 10 per cent. and 7 per cent. stock (that was to say, the 7 per cent. in relation to the 10 per cent.), and so they finally decided, with the approval of the District Council and Parliament, to create two stocks, one of 5 and the other of 3½ per cent. They thus doubled the whole stock of the Company; making the £60,000 of 10 per cent. "A" stock into £120,000 of 5 per cent., and the £125,260 of "B" stock into £250,520 of 3½ per cent. stock. This conversion did not in the slightest degree affect the dividend to be paid to the shareholders, nor the amount of money they needed to take from the consumers to pay it. But it made the nominal dividend more in harmony with the actual one received by the shareholders. They were dividing 12 per cent. upon their "A" stock. But, as everybody knew, it was only a comparatively small amount of capital that received 12 per cent.; and it was issued a very long time ago. It was the same with the "B" stock. It had been sold by auction, and those who bought it were receiving only 4 per cent., or a trifle over. Therefore it created a false impression in the minds of consumers and people of the district when they read of the Company paying 12 and 9 per cent. to the shareholders. Henceforth they would pay—until they reduced the price of gas still further—6 and 4½ per cent. As a necessity of this doubling of the stock, they would halve the amount of the advantage which came to the shareholders under the sliding-scale. At present they received 5s. per cent. for every penny reduction below the standard price; whereas in future it would be 2s. 6d.



per cent. upon the increased amount. It was suggested in Parliament that, instead of their receiving 2s. 6d. per cent. on the 7 per cent. stock, it should be a smaller amount. But they were able, to their great relief, to satisfy the authorities of the House that no true advantage would result to consumers from such a limitation; and they would therefore continue to pay the 7 per cent. stockholders the same rate of increase as they paid to the holders of the 10 per cent. stock. The additional capital they were authorized to raise was £150,000, which was 5 per cent. stock, and would be sold by auction. In addition to this they obtained authority to increase the amount of their borrowing powers upon the old capital already issued and subscribed, from £60,000 to £100,000; so that upon the old capital they had an added borrowing power of £40,000. On the new capital, with the cordial assent of the Tottenham District Council, who watched the Bill most carefully for the ratepayers, they had taken 33 per cent. of borrowing powers, giving them £50,000 under that head. Consequently, they had £90,000 additional borrowing powers, which added to the £150,000 of new stock gave them £240,000. The illuminating power of the gas had been raised from 14 to 15 candles; and the Directors had accepted certain provisions with regard to the purity of the gas which would no doubt inure to the advantage of the consumers, though they would add somewhat to the future cost of purification. The Directors had given notice to the Local Authorities of their intention to apply to the Board of Trade for a Provisional Order in the coming session for authority to supply the electric light; but they would not proceed with it if it were in opposition to the wishes of the authorities. Their only desire was to work with them, and, if there was a demand for the electric light in the district, to meet it. They were absolutely confident that they could supply the light at a lower rate than any independent company, or than the Local Authorities; and they were quite willing to do it if the authorities wished.

Mr. H. BAILEY seconded the motion.

Mr. H. D. ELLIS expressed his pleasure at hearing what the Chairman had said in regard to defraying expenses of maintenance and wear and tear out of revenue. Nothing could be more sound or beneficial to a company than to charge against revenue the full amount requisite for the repair and maintenance of works, instead of showing a large balance carried to the profit and loss account. He was certain the Company would, under the present régime, continue to carry out this policy. He supposed that during the past six months they had made as much water gas as in the corresponding period of 1897; yet notwithstanding this the residual products showed an increased revenue. If he might be allowed to express the opinion of the shareholders, he would say that they appreciated the way in which the Directors had carried on the business of the Company during the past half year.

The motion was carried unanimously.

Sir H. CARTWRIGHT next proposed that dividends be declared at the rate of 12 per cent. per annum on the "A" stock, and 9 per cent. per annum on the "B" and "C" stocks, both less income-tax, for the half year ended June 30.

Mr. G. T. WATSON seconded the motion, and it was adopted.

The retiring Directors (Mr. D. Ford Goddard, M.P., and Mr. Corbet Woodall) and Auditor (Mr. G. T. Watson) having been re-elected,

A vote of thanks was accorded to the Chairman, and the proceedings closed.

#### BARNET DISTRICT GAS AND WATER COMPANY.

The Half-Yearly Meeting of this Company was held last Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. JAMES GLAISHER, F.R.S., in the chair.

The SECRETARY (Mr. Alfred Lass, F.C.A.) read the notice convening the meeting; and the accounts, which were referred to in the "JOURNAL" for the 16th inst (p. 394), were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, remarked that the latter were so clear that they spoke for themselves; but he should like to say a few words regarding the working of the Company during the six months to June 30 last. They had carbonized 3817 tons of coal, which was 48 tons less than in the corresponding period of last year. The quantity of gas made was 41,772,000 cubic feet, or at the rate of 10,944 cubic feet per ton. It was therefore clear that everyone connected with the works had done his very best for the Company. The unaccounted-for gas amounted to 2,659,000 cubic feet, which was a little more than 6½ per cent., or almost the same as last year. The gas sold totalled to 38,486,420 cubic feet; being at the rate of 10,083 cubic feet per ton of coal carbonized. It would thus be seen that the Company received payment for over 10,000 cubic feet of gas for every ton of coal used at the works. They had made 3635 chaldrons of coke during the half year, 129 chaldrons of breeze, 40,078 gallons of tar, and 40½ tons of sulphate of ammonia. They had received for public and private lighting during the six months under review £7461; being £153 more than in the corresponding period of last year. For coke they had received £11 more; for breeze, £5 more; but for tar, £9 less. The sulphate of ammonia realized £71 more than in the same period of 1897; so that from residuals they had altogether an increased revenue of £78. The total revenue for the gas portion of the business was £9371, or £243 more than last year. On the other hand, coal had cost them £2893, which was very nearly the same amount as last year. The total manufacturing charges were £64 more; distribution cost £27 more; rates and taxes, £32 more; and management, £27 more. There was also an item which did not exist at all in the preceding year—namely, parliamentary expenses. This outlay was incurred in looking after a Bill promoted by the Enfield Gas Company, in which they were interested. The total expenditure on gas account was £6183, or £297 more than in the corresponding six months of 1897. The balance of profit was therefore £54 less than last year. He was a little disappointed at this result, seeing that they had produced a greater bulk of gas per ton of coal used, and had also sold a larger quantity. The two items, rates and taxes and parliamentary expenses, were, however, responsible for the small decrease. Looking at all the items in the accounts of the gas department, he thought the result was very satisfactory indeed. Turning to the water portion of the business, it would be seen that the total revenue from this source for the six months was £556 in excess of that for the corresponding period of

the preceding year. The outlay on maintenance was £237 more than last year; and management cost £58 more. The total expenditure on the water portion of the business was £3615, or £295 more than last year; and the balance carried to profit and loss account was £6797, or an increase of £260. Everything would be satisfactory if they had all the water they needed. The well at Potter's Bar, though not yielding as much as they wished it to do, had been of such assistance to them that they had had no occasion this year to stop the use of water for the roads, or even to send out notices to prevent waste. The Directors hoped that, the season being now so far advanced, there would be no need to send out such notices at all. He might here just say a few words about the East Barnet well. They were now something more than 200 feet from the surface, and about 70 feet in the chalk. From the surface down to the chalk they had fixed cast-iron cylinders; and outside these cylinders had been cemented. Therefore not a drop of water could enter the well, except it came from the chalk. The amount of water now in the East Barnet well was much greater than they had in the Potter's Bar well when at the same depth. This well therefore held out great promise of ultimately providing them with a very large addition to their resources. Taking the business of the Company altogether, he thought the prospect was very bright.

Mr. CHARLES HORSLEY, J.P., in seconding the motion, said he hoped that, when completed, the Potter's Bar well would yield a still larger quantity of water than it was doing at present.

The resolution was carried unanimously.

Dividends were afterwards declared at the rate of 9 per cent. per annum on the "A" and "C" stocks, 8 per cent. on the "B" stock, and £6 6s. per cent. on the "D" capital gas and water stocks, all less income-tax.

The CHAIRMAN, in proposing a vote of thanks to the officials, said the work of the Company could not possibly be better done than it was by the present staff.

The motion was carried unanimously; and Messrs. Lass, Martin, and Wright thanked the meeting for the confidence bestowed in them.

The CHAIRMAN, in replying to a vote of thanks to the Board, said he had often hoped that he might one day have the pleasure of proposing the payment of the full statutory dividends on the different classes of shares; but he was afraid now that this must be left to his successor. The Company was placed on such a good foundation, and was so secure, that the dividend was certain to increase ultimately.

The proceedings then terminated.

#### PROVINCIAL GAS AND WATER COMPANIES.

##### Gas Companies.

The profit made by the Altrincham Gas Company in the six months ending June 30 was £3753, as compared with £5530 in the first half of 1897, when the price of gas during the March quarter was 2d. per 1000 cubic feet higher. At the ordinary general meeting of the Company last Tuesday, the amount available for distribution was £3929; and the full statutory dividends were declared, leaving a balance of £788. In order to supply the increasing demand for gas, of which 58 million cubic feet were sold in the six months, it has become necessary to erect, under the supervision of the Manager (Mr. Lamb), an additional retort-house. To meet the expense of this extension, further capital is to be raised.

At the half-yearly general meeting of the Brighton and Hove Gas Company on the 9th prox., the Directors will report that the sale of gas in the six months ending June 30 increased by 4 per cent. as compared with the corresponding period of 1897; and that the amount realized for residual products showed a satisfactory improvement. There were sold for public and private lighting 478,686,700 cubic feet of gas, producing a revenue of £66,854; the rental of meters, fittings, and stoves was £3701; residuals produced £12,881; and the total receipts were £83,704. The manufacture of gas entailed an expenditure of £42,010 (£28,116 being for coal, oil, &c.); its distribution cost £8077; management came to £4350; and the total expenditure was £58,377. The balance carried to the profit and loss account is £25,327; and the amount available for distribution is £26,499. The sum required for dividends at the rates of 1½, 8½, and 6 per cent. per annum on the three classes of stock, which the Directors recommend, being £23,449, there will be a balance of £3050 to be carried forward. Under the supervision of the Engineer (Mr. J. Cash), 33,037 tons of coal and 425,791 gallons of oil were employed in the manufacture of gas; the estimated production of residuals being: Coke, 19,822 tons; breeze, 1802 tons; tar, 504,640 gallons; and ammoniacal liquor, 722,599 gallons.

The accounts presented at the half-yearly meeting of the Cork Gas Company last Thursday showed that the revenue from the sale of gas for public and private lighting in the six months ending June 30 amounted to £19,842; residuals produced £5502; and the total income was £25,358. The expenditure being £18,549, there was a balance of £6809 to go to the profit and loss account. There was a decrease in the amount of private rental as compared with the first half of 1897. This, however, was caused entirely by the reduction made in the price, as the consumption had increased. There was a small increase in the revenue from public lighting. The receipts for residuals were higher; and the Directors expected a further improvement in this direction, as the price of sulphate of ammonia had advanced. The balance available for distribution was £5393; and as the usual dividend amounted to £5652, the difference (£259) would have to be taken from the reserve fund. The Resident Engineer (Mr. T. P. Travers) reported that the works and plant had been maintained in good order and repair during the half year.

The report which the Directors of the Falmouth Gas Company will present to the shareholders next Thursday opens with an expression of regret that it is not so satisfactory as they could have wished. When the last reduction in the price of gas was made, it was thought the increase in the consumption would be sufficient in a short time to counterbalance the smaller profit obtainable from a lowering of the charge; but various circumstances have combined to upset these calculations. The increase in the consumption has been small; while the introduction of incandescent burners and the increase in the cost of coal all tend to lessen the profit. The long-continued strike of the coal miners has so raised the price of raw material that the Directors are reluctantly obliged to announce an increase in the charge for gas after Sept. 30 of 4d. per 1000 cubic feet;



making the price 3s. 4d., less the usual discounts. The Corporation have at last consented to fix some incandescent lights in the public lamps; and the Directors express the hope that before long the whole of the lamps will be fitted with these burners. The accounts accompanying the report show that the sale of 31,327,300 cubic feet of gas produced (less discounts) £4521; and 2,339,500 cubic feet sold through prepayment meters brought in £436. The amount available for distribution is £1650, which will enable the Directors to pay the full dividend.

At the meeting of the Hastings and St. Leonards Gas Company next Thursday, the Directors will report that the business of the Company continues in a very satisfactory condition. The increased quantity of gas sold in the six months ending June 30, as compared with the corresponding period of the previous year, was 8,632,200 cubic feet, or nearly 5 per cent.—a very gratifying fact considering the exceptionally fine and mild weather prevailing at the beginning of the half year. The receipts from private lighting were £26,000; from public and contract lighting, £3224; residuals produced £6513; and the total revenue was £37,623. The expenditure on the manufacture of gas was £21,448 (coal, oil, &c., costing £14,064); on its distribution, £1739; and on management, £1207—the total expenditure being £26,534. The balance carried to the profit and loss account is £11,089; and it is proposed to pay the statutory dividend of 13 per cent. per annum on the £25 shares, and of 10 per cent. per annum on the £20 shares. In view of the possible contingencies that may arise under the Workmen's Compensation Act, the Directors have deemed it advisable to augment the insurance fund by transferring from the profit and loss account £1792, as authorized by the Company's Act. Great improvements have been made, under the supervision of the Engineer and Manager (Mr. C. E. Botley), in the manufacturing details, which have resulted in an exceedingly good half-year's working. The quantity of coal and cannel carbonized was 16,282 tons; and, in addition, 89,930 gallons of oil were used. The amount of gas made was 196,193,000 cubic feet, including 28,340,000 cubic feet of oil gas. The estimated quantities of residuals produced were: Coke, 10,089 tons 16 cwt.; breeze, 663 tons 17 cwt.; tar, 146,776 gallons; ammoniacal liquor, 284,587 gallons. As the capital of the Company has been over-spent to the extent of £16,785, the Directors purpose issuing more shares; and the necessary authority for so doing will be asked at the meeting.

The half-yearly general meeting of the Kingston Gas Company was held on the 18th inst.—Mr. P. Jones, J.P., in the chair. The accounts for the six months ending June 30 showed that the sale of gas and the rental of meters produced £25,377. In the corresponding period of 1896, it was only £22,837; showing an increase of £2540 in two years, notwithstanding the competition of the electric light, the more extended use of incandescent gas-burners, and the reductions made to the Local Authorities for public lighting. The business in residuals was better last half year; but, on the other hand, there was a material addition to the cost of coal, to the carbonizing wages (the make of gas having gone up more than 11 million cubic feet), and to the amount paid for repairing and renewing meters. Nevertheless, the net profit on the half-year's working was £5242; enabling the maximum dividends to be paid, and leaving a surplus of more than £400. The Directors, Secretary (Mr. J. A. Fricker), and Engineer (Mr. H. F. Packham) were complimented on their efficient conduct of the Company's business.

The revenue from the sale of gas by the Riddings District Gas Company, in the six months ending June 30, was £1600; and the total receipts amounted to £1854. The expenditure was £1179; so that there was a balance of £675. The balance on the profit and loss account was £1788, out of which a dividend for the half year at the rate of 5 per cent. per annum, free of income-tax, has been declared.

The annual general meeting of the Salisbury Gas Company was held on the 17th inst.—Mr. G. Fullford in the chair. The accounts presented enabled the Directors to recommend dividends ranging from 5 to 10 per cent. per annum. In moving the adoption of the report, the Chairman remarked that the results of the past year's working had been satisfactory. Though the price of gas had been reduced, and some concessions made to large consumers, and though the unusually mild and light winter of 1897-8 was not favourable to a large consumption of gas or of coke, the profit for the year was sufficient to pay full dividends. Coal had cost more, partly because more was required, and also on account of prices being slightly higher; but the other items of expenditure called for no particular remark. The amount received for gas was £93 less, though the quantity sold was  $1\frac{1}{2}$  million cubic feet more; but the lower price charged by the Company accounted for the decrease. Sales of coke were well maintained, notwithstanding the mild season. During the past year great improvements had been made in the machinery, plant, and works generally. A new retort-house with four beds of retorts on the newest principle had been built to enable the Manager to meet the increasing demands for gas. These improvements were necessary, notwithstanding the extensive adoption of Welsbach burners. The demand for cooking and heating stoves increased; and the energies of the staff had been severely tested in keeping pace with the demand. Mr. Young seconded the proposition; and it was unanimously carried. A vote of thanks having been accorded to the Chairman, Directors, and officers of the Company, the Chairman, in responding, referred to the labours of their careful and energetic Secretary (Mr. A. Whitehead), and also spoke with appreciation of the Manager (Mr. Norton H. Humphrys), the principal officers, and the staff generally. Mr. Whitehead thanked the meeting for their courtesy and kindness; and Mr. Humphrys, speaking for himself and the staff generally, acknowledged the kindly remarks from the chair, which had been endorsed by the meeting. He said the reference to improved burners reminded him that, with the aid of modern appliances and reductions in price, he now supplied as much value for 1d. as could be had for 1s. when he first started in the gas industry nearly thirty years ago.

The Chairman of the Scarborough Gas Company (Mr. B. Fowler, J.P.) laid before the shareholders a good record of progress when moving the adoption of the report, noticed in the "JOURNAL" last week, at the half-yearly meeting of the Company on the 20th inst. The sale of gas in the six months ending June 30 showed an increase of close upon 7 million cubic feet on the quantity sold in the corresponding half of last year—or nearly 7 per cent. It was made up as follows: Quarterly consumers, 5,414,000 cubic feet; monthly consumers, 603,000 cubic feet; prepayment consumers, 778,000 cubic feet; public lighting, 166,000 cubic feet—total, 6,961,000 cubic feet. The Company had out on hire 1355 cooking-stoves. Taking the year, the increase was  $9\frac{1}{2}$  millions—4 per cent.—on the

previous year. Comparing the gas sold during the year ending June last with that sold five years ago, the increase amounted to 40 million cubic feet, or nearly 20 per cent. in five years. Going back ten years, the increase was found to be 86 millions, or 54 per cent. The number of consumers had also greatly augmented—viz., from 4000 ten years ago to 6634 on the 30th of June last. In 1890, a system of monthly payment of accounts was introduced; and four-and-a-half years ago the penny-in-the-slot system was adopted. Under the former, the Company had 600 and under the latter 900 consumers. The total receipts were £18,967, or an increase of £1240 over those for the corresponding half of last year; and the payments, £13,370—an increase of £305 only. The balance carried to the profit and loss account was £5597—an increase of £935. These figures showed greater economy in working, owing to the new retorts and the new gasholder. On capital account they had spent £2549—chiefly on the new gasholder, and a payment on account for the water-gas installation. The extension of the manufacturing plant was in progress, and he hoped it would be completed by Christmas. The report was adopted, and the dividends recommended were declared. At the close of the ordinary meeting, a special meeting was held at which sanction was given for the conversion of the whole of the ordinary stocks in the capital of the Company, issued before the passing of the Company's Act of 1895, into one consolidated ordinary stock bearing a uniform dividend of 5 per cent. per annum. It was decided that the conversion should take effect not later than Jan. 1, 1899.

At the annual meeting of the Sunderland Gas Company on Thursday, the Directors will present accounts showing that the gas and meter rentals for the year ending June 30 amounted to £70,120, and residuals produced £21,956, as compared with £68,427 and £20,704 in the preceding year. The total revenue was £92,112, and the expenditure £74,932; leaving a balance of £17,180. The corresponding figures last year were £89,169, £71,555, and £17,614. The Directors in their report state that the prolonged strike of the engineers and the mildness of the past winter arrested to a considerable extent the rate of increase in the consumption of gas which prevailed during the preceding twelve months; and the advance in the cost of coal, labour, &c., has more than absorbed the increased revenue resulting from the transactions of the year covered by the accounts. Interim dividends of 5 and  $4\frac{1}{2}$  per cent. were paid in March; and the Directors will recommend similar payments.

The 53rd annual general meeting of the Taunton Gas Company was held last Tuesday, under the presidency of the Chairman (Mr. J. Barrett). The Secretary and Manager (Mr. A. J. Edwards) presented the report of the Directors, in which they expressed their pleasure in announcing that, notwithstanding the comparative mildness of the past winter, the quantity of gas sent out had been 65,567,000 cubic feet. Considerable progress had been made with the extension of the works; and a portion of the new plant for the manufacture of carburetted water gas had been brought into use and proved satisfactory. The Directors hoped to have all the works completed by next winter. The amount available for distribution was £3709, out of which the Directors recommended dividends of 5, 7, and 8 per cent. on the preference stock, yellow shares, and consolidated "A" stock for the past year, and at the rate of 7 per cent. per annum on the ordinary stock for the past half year. The payment of these dividends would absorb £2992, and leave £717 to be carried forward. The Chairman, in moving the adoption of the report, congratulated the shareholders on its favourable character. He said the quantity of gas sent out during the year was very satisfactory, considering the mild winter; but, notwithstanding this, they had been able to bring up the consumption to within 206,000 cubic feet of that of the previous year. This was about the quantity of gas formerly supplied to the Town Council for the public lamps. Referring to the new Welsbach burner, he remarked that, though it must effect a saving to the consumer, it was hoped that it would bring fresh customers to the Company. The penny-in-the-slot meters had been tried with marked success among the poorer residents; and the Directors trusted that, by proceeding cautiously, most of the artisans' houses in Taunton would be supplied with these meters. Mr. Barnicott seconded the motion; and it was carried. The thanks of the meeting having been accorded to the Chairman and Directors for their services, it was resolved to increase the salary of Mr. Edwards by £50 per annum. It was mentioned that he had superintended the erection of the new works without the assistance of a clerk of the works; and it could not have been done better. The quantity of gas sent out last year was largely in excess of that of previous years; and this consequently added to the Manager's duties. Mr. Edwards, in returning thanks, said it gave him great satisfaction to know that the way in which he had performed his duties merited the confidence of the shareholders.

The annual general meeting of the Waterford Gas Company was held on the 19th inst.—Mr. R. Hesketh Jones, J.P., in the chair. In the report the Directors reminded the shareholders that among the clauses in the Bill promoted by the Company in the past session was one seeking permission to apply the funds at any time for making application for a Provisional Order or Licence to supply electricity; another clause being to enable the Company to issue new capital to the consumers at par. Against both of these clauses the Corporation of Waterford petitioned, and they were withdrawn. At the request of the Corporation, a clause similar to that contained in the Company's Act of 1877 was inserted, empowering that body to purchase the undertaking of the Company on or before May 16, 1901. The other main features of the Act were the consolidation of the shares into a 5 per cent. stock, with a sliding-scale of increased or decreased dividends of 1s. 3d. on every £100 of consolidated stock actually paid up when the price of gas charged by the Company shall have been 1d. below or above the standard rate of 4s. 9d. per 1000 cubic feet. Another clause relates to the hire of stoves, &c. Further capital is authorized to the extent of £24,000, with additional borrowing powers of £6000; thus adding £30,000 of additional capital. The accounts accompanying the report showed that the sale of gas (less discounts) produced £10,367; residuals, £2426—the total receipts being £12,810. The expenditure was £9288; and consequently the amount carried to the profit and loss account was £3522. The divisible balance was £2149; and the Directors recommended the payment of a dividend equivalent to 5 per cent. per annum on the consolidated stock, amounting to £1404—leaving £745 to be carried forward. The Chairman, in moving the adoption of the report, expressed his pleasure at laying before the proprietors the most favourable statement of accounts presented during



the Company's existence. The business during the past year had increased by 4 per cent. as compared with 1896-7; and the profits were more than sufficient to pay a dividend of  $5\frac{1}{2}$  per cent. on the consolidated stock of £56,400. The revenue for gas had increased from £9909 to £10,367; and the profits from £3146 to £3522. Next year the Directors hoped to pay a dividend at the rate of  $5\frac{1}{2}$  per cent. The new Act enabled them to raise £30,000 of additional capital, which, judging from the past, would carry them on for twenty years. The Corporation had now the power to purchase the Company's undertaking; and if the citizens decided to do this, he trusted the negotiations would be carried on in the same spirit of fairness and equity which had characterized the consideration of the clauses in the new Act of Parliament. Mr. Shaw seconded the motion. The Company's Engineer (Mr. George Anderson) expressed his gratification that the Company were getting on much more smoothly with everybody—the Corporation of Waterford included; for since they entered the city they had never progressed so well. The report was adopted, and the dividend recommended was declared.

The half-yearly general meeting of the Wellingborough Gas Company was held on the 22nd inst., when the accounts submitted showed that the sale of 35,908,039 cubic feet of gas to private consumers and 1,810,997 cubic feet for public lighting in the six months ending June 30 produced £5277, and that the total revenue was £6467. The expenditure on the manufacture of gas was £3849; on distribution, £311; and on management, £265. The total expenses were £4685; so that a balance of £1782 was carried to the profit and loss account. There was a sum of £2754 available for distribution; and dividends of  $5\frac{1}{2}$  per cent. on the "A" and "B" shares and of 4 per cent. on the "C" shares, free of income-tax, were declared. The quantity of gas sold showed an increase of nearly 8 per cent. on the first half of 1897. Additional mains and services were laid during the half year at a cost of £450; and further extensions are in progress. The alterations and enlargements at the works are being pushed forward, under the supervision of Mr. J. T. Lewis, the Engineer and Manager, so as to have some of the new plant ready for use during the coming winter season.

The Directors of the Wolverhampton Gas Company have issued their 93rd half-yearly statement of accounts, covering the six months ending June 30 last. They show that the net profit amounts to £6080; the addition of the balance brought forward making a total of £8679. There having been a decrease in the earnings of the Company from various causes, among which may be mentioned the extremely mild weather during the early part of the year, combined with a diminution in the demand for gas for manufacturing purposes, the Directors recommend the following dividends: 3 per cent. upon the preference stock, 5 per cent. upon the consolidated stock, and 3 per cent. upon the new ordinary stock, less income-tax. In the previous report, mention was made of extensive additions at the Stafford Road works. These are progressing rapidly, and to the satisfaction of the Directors. Of the additional capital authorized to be raised at the last meeting, £30,000 has been sold by auction, and the whole of the money paid up.

#### Water Companies.

The annual general meeting of the Lewes Water Company was held last Tuesday—Mr. F. Verrall in the chair. The report of the Directors showed an amount of £2292 available for distribution. Deducting the interim dividend of £1035 paid in March, there was left for disposal the sum of £1257. The Directors recommended dividends of  $5\frac{3}{4}$ , and  $2\frac{1}{2}$  per cent.; making 10, 7, and 5 per cent. for the year, with 15s. per share to the holders of original shares, in part payment of the arrears due to them. A proposed Water Board for Newhaven and Seaford having during the last session applied for powers to purchase the undertaking of the Newhaven and Seaford Water Company and construct additional works, including a pumping-station and water-mains at Ashcombe, within the Lewes Company's area of supply, the Directors instructed the Solicitor to oppose the Bill; and it was eventually thrown out, but not until the Company had been put to considerable expense in opposing it. The Manager (Mr. A. Wells) reported that the whole of the machinery and works were in a satisfactory condition. The report was adopted; and the dividends recommended were declared.

The 61st half-yearly meeting of the Luton Water Company was held last Thursday—Mr. B. Seeborn presiding. The Directors' report stated that the balance of the revenue account for the half year ended June 30 was £3156—an increase of £427 on the corresponding period of 1897. This would admit of the declaration of the maximum dividend of 4 per cent. on £105,500 consolidated ordinary stock, amounting to £2110; while the balance of £963 would be carried to the renewal and contingency fund, which now amounts to £2772. In moving the adoption of the report, the Chairman remarked that they had an unprecedented surplus and a largely increased revenue. This was accounted for by the growth of the town; while the drought and the new Corporation storm-water drainage scheme had dried up many of the old wells. They had had to lay on new water connections to an extent which they had never done before; and this would result in a permanent addition to the revenue. They had little difficulty in securing their dividends or in paying for extensions; while their expenses remained practically the same. They had recently sold £3000 more stock at a good premium. The report was adopted unanimously. The Company's Engineer (Mr. W. R. Phillips) pointed out that the level of the Company's wells and the line of saturation in the whole town had been affected by the Corporation's new drainage scheme.

At the half-yearly meeting of the Maidstone Water Company last Thursday, the Directors reported that their scheme for obtaining additional water from the North Downs of Kent had been abandoned on account of the excessive estimated cost. The Chairman (Mr. G. Marsham, J.P.) said the amount of water available daily since July 11 had been equal to rather more than 18 gallons per head of the population; and he thought that if the consumers in Maidstone had been economical, and had helped the Company as they might have done, there would have been no necessity for an intermittent supply at the present time. With regard to the Mid-Kent Company, he believed they had done their best to carry out the wish they expressed to provide the town with 100,000 gallons of water per day; but they had been unable to do so. People were inclined to throw stones at the Directors, and especially at their Chairman; but when they came to consider the Company's difficulties, he believed they would concede that the directorate had done the best

they could for the town. Alderman C. Ellis (ex-Chairman of the Company) said the fault of the scarcity of water in the town did not rest with the Company, but with someone else. Unfortunately, the Mid-Kent Company had not been able to keep their promise. Replying to questions, Mr. Marsham said the Directors found they could not enter into any contract with the Mid-Kent Company with regard to the amount of water they should take; but they agreed to pay the price their neighbours asked, on the understanding that they should not be limited to any definite quantity. It transpired during the meeting that the expenses incurred by the Company in connection with the late typhoid epidemic reached a total of £7472. The Chairman said the Directors were unable to recommend any dividend on the ordinary shares at present, but they hoped to pay one of some sort in the next half year.

The half-yearly meeting of the South Staffordshire Water Company was held last Thursday—Mr. F. James in the chair. As already mentioned in the "JOURNAL" (*ante*, p. 387), there was a sum of £23,024 available for division; and the Directors recommended a dividend at the rate of 6 per cent. per annum, leaving £5174 to be carried forward. In moving the adoption of the report, the Chairman said the number of services laid on during the six months ending June 30 was 1828; making the total 96,681. The gross water-rates were in excess of the previous half year. On capital account, £8900 had been expended partly for the new reservoirs at Barr Beacon and Dudley, and the laying of between 9 and 10 miles of new mains. He congratulated the shareholders on the fact that the Company had not been called upon to curtail their supply, and remarked that, in his opinion, a constant service was more economical than an intermittent one. When householders were warned that the supply would be cut off at certain times, they generally stored water much of which was ultimately wasted. At present the Directors were perfectly satisfied with their sources of supply, and over and over again they had ascertained from various public authorities taking the Company's water that the supply was most satisfactory. Sir Henry Wiggin seconded the motion. Mr. Houghton asked how the Directors proposed to deal with their servants under the Workmen's Compensation Act. The Chairman replied that the Company were insured under the old law. There was a great divergence of opinion as to how far water-works were responsible under the new Act. The Directors had decided to be their own insurers—for a time, at any rate. Mr. Asquith had given the opinion that pumping-stations did not come under the Act. The motion was carried unanimously; and the dividend recommended was approved.

**The Price of Gas in Nottingham.**—Gas in Nottingham in 1820 was 12s. per 1000 cubic feet; in 1830, the price had been reduced to 10s.; in 1840, it was 7s. 6d.; in 1850, just half that price, 3s. 9d.; in 1860, it was 3s. 0½d.; in 1870, 2s. 9d. There has practically been no change in the price of gas since 1882. It was then 2s. 6d. and 2s. 4d. per 1000 cubic feet; and the variations have been only slight and temporary.

**Kirkby Stephen Water Supply.**—Yesterday week the East Westmorland Rural District Council negatived a proposal to apply for borrowing powers for £800 for works of water supply at Kirkby Stephen. By a small majority, it was decided to consult an expert water engineer before proceeding further with the scheme. For several years the existing supply, which was originally in excess of requirements, has failed to deliver anything like the quantity of water needed for the district.

**New Works for the Tuxford Gas Company.**—The Tuxford Gas Company, who obtained parliamentary powers last year, have decided to abandon their old gas-works, which have become too small for present requirements, and build new ones on modern lines. A site has been selected adjoining the Great Northern Railway, and new works have been designed by Mr. Arthur Graham, of Mansfield, the Company's Engineer. The contract for building them and laying the mains throughout the district has been let to Messrs. R. Dempster and Sons, Limited, of Elland, who, it is expected, will have the works ready to meet the coming winter's requirements.

**Village Water Supply.**—Mr. M. Biddulph, M.P., has lately contributed to the solution of the question of water supply to rural communities. The villages of Toulton and Rodmorton, on his estate near Cirencester, stand high on the oolite. These villages, which together have a population of 500 or 600, do not possess any local wells or springs, and until quite lately both farmers and cottagers had to fetch their supplies from a well more than a mile distant. Deciding that, instead of having to fetch their water these people should have the water carried to them, Mr. Biddulph has established water-works, at a cost of something like £1300, which convey the water into the midst of the two villages. The chief features of the works are a pump, operated by an oil-engine at the before-mentioned well, some miles of 3-inch iron pipes, and an elevated tank holding about 3000 gallons in the village of Toulton. Both farmers and cottagers are delighted with the new arrangement, for the benefit of which the former pay £10 to £12 per annum and the latter the nominal sum of ½d. per week.

**The New Works of the Newcastle and Gateshead Water Company.**—On Friday, the 19th inst., the members of the Gas and Water Committee of the Newcastle Corporation inspected the new works of the Newcastle and Gateshead Water Company at Catcleugh. On arriving, the visitors were shown over the works by the Secretary and Manager of the Company (Mr. G. Smith) and the Resident Engineer (Mr. Henzell). During the tour of inspection, an exceedingly interesting function took place, the Chairman of the Committee (Mr. Riley Lord), at the request of the Secretary of the Company, placing in position the last brick in the first junction of the tunnel which is being constructed underneath the new reservoir. In the course of a few remarks, Mr. Lord wished the Company every success in their huge undertaking. When the reservoir was completed, he thought they would all agree there would be ample provision for a sufficient supply of pure water to the city for, at any rate, another quarter of a century. On behalf of the Committee, he very heartily thanked the Directors of the Company, Mr. Smith, and Mr. Henzell for their courteous reception of the representatives of the City Council and their description of the great works now in progress. It may be added that the reservoir will cover an area of 270 acres, and will be capable of storing about 2000 million gallons of water. The present storage capacity is 3060 millions.



## ELECTRIC LIGHTING NOTES.

The Local Government Board have sanctioned the borrowing of £29,850 by the Coventry City Council for electric lighting purposes.

The Workop Urban District Council resolved last week to apply for a Provisional Order under the Electric Lighting Act. So far they are committing the townspeople to an expenditure of about £200 only—being the estimated cost of obtaining the Order; but, in the event of the Order being secured, some £10,000 would need to be spent on an electric lighting scheme adequate for the place.

Professor Kennedy has lately presented to the Lighting Committee of the Grimsby Corporation a report upon the lighting of the town by electricity. In the course thereof he stated that a well-conducted municipal electrical undertaking might now be considered as certain of success, both from the technical and financial points of view. This was the case even where it was only proposed to supply current for lighting purposes; whereas in Grimsby they also expected to be able to furnish it to the Tramway Company for power. Therefore success was still more certain. The estimated cost was put down at £35,000; but in view of contingencies, slight alterations, and extensions, it was advised that £40,000 should be applied for as the probable capital expenditure. He recommended the use of the continuous current three-wire system. It was assumed that within a year or two of the opening of the station there would be a total of about 9000 lamps of 8-candle power, or their equivalent, connected to the mains; but of these not more than 5000 would be alight at once. The total capacity of the plant to be put down in the station, including reserves, would be about 750-horse power. Separate mains would be required for tram lines. A route was mapped out in the report for public lighting by electricity. Professor Kennedy did not consider it would be worth the while to supply electricity to the docks. The Corporation have adopted the report.

The Vestry Clerk of Hampstead (Mr. A. P. Johnson) has issued a report on the working of the Vestry's Electric Light Department for the year ending March last. He is evidently delighted with the state of things, for he says "the Vestry has now under its control a most important and highly remunerative branch of administration, such as must undoubtedly prove itself a source of gratification to the Vestry which has conducted its development, and an inestimable boon to the ratepayers generally." Under these circumstances, therefore, it seems rather churlish to make any depreciatory remarks, but it should be noted that this scheme has now absorbed £100,176—£35,000 from the London County Council, and £24,400 from the Prudential Insurance Company, while £37,000 odd is "balance due to Treasurer" (i.e., overdraft at the bank). This enormous capital earned during the year under review the fabulous profit of £3905—not quite 4 per cent. Nothing appears to have been set aside for depreciation. The Vestry Clerk is of opinion that "of course there is every reason to hope for and anticipate even larger profits in future years." Apart from this financial aspect, the undertaking is progressing, as with such monetary backing it is bound to do. The gross income was £15,930, as against £13,426 the previous year; while the trade expenditure has slightly decreased. There were 840,002 units generated; but 172,075 are not accounted for. There are 24 public lamps.

A conference took place last Thursday between representatives of the Parliamentary Committee of the Leeds Corporation and the Directors of the Yorkshire House-to-House Electric Supply Company, in reference to the purchase by the City Council of the undertaking of the Company. There was, says the "Yorkshire Post," a very long but friendly discussion, resulting in an agreement being arrived at, which will be elaborated and signed in due course. It will first provide that the capital expenditure from which the Company shall benefit is to cease on the 1st prox. From that date all capital expenditure will be for and on behalf of the Corporation. The second provision is that the Company shall receive all the earnings up to the same date, and the Company will only begin to receive interest on any unpaid purchase money from Oct. 1. The date definitely fixed for handing over Corporation scrip and cash to the Company in payment for their concern is Nov. 15. The worth of the stores is to be ascertained by valuation; the Corporation and the Company each appointing a valuer. It is further provided in the agreement that the Corporation shall take and pay for the book debts, which are to be guaranteed by the Company. The Corporation will take over contracts, way-leaves, and other matters. In regard to the purchase-money, the Corporation have already obtained parliamentary sanction to the issuing of 5 per cent. irredeemable stock for the amount properly expended on capital account and cash for book-debts, stores, &c.

The Newbury Town Council, as intimated in a paragraph which appeared last week, will not have the electric light installed in the town. This decision was come to at their last quarterly meeting. The discussion on the question was initiated by the presentation of a report by the Gas Committee, who had been informed that notices from the Great Western Electric Light and Power Company, Limited, and the United Electric Light and Traction Company had been received by the Town Clerk, intimating the intention of these Companies to apply to the Board of Trade for Provisional Orders authorizing the supply of electricity for public and private purposes within the borough. Subsequently an interview had taken place between Mr. George Ofor, the Secretary of the Municipal Electric Supply Company (who is also Secretary of the Great Western Electric Light and Power Company, Limited), and the Chairman of the Committee, and the Town Clerk, with reference to the notice received from the latter Company. As a result of this interview a letter had been received from Mr. Ofor, which said: "My Company is prepared to take a lease of your Provisional Order upon the terms that at the end of ten years (and at any time thereafter), by giving two years' notice, the Council shall be entitled to purchase the entire undertaking and goodwill at a valuation by independent valuers; or, as alternative terms, the Council may have the option, at the end of seven years and up to fifteen years, of purchasing on the basis of capital expenditure, plus 6s. 8d. in the pound thereon, or at any time after the works are started, by issuing to the Company bonds or stock of the Local Authority of such an amount, having regard to the rate of interest on such bonds or stock, as will secure to the Company an amount equal to 5 per cent. per annum upon such capital expenditure—the said bonds being redeemable at par at the expiration of 21 years from date of issue." The Committee, after careful consideration, did not see their way to recommend the Council to accept the terms.

## THE DRY WEATHER AND WATER SUPPLY.

## The Curtailment of Supply at the East-End—Other Districts Affected.

Although the notice given by the Secretary of the East London Water Company (Mr. I. A. Crookenden), on the 18th inst., that, owing to the present severe and continuous drought, the Company would be compelled to suspend the constant supply of water on the following Monday, and substitute a service for two periods of three hours each day, aroused a good deal of excitement in their district, which is about 80 square miles in extent, and has a population of nearly 1,300,000 persons, there were no striking signs of the so-called "water famine" on the first day on which the changed conditions came into operation; and inquiries made in various places elicited the singular fact that some at least of the inhabitants were not aware of any restriction in the supply. In no part of the area was the water shut off till six o'clock on Monday morning; while in some of the Whitechapel, St. George's-in-the-East, Poplar, and Stepney districts it was on till noon, and again at six in the evening. The streets were watered as usual, and the factories and numerous stable-yards had their full supply; and, save for the presence of stand-pipes in some of the bye-streets near the City, things presented very much their usual appearance. The action of the Company which has been so generally criticized adversely was a measure of precaution adopted to check reckless use—not to say waste—of water at a time when meteorological conditions are unfavourable to the replenishment of the stores; but, even with the restricted supply, the consumers are furnished, on an average, with 24 gallons per head daily, or a total of 31 million gallons. In the week ending the 20th inst., the daily quantity was 46 millions; and in the preceding week, 44 millions. The quantity in store on Monday morning last week was 169 million gallons, or about one-seventh of the water available when the reservoirs are full; and, unless the season changes rapidly, there are fully six weeks of short supply to be faced. Of course, where storage cisterns exist, the inconvenience of an intermittent supply will scarcely be felt; and arrangements have been made whereby the poorer classes will, as on previous occasions, be furnished with suitable receptacles for the water while it is available.

A special meeting of the General Purposes Committee of the Hackney Vestry was held on Monday night last week, at the Hackney Town Hall, to consider the Company's notice. Mr. J. W. Whiter presided, and, contrary to the usual practice, representatives of the Press were admitted. Mr. Hasemer suggested that road watering should be stopped at once, and that the water-carts should be sent round to the poorer districts which had no storage accommodation. Mr. Sheehan said he thought the Vestry should buy water from the New River Company for watering the roads and for the supply of the poorer districts when the water was not on, and that the cost should be charged to the East London Company. The Chairman, after a long discussion, suggested that a Sub-Committee should be appointed to wait on the officials of the Company and obtain their consent in writing to be responsible for any expense to which the Vestry might be put in supplying those districts which were without storage accommodation. Mr. Mate opposed the suggestion not to water the roads; adding that the Company had erected stand-pipes in the poor districts that morning. Ultimately the Sub-Committee was appointed.

The General Purposes Committee had another meeting on the following night, under the presidency of Mr. Whiter. He stated that the Sub-Committee had that day waited upon the Company's Engineer (Mr. W. B. Bryan) at the Company's offices; and a transcript of the shorthand writer's notes taken at the interview was read. From these it was gathered that Mr. Bryan would recommend the Directors to adopt the course they took during the short supply in 1896—namely, to agree to pay the expenses the Vestry were put to in supplying water to the poorer districts by water-carts during the time the water was turned off. The Company would also undertake to supply jars and pans for the storage of water, 200 of which would be ready for delivery the following morning. Mr. Bryan also undertook to send to Mr. Grocott, the Vestry Clerk, a time table of the hours that the water would be on and off in each district, and to consider the case of hospitals and Board schools which had no storage supply.

He made the following statement as to the cause of the present short supply of water: "In the last twelve months the rainfall has been worse than it has been for many years—something under 15 inches. The average at our rain-gauge stations has been 14.85 inches. The River Lea has been flowing at a lower level than has been known for years. The experience of 1895-6 proved that all the experience of sixty years was not safe; the consequence being that we went to Parliament and got our Bill through last session. This experience will necessitate the Company looking farther afield to extend their works. The New River Company take 22½ million gallons per day from the Lea before we can take a drop. Notwithstanding this, the Company have never given so good a supply to their district as they have done this year." Mr. Whiter said: "You find the necessities of life require more water per head than formerly;" and Mr. Bryan replied in the affirmative. As a result of this interview, the Committee decided to send out 12 water-carts the next morning. They further directed that 1000 notices to the following effect should be posted in the part of the parish served by the Company: "Water.—The East London Water-Works Company have empowered the Hackney Vestry to send to the doors of the consumers water to be delivered free by means of water-carts during the hours that the water is turned off. Any person failing to secure a supply is requested to communicate in writing with the Vestry at the Town Hall, Mare Street, when the matter will receive immediate attention. No money for water from the carts should in any case be given. By order, George Grocott, Vestry Clerk." The Committee also undertook to personally visit the affected districts, and see that the arrangements were properly carried out.

Although the short supply of water caused considerable inconvenience in the poorer parts of Hackney, not a single complaint was received at the Town Hall last Tuesday. In streets where no storage accommodation exists, stand-pipes were erected, and the people were thus enabled to help themselves from the main. Inquiries at the public baths in the district showed that they had not experienced any lack of water; neither had the large manufactories and the private houses which are supplied



by meter. The explanation of this is that those consumers who pay by meter are supplied from the fire-mains, which are always kept charged. A letter appeared in "The Times" on Wednesday, signed by twelve medical men practising in Ilford, calling attention to the great dangers attending the curtailment of the water supply, especially in cases of diarrhoea. The writers of the letter went so far as to say that, as the proportion of these cases would enormously increase under the new conditions, the stoppage of the water would be as directly the cause of any deaths that might occur "as if the patients had been actually poisoned." They advised the interference of Parliament.

Last Wednesday there were many more signs of the trouble in connection with the water supply than had been previously noticeable. The twelve water-carts of the Hackney Vestry, each bearing the inscription, "Water Free. No Gratuities Allowed," started in the morning, and did good service. Other Local Authorities prepared to follow the lead of the Vestry in this method of distribution; and the officials of the Company assured the Corporation of West Ham, a deputation from which had waited upon Mr. Bryan, that they would reimburse any of them for the expense. Another point in which the Company assisted the Local Authorities was in the distribution of suitable storage vessels. A supply of two-gallon jars was sent to Hackney; and other authorities were to have them. The officials of the Company and of the Health Authorities, therefore, were doing all in their power to mitigate the existing trouble, and remove sources of possible danger. The Official Water Examiner for the Metropolis (Major-General A. de Courcy Scott) had a prolonged interview with Mr. Bryan on Wednesday. The latter explained all that had been done and all that was contemplated by the Company to alleviate the present trouble. The proposed distribution of storage vessels was especially welcomed; and a very satisfactory feature of the interview was that in which Mr. Bryan reported that he had ordered for immediate delivery another 5000 two-gallon jars. This would materially lessen the danger which would otherwise have arisen from imperfect and inconvenient storage in the crowded dwellings of the poorer districts.

The experience of the first three days of the intermittent supply was less satisfactory than had been wished. The estimate made by Mr. Bryan as to the effect of the reduction of the output of water to six hours was that he would save 14 to 15 million gallons per day. In the first two days, however, he only saved 8½ million gallons per day. The reason of this may possibly be found in a letter which appeared in "The Times" on Thursday. The writer said: "Judging by my personal observation, I am inclined to think that the present system [of intermittent supply] leads to much needless waste of water. To take my own case as an instance, the water was turned on early this [Wednesday] morning, and all the water remaining in kettles, jugs, &c., was promptly poured out and used for flushing purposes, or for watering the garden. Kettles, saucepans, and a large tub were then filled, and a store of perhaps 50 gallons thus put by; for we cannot be sure that we shall get any more until to-morrow. If, however, the water is turned on again this afternoon, all that is left of this morning's supply, or a very considerable part of it, will be used to flush the drains, and a fresh supply of water will then be laid in. In the ordinary course, we probably use about 30 gallons of water per day; while the East London Water Company pursue their present insane policy, we shall probably use, or waste, quite double that quantity. Nor are we alone in thus acting. All our neighbours, so far as I can see, do the same. I do not think that anybody but a water-works official will be found to blame them. While the constant supply for which we have paid is provided, the water is drawn as required, and is not wasted. While, however, it is turned off during the greater part of the day, we have, when the opportunity is given, to draw sufficient water to last perhaps for 12, possibly for 24, hours. We take enough to meet all possible requirements for 24 hours. The water gets warm and dusty; and when a fresh supply is provided, we naturally prefer to have clean fresh water, so the standing water is thrown away. I assure you that this is what is being done all over the East-end; and it will continue until the East London Water Company decide to carry out their contracts with their customers."

The General Purposes Committee of the Hackney Vestry met again on Wednesday evening, when a discussion was raised as to the advisability of continuing the watering of the roads. The Chairman (Mr. Whiter) said he was assured by the Company's Engineer that this was a small matter, and would not affect the supply. Mr. Chambers said he had spent the afternoon at the Company's reservoirs. He was informed that the average depth of water was 4 feet; but that it would be impossible to utilize this water, as the level was below the conduits which took it into the Company's mains. The reservoirs were teeming with fish; and a very great danger would arise if these died. This state of things applied to five of the reservoirs; and before the water in them could be used, steam-engines would have to be erected on the banks to pump the water out. He was inclined to the opinion that, after seeing the reservoirs, the Committee would stop the watering of the roads as a public necessity. Mr. Boulton, an official of the Vestry, who had been deputed to inquire into complaints, said he had visited a number of the streets which were affected during the last drought, and had found only one jar which was supplied on that occasion. Many people complained that, although they could get water, they had nothing to store it in. The Committee decided to proceed at once with the distribution of jars and pans.

The Directors of the Company held a meeting last Thursday—Mr. G. Banbury in the chair. Mr. Bryan made a detailed statement of the arrangements he had made on behalf of the directorate with various local bodies, including the Hackney Vestry and the West Ham Town Council. He also stated that the direct saving of water due to the limitation of the supply had amounted to some 18 million gallons, which was much less than he had estimated. The Company had received offers of assistance and co-operation from various Local Authorities, and plans had been suggested for the relief of the poorer inhabitants of certain districts in which the supply of water was restricted. In some instances the suggested methods of relief had already been adopted, and water-carts had been sent out to distribute water to all those applying for it. A large number of earthenware jars had been distributed; and many more had been ordered. The stand-pipes that had been erected had proved invaluable; waste of water from these being prevented by the Company's officials who were in charge of them. He asked the Directors to give their assent to the arrangements made in their name, and to confirm his promise that the Local Authorities should be reimbursed

for all expenses they had incurred in assisting the inhabitants of their respective districts. The Directors sanctioned the outlay proposed by the Engineer, and approved of the arrangements made by him. They agreed to reimburse the Local Authorities, and passed a resolution to the effect that "every effort would continue to be made to mitigate the inconvenience caused by the cessation of the usual constant supply, and to co-operate in every possible way with the efforts being made by the Local Authorities to achieve this purpose." They also agreed to continue to purchase all the water that could be spared by the New River Company, as well as any further supply obtainable from other Companies. The Directors expressed their gratitude for the offers of assistance made to the Company. It was officially stated last Thursday that for the 24 hours ending 6 a.m. on the previous morning, the total quantity of water sent into the Company's area represented 26 gallons per head of the population. The amount withdrawn from the storage reservoir at Walthamstow was 6 million gallons. Mr. Bryan said that the Company could not obtain more water than they were now purchasing from the New River Company. If an attempt were made to get water from the mains of the Grand Junction Company, the result would be that the water in the East London Company's mains would force the Grand Junction water back, and would itself flow into the latter Company's pipes.

The General Purposes Committee of the Hackney Vestry met again on Thursday night, and were engaged for some hours in settling details with regard to the work of the officials in coping with the inconvenience caused by the shortened water supply. The Chairman (Mr. Whiter) said the inquiries of the road surveyors and the sanitary inspectors showed that at least 2000 jars would be necessary to supply the poorer districts of Hackney with the means of storing water. It was decided to write to the Water Company to this effect. The Company had delivered a further consignment of jars that afternoon; and up to six o'clock that evening 280 had been distributed. Twenty water-carts had been at work, and 15,000 gallons of water had been distributed free. Mr. Whiter added that during the day Dr. Bruce Low, one of the Medical Inspectors of the Local Government Board, had been in the district making inquiries and taking notes for the use of the Board. The Doctor had expressed satisfaction with the action the Vestry had taken to meet the difficulty.

The Hackney Vestry met again on Friday night to further consider the position of affairs. The report of the General Purposes Committee, embodying a statement of facts as to what has already been done by the Hackney Authorities, was received and approved. Mr. J. Whiter, the Chairman of the Committee, said the Vestry's water-carts had up to five o'clock that evening furnished 43,200 gallons of water in the poorer districts. The Vestry had also distributed 583 jars. He moved that the Company's letter announcing the curtailment of the supply should be referred to a Joint Committee of the Public Health Committee and the General Purposes Committee, to take whatever action might be deemed necessary. On this Mr. Cohen moved—"That, in accordance with the Metropolis Water Act, 1897, 60 & 61 Vict., cap. 56, sec. 2, this Vestry make an immediate appeal to the Railway and Canal Commissioners to hear and determine the complaint of this Vestry in regard to the present inadequate water supply in East London, and to urge upon the Commission to take immediate action to remove such ground of complaint, seeing that the health of a million and a quarter of inhabitants is imperilled thereby." Mr. J. B. Holmes seconded the motion. Mr. Wiltshire suggested that Hackney should not undertake the whole of the responsibility of bringing the matter before the Railway Commission. Mr. Whiter supported the proposed combination of the different parishes, as he was convinced that a strong combination would be necessary to fight the vested interest which the Water Company possessed. Personally, he was strongly in favour of a municipal supply. Ultimately, Mr. Wiltshire's proposition was rejected, and Mr. Cohen's motion was carried, as was also that of Mr. Whiter, that the Company's letter should be referred to the Joint Committee of the General Purposes and Public Health Committees. Mr. Whiter said this placed him in a rather difficult position, as he felt sure that one of the first acts of the Joint Committee would be to seek the support of the other local bodies. He added that the complaint of the Vestry would be embodied in a formal document, and sent to the Commission at once.

Mr. G. Grocott, the Vestry Clerk of Hackney, stated to Dr. Bruce Low, who called upon him to ascertain the position of affairs in the district, that no complaints had been received, owing probably to the prompt action of the General Purposes Committee. Mr. Grocott waited upon Mr. Bryan on Friday morning, and laid before him the report of the Vestry's officials with regard to the Board Schools in the districts where no water was to be obtained in the outside lavatories and at the yard fountains during school hours. Mr. Bryan promised that this state of things should be remedied if possible. He added that the Company had ordered 8000 jars for distribution for storage purposes, and that they would be sent to the Local Authorities as soon as the manufacturers delivered them. In the evening, it was officially stated by the Company that but few complaints of the intermittent supply, of a personal character, had been received, and that what few there were came from persons using water for steam-raising purposes, whose tanks were not sufficiently capacious to store the needful quantity. A connection had been made between the mains of the Company and those of the Kent Company, by means of pipes running through the Blackwall Tunnel. The quantity supplied in this way was not large; but it was a highly useful auxiliary.

Last Saturday it was stated at the offices of the Water Company that the outflow from the reservoirs on the previous day had reached 30 million gallons—an amount which encroached very slightly on the reserve supply the reservoirs had contained since the constant service was discontinued. A connection with the Kent Water Company's mains in the River Thames at Blackwall had been effected, and upwards of 500,000 gallons of water had been pumped into the East London Company's mains. The pumping operations were being carried out both night and day, with the result that a portion of the district of Poplar was again enjoying a full 24 hours' service. The officials considered it was highly probable that several other streets would, in the course of a few days, be again put on the constant system. A further consignment of 2000 earthenware jars was despatched from the Company's works at Lea Bridge to several of the parishes, including St. George's-in-the-East, Poplar, Limehouse, and Hackney, for distribution among those persons



who did not possess the necessary utensils for storing the water when turned on. The Directors, acting on the advice of Mr. Bryan, placed a further order for an additional supply of 8000 jars, with instructions for them to be delivered immediately.

The provision of means of storing the water while it is on seems, notwithstanding many statements to the contrary, to be the best means of mitigating the inconvenience entailed upon the poorer classes by the restriction of the supply; and the promptitude with which the Company took steps to distribute earthenware jars deserves commendation as well as simple recognition. If the vessels supplied to the consumers on the occasion of the previous trouble had been preserved, they would have been again available. But the Inspectors of the Hackney Vestry found very few of them were in existence. It is beginning to be recognized that in such a crisis as the present it is wiser to assist the consumers in preserving the water supplied to them than to abuse the Company for taking a judicious step forced upon them by exceptional meteorological conditions; and one of the London evening papers has put down £100 as the basis of a fund, to which contributions are invited, for supplying three-gallon jars to the poorer classes. They are to be distributed from centres under the control of persons intimately acquainted with the needs of the various districts. The truth is that most of the present trouble arises from the abolition of the house cistern. A correspondent of the "Standard" suggests that cisterns should invariably be provided for the storage of water for ordinary domestic purposes—for cleansing, and for the flushing of water-closets by means of water-waste preventers of 3 gallons capacity. But water for potable use should be obtained direct from the main, without the intervention of cisterns, by means of a tap affixed to the house service-pipe. He says: "The quantity of water now supplied, in six hours, by the East London Company—24 gallons per head daily—is reasonably sufficient for all purposes and occasions, could it be properly utilized. Subject to the provision of cisterns, this quantity would probably even allow of the continuance of constant supply. I remember the time when in the West-end water was turned on for less than an hour once daily. But every house being provided with more or less adequate cisternage, the supply was ample. Take away the cisterns, and the 'famine' would probably be general. Restore to East London the means of domestic storage, and enforce the provisions of law against wilful waste, and we should then hear little more of 'water famines' in that district." Mr. George Kebbell, writing to the same paper, shows how recklessly the Company's water is wasted. He says: "There can be no question that, if the consumers would use due care, no difficulty in giving a good supply could arise even in a period of drought such as the present. You cannot possibly get a sufficient quantity of water if two or three of your neighbours are wasting it at the rate of (say) 50 or 60 gallons an hour. Waste is at the root of it all. I can speak with some experience; and this waste, particularly in the East-end, arises in several ways. There is the man who wastes 40 gallons an hour sooner than spend eighteenpence to have his tap repaired. There is the gentleman—generally the Polish Jew in Whitechapel—who washes his clothes by putting them in the sink, and letting the water run on them all night. Again, there is the consumer who leaves the tap open all through the 24 hours to 'flush his drains'; and, lastly, there is the criminal, who, from sheer devilry, lets his water run full bore to waste. You cannot eat your cake and have it as well. 'Waste not, want not.'"

As mentioned in the "JOURNAL" last week, the East-end of London is by no means the only place where it has been necessary to restrict the water supply. A short time ago, the Manager of the Maidstone Water Company (Mr. W. J. Ware) sent out a notice that, on and from the 18th inst., the water supply would be suspended daily from 7 p.m. till 6 a.m. This action on the part of the Company naturally caused some misgiving in the public mind; but an assurance has been given that there is no reason whatever to anticipate a "water famine." The supply available to Maidstone now is nearly as large as at any previous time since the suspension of the Farleigh springs. The drought has, of course, slightly reduced the yield of water at Cossington, Boarley, and elsewhere; but this is not the real ground on which the Directors of the Water Company have decided to cut off the town's supply between the hours above mentioned. As is the case in the East London Company's district, it is found that during the hot weather people are accustomed in the evening to water their gardens with a very free hand. This puts an extra strain on the Company's supply to which it is not equal under present conditions; and the Directors had no course open to them but to suspend service at the hour when garden watering usually commences. The Mayor of the borough (Mr. J. Barker) stated to a Press representative, on Monday last week, that he did not believe there was any cause for alarm in the town. He acknowledged that there was a scarcity of water; but there was no danger of anything like a "famine." It was only necessary that people should be economical. At the present time there were, he said, 3000 persons outside the borough drinking water from one of the springs at Farleigh which were cut off during the typhoid epidemic last year on the recommendation of the Medical Officer of Health (Mr. M. A. Adams). Ewell spring was not one of those which were proved to be contaminated; and the Town Council were about to consider the advisability of asking the Water Company to restore the supply derived from it. He was satisfied that the Company could not increase their supply by taking additional water from the Mid-Kent Company. At present the Maidstone Company could only get about 3000 gallons per hour from their neighbours, or a total of 60,000 or 70,000 gallons per day; whereas they originally guaranteed 100,000 gallons per day. At a meeting of the Council in Committee on Wednesday, the question of supplementing the water supply of the borough was discussed at considerable length; a proposal being put forward to the effect that the Water Company should be asked to revert to the use of certain of their Farleigh springs, said to be capable of yielding some 2 million gallons of water per week. In view of the fact that the typhoid epidemic of last year originated from the Farleigh water, and that the whole of the springs were more or less condemned by experts, the proposal raised an angry protest; and the opinion was expressed that a riot would ensue if any portion of the suspected supply were restored. The opposition was strengthened by the report of the Medical Officer of Health in regard to certain samples of the water now under examination. One of these samples he had no hesitation in saying

was very bad. Looking to what occurred last year, and bearing in mind that the whole of the Farleigh water was derived from surface springs, it was impossible not to regard it with suspicion. Eventually a resolution was passed that the Ewell water should not again be turned on for the use of the town; a rider being added requesting the inhabitants of the borough to use their best endeavours to prevent any waste of the present supply. One or two members of the Council contended that the Water Company could further augment the quantity of water at their command by entering into an agreement with the Mid-Kent Company, which up to the present they had declined to do. On behalf of the Company, it was pleaded that they were already taking all the water their neighbours could supply. Not being satisfied with this assurance, the Council appointed a deputation to meet the Chairman and Directors of the Mid-Kent Company on the subject.

The Water Committee of the Bury St. Edmunds Corporation a few days ago issued a notice to the consumers to the effect that, in consequence of the continued drought, and the possibility of a greatly reduced supply, they had instructed their Engineer to turn off the water from the town mains between the hours of 11.30 p.m. and 5 a.m. At the same time, they prohibited the use of water for garden-hose and fountains. Ample provision, however, would be made for fire extinguishing; and the Committee expressed the hope that the initial steps they had taken would enable them to continue the supply without much inconvenience to the consumers, whose co-operation they invited in endeavouring to check all waste and misuse of water. The new regulations came into force last Thursday.

Last Wednesday, the South Essex Water Company notified to their consumers that the supply would have to be reduced during the continuance of the drought. This notice will affect what is known as the Metropolitan area of Essex.

At Stopsley—a village of nearly 800 inhabitants, about two miles from Luton—the residents have been for the past month practically without a supply of water. The public well, which is some 200 feet deep, has become dry, owing to the drought; and in consequence the villagers have had to go begging for water from their neighbours. Arrangements have been made for a supply from the Luton Water Company, whose mains extend to within a mile of the village; and water is being distributed by carts at 3d. per pailful. The supply in several other villages is running short. At Battle, the great falling off in the yield of water at the works—the quantity being only 4000 gallons per day—caused the Urban District Council some anxiety at their meeting last Thursday, when a report on the matter was presented. It was decided to seek the assistance of Mr. Palmer, of Hastings, in obtaining a proper supply of water.

On the other side of the Channel, the water supply is being affected by the recent excessive heat combined with the drought. The supply of spring water is giving out in Paris, and last Thursday the Seine water was turned on in three *arrondissements*. It appears that notwithstanding the large amounts spent some years ago to supply the city with the pure water of the Avre, in addition to that the inhabitants already received from the Dhuis and the Vanne, the reservoirs are almost empty. As may be imagined, says the correspondent of the "Standard," the prospect of having to drink the unwholesome waters of the Marne and the Seine was not contemplated with perfect equanimity by the Parisians. Nevertheless the "Temps" tries to console them by declaring that the Seine water would be well filtered, and that it was, in reality, just as healthy as that of the Vanne, the Dhuis, or the Avre. The only difference is said to be in the temperature. That of the last-named three rivers varies between 51° and 53° Fahr.; whereas the Seine and the Marne is about 68° or 70°.

## THE EPIDEMIC OF TYPHOID FEVER AT MAIDSTONE.

[The Report to the Local Government Board.

The report of Mr. J. S. Davy, Dr. Thomson, and Mr. G. W. Willecocks, the Local Government Board Inspectors, with reference to the Maidstone typhoid epidemic of 1897, was received at Maidstone last Friday. The inquiry was opened at the Sessions House, Maidstone, on Jan. 31, and continued for eight days. The epidemic began in September of last year, and extended over three or four months. Up to Jan. 20, 1898, there had been a total of 1681 cases in the borough, excluding 107 notifications by the Kent County Lunatic Asylum at Barming. There were also 20 cases in the Maidstone Union Workhouse, which is situated outside the borough; and, in addition, a number of persons were attacked in rural parishes adjoining Maidstone, and supplied with water by the Maidstone Water Company.

After sketching in great detail the history of the epidemic, the Commissioners state in their concluding comments: "On a review of the whole of the epidemic, we have no hesitation in coming to the conclusion that the epidemic was caused by the pollution of the water supplied by the Maidstone Company from their Farleigh sources. It is true that there is abundant testimony to show that grave sanitary defects exist in the construction of some of the sewers and of many house drains and water-closets within the borough; while one of the expert witnesses, Dr. Corfield, said that, in his opinion, these defects were sufficient to account for the epidemic. But the sudden and simultaneous outbreak of fever over a wide area, and the rapidity with which the epidemic grew, cannot be accounted for by the existence of defective conditions of sewerage and drainage. Further, the facts as to the local incidence of the disease are not consistent with the theory that these conditions had anything to do with its origin. The old brick barrel sewers are almost all in the lower part of the town, which was comparatively free from attack, and the hand-flushed and defective house drains are distributed pretty equally over the whole town; whereas the cases of typhoid fever were confined to the Farleigh area of water supply to an extent which quite precludes the possibility of mere chance."

Dealing with the contention of the Water Company that many of the typhoid cases were wrongly attributed to the Farleigh water supply, the Commissioners say: "We are of opinion that many of the typhoid cases in the borough were due to defects of drainage and sewerage, with consequent pollution of the soil underlying the town. The responsibility for the existence of these insanitary conditions lies with the Town Council, whose duty it was to take steps that would lead to effective remedy of



these defects. This duty they have in large measure neglected, notwithstanding that for many years the Medical Officer of Health has repeatedly warned them of the risk to which the inhabitants of the town were exposed by the continuance of these insanitary conditions."

Concluding their report, the Commissioners state: "The history of the epidemic appears to us to raise the question as to how far the regulations of the Board relating to the duties of Medical Officers of Health and the statutes which regulate the powers and obligations of private water companies are sufficient to ensure a reasonable amount of protection to the public health. The General Order of the Board of 1891 prescribes that the Medical Officer of Health 'shall inform himself as far as may be practicable respecting all influences affecting or threatening to affect injuriously the public health within the district.' This regulation might be held to make it the duty of the Medical Officer to visit and inspect the works of a private water company supplying water to his district, even though the works were situate outside it, as is the case at Maidstone. This, however, was not the construction put upon the regulation by Mr. M. A. Adams, the Medical Officer for Maidstone; and, as a matter of fact, he had never seen the sources of the water supply furnished to the Farleigh area. He pointed out with considerable force that he had no legal right of access to the works, or to take samples of the water. Yet section 7 of the Public Health (Water) Act, 1878, imposes upon rural sanitary authorities the duty of taking such steps as may be necessary to ascertain the condition of the water supply within their district. It must be stated, however, that it did not appear that any application to inspect the works or to take samples of the springs separately was ever made to the Directors of the Water Company by either of the Sanitary Authorities concerned."

### NOTTINGHAM CORPORATION WATER SUPPLY.

#### The Water Committee's Annual Report.

From the annual report of the Water Committee of the Nottingham Corporation for the year ending March 31, which will be presented at the next meeting of the City Council, it appears that the revenue has been £2607 more, and the expenditure £2495 more than in the previous year; the latter increase being caused by additional distribution expenses, interest on loans, &c. After paying annuities, interest on loans and consolidated stock, and the annual contributions to the renewal fund and the different sinking funds, there is an ultimate balance of profits amounting to £4243, which the Committee have carried forward to the new account called the "additional works account," which was established in 1896 to provide for the estimated expenses incurred in seeking further supplies of water. The profit and loss account shows that water-rents brought in £72,556; while £126 was paid by the public in fees for the testing of water-fittings. The total revenue of the department for the year amounted to £74,424. On the other side, the net expenditure was £69,681, of which £27,808 was absorbed by working expenses, £1969 by empties and collectable and non-collectable arrears of water-rents, £35,125 by interest on stock, annuities, &c., and £4777 by the annual instalments to the sinking fund. The repairs and maintenance of machinery, general stock, and buildings came altogether to £6929, which was divided as follows among the various water-works owned by the Corporation: Park works, £279; Basford works, £2305; Bestwood works, £2051; the Papplewick works, £2294. The capital account shows that £1518 has been expended upon the new works at Boughton.

### PUDSEY AND ITS WATER SUPPLY.

#### An Incorporation Proposal.

An inquiry into the application of the inhabitants of Pudsey for incorporation occupied the attention of Mr. C. N. Cresswell, from the Privy Council Office, for two whole days last week; and from the eminent standing of some of the learned Counsel engaged in representing various interests supposed to be affected by the proposal, more than appeared on the surface was really involved in the proceedings. As a matter of fact, as pointed out by the "Bradford Observer," the attitude of the various parties throws an interesting light upon the relationship of the large and prosperous communities which within a radius of some ten or twelve miles from the town of Leeds threaten in the long run to cover every available inch of land with buildings, and obliterate all natural dividing lines. Pudsey desires incorporation in order to keep out of the clutches of Bradford and Leeds (between whom it stands like a buffer state), and from a desire to gain the higher status. The West Riding County Council support the application, because if Bradford—with the jurisdiction of a county borough—swallows up Pudsey, the district disappears for all practical purposes from the area of the county; while the separate incorporation of Pudsey as a borough of the ordinary status would make no material difference. Leeds supports the application because it has not only an eye on Bradford and its extension, but another on the possibility of supplying Pudsey with water after the year 1913, when the agreement with Bradford will expire. Bradford alone opposes the project of the Pudsey people; and the reasons for its opposition are very tangible. For many years—during which Bradford has been moving in municipal matters at a pace which entitled it to some distinction as a pioneer—it provided itself with gas, water, market rights, hospitals, libraries, and other equipment which have put its inhabitants to very great expense, and the privileges of which are largely shared by the people of surrounding townships such as Pudsey. And now the City Authorities naturally have a great objection to any of these surrounding places escaping from such financial responsibility as can be put upon them in respect to these matters. The Bradford Corporation undertook to provide Pudsey with water, and—as was disclosed at the inquiry, apparently to the astonishment of all the other parties—can be compelled to do this, and even to put down pipes in the streets if necessary. It must be presumed that it suited the purposes of Pudsey that such arrangements should be made with the Municipality; and it is equally obvious that Bradford needed a proper consideration for such obligations. The consideration, according to Mr. Balfour Browne, Q.C., is that on present

parliamentary powers Pudsey must continue for an indefinite period to take water from Bradford, and cannot, by arrangement with Leeds, or even by the establishment of its own water-works, set aside an obligation upon which to some extent Bradford's very costly scheme of water-works extension was based. The effect of this position is that Pudsey can never fulfil the first requirement of a self-contained community, unless Parliament or the Law Courts should intervene. And so it is with other matters. Bradford has large vested interests in Pudsey which could not be furthered by separate incorporation; while at the same time it would be too costly a business to fight Leeds on the question of the inclusion of that district.

### WATER SUPPLY QUESTIONS IN THE MIDLANDS.

Readers of the "JOURNAL" are aware that considerable attention is now being directed to the problem of water supplies in the counties of Leicester, Derby, and Nottingham. The water-works at Little Eaton, upon which the town of Derby is mainly dependent, were established in 1848; the sources of supply being the River Derwent and springs in the valley of Bottle Brook. Extensions have been made from time to time; and an important report has lately been presented to the Corporation by the Water Committee recommending the expenditure of considerable sums for the construction of filter tunnels, the enlargement of the Littleover reservoir, and the provision of engines and connections. Further, after careful consideration, the Committee have come to the conclusion that the promotion of a Bill for the supply of Derby from the Upper Derwent can be no longer deferred. Several other towns, however, have their municipal eyes upon this desirable source, and likewise intend promoting Bills of a similar character. This course of action is by no means looked upon with favour either by the Derby Corporation or by the Derbyshire County Council, both of whom not unnaturally regard the Upper Derwent as their own. These bodies might perhaps consent to an amicable arrangement with the Leicester and Nottingham Corporations; but the claim made by Sheffield for a share of the water is regarded as being geographically indefensible. The Upper Derwent water is most abundant, of excellent quality, and possesses only about 2° of hardness. If carried through Derby as far as Leicester, it will traverse some 66 miles; and there will therefore be a large number of local governing bodies whose good-will is a necessary condition for success.

At Leicester the necessity for further sources of supply is so strongly felt that it has been decided to apply to Parliament for sanction to obtain water from the Upper Derwent. The co-operation of the Derbyshire and Nottinghamshire Local Authorities is to be invited; and the total cost of the scheme, providing for 14 million gallons daily, is estimated at £3,000,000. Scarcity of water has been experienced at Leicester during the past five years, notwithstanding successive additions to the water-works. It was popularly supposed that the completion of the new Swithland reservoir, commenced in 1890, would postpone any trouble for some years; but events have proved this to be a mistaken notion. During the recent meeting of the Institution of Mechanical Engineers, a visit was paid to the works at Swithland, which cover a site of some 275 acres. The drainage area above the reservoir is 3500 acres, and, in addition, there is an overflow of 4400 acres from the drainage area of the Bradgate reservoir. In the reservoir there is capacity for storing 490 million gallons, and water drawn through the valve-tower is filtered through 3 feet of Leighton Buzzard sand. There are six filter-beds, having a total area of more than 88,000 square feet, with an aggregate filtering capacity of nearly 3 million gallons daily. Each filter-bed is provided with a sand-washer, similar to those used at the Grand Junction Water-Works. From a covered pure-water tank, the water is pumped to the Hall Gates service reservoir, at a distance of 2½ miles, through a 20-inch rising main. The pumping-station contains two 143-horse power triple-expansion pumping-engines of marine type, built by Messrs. Easton and Anderson. There are three pumps, 12½ inches in diameter and 3 feet stroke, to each engine, each pumping 45 gallons per revolution. The diameters of the steam cylinders are 17, 27, and 44 inches. Electric lighting apparatus and electric water-level indicators are included in the appliances provided. The Engineer and Manager is Mr. F. Griffith; and the plans and estimates were approved by the late Mr. T. Hawksley, who was Consulting Engineer to the Water Department. Including the cost of land, the outlay involved at Swithland was £317,026; and the recently announced intention on the part of the Corporation of promoting a scheme, of which the share falling on Leicester will probably exceed £800,000, has not been very cordially received. A good deal of the criticism evoked is apparently due rather to the secrecy in which the proceedings have been enshrouded, than to the character of the project itself. On this score, the Council reply that it was necessary to avoid affording information for the benefit of other authorities who might become formidable rivals rather than partners. As no doubt whatever exists that the continued prosperity and advance of the town largely depends upon the quality and ample supply of water suited to local industries, it is hoped that the present scheme may be successfully inaugurated.

**Padtham Gas Supply.**—A proposition has been on foot to apply for a Provisional Order next session for the construction of new gas-works for the Padtham District Council. At the meeting of the Council on the 18th inst., however, it was reported that the Gas and Water Committee had decided, by a narrow majority, not to proceed with the matter.

**The Price of American Pipes.**—Referring to a paragraph appearing with this heading last week (p. 446), a correspondent writes that the action of the Glasgow Water Commissioners is an example of the fairness of British trading. "It may, to us, be somewhat of a disappointment to see our home producers underbid by those of other nations. It is, however, just possible that these low quotations are not likely to be permanent; but are only meant to serve for the opening up of a new market for United States manufactures, in reliance upon excellence of workmanship leading to a continuance of orders, even at rates as high as the home article. It is evident, too, that our manufacturers do not look upon their industry as at all played out; for another tube manufactory is just now being started in the Clyde district."



### THE CLEVELAND (OHIO) TUNNEL EXPLOSIONS.

In the "JOURNAL" for the 26th ult., we announced, on the authority of a telegram received through Reuter's Agency, the occurrence of a fatal explosion in a tunnel in process of construction under Lake Erie for the Cleveland (Ohio) Water-Works. Some particulars as to the accident have since been furnished to the "Engineering Record" by Mr. M. W. Kingsley, the Chief Engineer. In all eleven men were killed; and though the explosion took place on the 11th of July, the last of the bodies was not recovered till the 18th. Unfortunately, an explosion occurred in the tunnel on the 11th of May, whereby seven men lost their lives.

The tunnel has a circular brick lining 13 inches thick and 9 feet in inside diameter, with its bottom from 105 to 109 feet below the surface of Lake Erie. The final length of the tunnel will be 26,000 feet; and at the time of the accident it had been excavated 6550 feet from the foot of the shore shaft, and finished up to about 16 feet from the working face. An air-lock was set in the tunnel at a point 3700 feet from the shaft and 2850 feet from the face; and beyond this lock the construction was going on under a pneumatic pressure of 22 lbs. per square inch above the atmosphere. The tunnel was absolutely dry; and the air pressure was maintained to prevent the clay from swelling in and to support the face and sides of the excavation until the lining was built. An odourless gas, supposed to be light carburetted hydrogen, penetrated the tunnel through seams in the clay. Its presence was detected from time to time by the hissing sound it made when escaping from the seams. Frequently, when there were any indications of it, holes were bored in the roof to exhaust the gas, which would blow against the tunnel pressure for a short time, and then stop. At the working face the lower half of the excavation was in plastic medium soft clay, without seams. Above this was plastic clay in 2-inch layers, with small seams of dry quicksand between. The excavating was done by hand with mattocks and shovels. No explosives were used. The regular ventilation of the tunnel while the work was in progress was maintained by a duplex air compressor with 14 in. by 16 in. cylinders, which constantly forced fresh air into the tunnel just beyond the lock. Every time the air-lock was operated, about 400 cubic feet of foul air, gas, &c., were drawn from the face to supply its pressure, and were, of course, replaced by the same amount of fresh air. After the explosion in May, additional ventilation and removal of gas was secured by constantly exhausting or wasting the air.

The tunnel was lighted only by incandescent electric lamps, and smoking and the use of matches were strictly forbidden. At the time of the explosion, the invert had been extended 16 feet from the finished lining to the face, and the arch centring was being put up. The inspector had just come out, and the bricklayers had probably begun laying the arch. There were 13 men between the air-lock and face of the work. The lock tender and one mule driver were at the air-lock, 2850 feet from the heading. One man was 350 feet from the heading when found, and one mule driver and a mule were found 150 feet from the face of the heading. The others were all near the face. The foreman in charge of the work was a very reliable man. He was found under the cave-in at the end of the work. There were 11 men killed, probably by burning and suffocation, and the foreman was crushed by the cave-in. The cause of the explosion is not known. There was no indication of a short circuit of the electric wires, and all the lights were afterwards found in good order up to 5600 feet from the shaft. Beyond this the wires had been knocked down by the explosion and the lamps broken. The explosion was followed by a slight fire, which burned only a few feet of flooring; and a bulkhead and flooring near the face were blown up. The tunnel itself was uninjured, though the clay caved in at the face. Shortly after the explosion, the tunnel was entered, and the men could go as far as 5300 feet, which was 1600 feet beyond the air-lock. The following morning, they could only go to 4300 feet. Late in the afternoon, another party succeeded in getting as far as 4900 feet. The next day, another party succeeded in getting up to 6150 feet. On July 14, parties were able to reach 6400 feet; but this was 500 feet beyond where the ventilating-pipe had been broken off by the explosion. On the 15th, the face of the work was reached. The tunnel itself was in perfect condition, without any sign of injury. The temporary bulkhead which had been constructed at 6200 feet was completely demolished; having been moved a distance of 120 feet, carrying plank, flooring, tracks, &c., with it.

After the explosion, air was forced into the tunnel through a 4-inch pipe, laid from the compressor to just beyond the air-lock, and was exhausted from the heading through a 2½-inch pipe. The valve at the air-lock was kept fully open, and the compressors were speeded up to maintain the air pressure in the tunnel. The quantity of air thus forced in per hour was sufficient to displace the foul air in 90 lineal feet of tunnel with pure air. One man was removed the 14th of July; nine men and a dead mule on the 15th; and the foreman, who was buried under about 40 tons of clay, on the 18th. On the morning of the 14th, a telephone was placed at 5600 feet. The current was then shut off the electric wires, and the wires cut to prevent any possibility of accident from the wires which were known to be down beyond this. The cars run up to this point, and the bodies were brought to them on stretchers from the face of the work. Beyond this point the tunnel was lighted with electric battery lamps.

The work is wholly at the Contractor's risk, with restrictions regarding the progress and quality of the work and ventilation. The contract requires him to have a compressed air plant on hand ready for use at any moment, otherwise there were no restrictions, except that he must not excavate more than he can line with masonry the same day. Both the Contractor and his Superintendent are experienced men in contract work. The Superintendent was Inspector for the City of Cleveland when the 7-feet tunnel was built in 1887 to 1890; and compressed air was used to support the excavation until it could be bricked up. Practically the same conditions regarding ground and gas existed there as in the present tunnel. The process here used was adopted on the 7-feet tunnel after several explosions had occurred and disasters had been met in attempting to go round bad ground.

It appears from a statement previously furnished to our contemporary by Mr. Kingsley that the accident which occurred on the 11th of May was caused by gas which had come in, unknown to the workmen, through

the new excavation. The tunnel had been completed to a point 6281 feet from the shore shaft, and they had excavated, nearly ready for bricking, about 17 feet. The accident occurred about 12.45 p.m., while the men were taking their lunch. As nearly as can be learned, one of the workmen had unscrewed an old lamp from its socket, and was replacing it with a new one when the explosion took place. There were eight men at the face, seven of whom were killed; but no damage was done to the tunnel, with the exception that a few bricks in two places—one at 80 feet, and the other at 180 feet from the end of the brickwork—were forced upward about 1½ inches. In the face of the excavation the earth caved in to a height of 18 or 20 feet above the height of the tunnel. There were 53 feet of clay between the roof of the tunnel and the bottom of the lake; and the 20 feet caved in left about 33 feet of solid clay over the whole. The whole tunnel was lighted with incandescent lamps, and every precaution was taken in the wiring of the tunnel to make it safe.

### KINGSTON (N.Y.) WATER-WORKS.

The old part of the city of Kingston (N.Y.) stands on a plain 180 feet above the level of high tide; but Rondout, which is now a part of Kingston, lies chiefly along the Rondout Creek, only a little above the tide-level, and on the slopes of a steep bluff rising to the Kingston plain at some places 100 feet above it. The population of the whole city in 1882 was about 20,000; and its annual increase has since been very small. In that year, Mr. W. R. Hutton was requested to examine different sources of water supply for the city, and devise a project for introducing it. He recommended taking the supply from the Sawkill, a mountain stream, and constructing a small reservoir, a pipe-line 7 miles long, and a distributing system. It was, however, against his advice that a contract was entered into with a Company who in 1883 built the works substantially as designed, including a 50-million gallon reservoir 350 feet above tide-level and 7 miles from the city limits, at a cost of about £68,000. The works, which were afterwards purchased by the Municipality, were in 1896 found inadequate; and Mr. Hutton was again retained for their improvement and extension. The cost of the new construction here described is about £43,400, exclusive of lands, engineering, &c. The estimated total cost of the new construction, extensions, repairs, &c., is about £66,600; and the amount paid for the old works is £93,600. We gather the foregoing facts from the "Engineering Record," in which the particulars here given were published.

A new 40-million gallon reservoir (No. 2) has been constructed on the Sawkill, at a level 100 feet higher than No. 1 reservoir, for the supply of the high points in Kingston. The 18-inch pipe from the old reservoir will be used to supply Rondout; while Kingston proper will receive its water through a 20-inch pipe from the new reservoir. The latter is formed by a dam 130 feet long, chiefly of masonry, across a narrow point in the bed of the stream, and raises the water 36 feet. The overflowed surface of the valley was cleaned of soil and vegetable matter, and was excavated to a depth of 5 to 6 feet. As the Sawkill is a mountain torrent, subject to floods of more than 8000 cubic feet per second on a watershed of 35 square miles, and of 6000 cubic feet per second on 25 miles, the wing walls and embankment of this dam have been raised 10 feet above the level of the overflow.

As the natural flow of the stream sometimes falls to a million gallons per day, a further storage is designed at Cooper's Lake, on one of the heads of the Sawkill, into which a neighbouring stream from Mink Hollow can easily be diverted. The old reservoir (No. 1) is formed by an earthen embankment across the valley; the overflow escaping through a rock-cut 225 feet wide and 350 feet above tide-level. From this the original 18-inch pipe, 7 miles long, to the city limits of Kingston is now extended by a line of 16-inch pipe provided for the exclusive supply of Rondout and the low-level area.

A cast-iron supply-pipe 20 inches in diameter and 47,000 feet long supplies Kingston proper, or the upper level, the greater part of which is about 180 feet above tide water, though some portions are 100 feet higher still. The pipes from the two reservoirs are connected below the old reservoir; valves for regulating the pressure being placed in the connection. The original pipe-line was taken across Esopus Creek, 180 feet wide, on a structure of piles. The new line is carried in a dredged channel under the bed of the stream in a pipe with flexible joints.

The water of the Sawkill is normally pure, but during the spring and summer floods it becomes heavily charged with sediment; and in the hot dry season, being confined in reservoirs, it acquires a disagreeable taste and odour. To prevent this, there has been installed half a mile below the reservoir a plant consisting of eight pressure filters, capable of filtering 4 million gallons per 24 hours. The supply-pipes from both reservoirs are connected with these filters. An 18-inch and a 20-inch Venturi meter have also been purchased, one for each main pipe-line. The construction of the new work included about 3800 tons of new pipes, 45,000 cubic yards of earth excavation, 10,700 cubic yards of rock excavation, 12 air-valves, about 20 gate-valves, and the construction of masonry chambers for air-valves, gate-valves, blow-offs, &c.

The pipe is laid with its top at least 3 feet below the surface of the ground in earth, and 4 inches deeper in rock. The trench was 3 feet wide at the bottom in earth, and 4 feet in rock. The bottom of the trench was refilled with fine earth rammed 4 inches deep, and upon it each 12-foot length of pipe was supported on two sets of 12-inch wedges 3 inches thick, carried on 2 in. by 6 in. blocks 30 inches long. After the joints had been poured and caulked, the trench was back-filled by ramming earth round the pipe with pointed iron bars. No stone was permitted within 2 feet of the pipe. All pipes were tested to 300 lbs. hydraulic pressure, heated, and dipped in a hot bath of coal-tar pitch and linseed oil.

The dam consists of a weir made of concrete and faced with broken-range ashlar. The back is plastered with portland cement mortar. The gravelling above the weir is paved in cement mortar for a short distance back from the dam. The remainder is protected with riprap. A concrete apron below the dam is intended to be protected on the top with iron rails. The wing walls rise 10 feet above the crest of the weir, and conform to the slopes of the embankment. They are of rubble masonry; all exposed surfaces being faced with broken-range ashlar, and the walls coped with steps. The backs of the walls are battered and plastered with cement mortar. The core-wall is of concrete, built with a batter and







gas made was 67,120,000 cubic feet. The gas sold was 61,791,000 cubic feet—an increase of 3,894,000 cubic feet, or 6·84 per cent. over the quantity in the preceding year. The gas unaccounted for amounted to 5,329,000 cubic feet, or 8 per cent. of the make, which was 2 per cent. less than in the preceding year. During the year, 178 new consumers were added, of whom 44 were furnished with prepayment meters, the consumption through which was close upon 800,000 cubic feet. There was a surplus of £1886 on the year's working. It has been resolved to reduce the price of gas, as from the November survey, from 3s. 9d. to 3s. 4d. per 1000 cubic feet. To do this, a sum of £1350 will be required, so that there will still be a margin to the good. Mr. Thomson has been in Inverness for about 14 years. In his time he has reduced the price of gas by more than one-half, and has, in addition, abolished meter-rents. The boon he has conferred upon the community of Inverness is thus extensive; and it is also far-reaching. It has been accomplished by a thorough renovation of the works, which is the first and most essential condition of prosperous working. Along with this, the introduction of modern processes has not been neglected, even to the working up of residual products, the plant for which is considered to be quite of a model description. Mr. Thomson possesses the confidence of his Commissioners—a circumstance which is productive of as much favour to them as to him, for, without trust, a manager may do his best, but the result sought will not be obtained.

The "Hamilton Advertiser" publishes the following with reference to a find at the Linlithgow Gas Company's works: "As mentioned by us in a recent issue, specimens of the relics turned up in the course of the excavations at the gas-works have, at the instigation of Mr. W. H. Henderson, been seen by experts, who have expressed the opinion that some of the relics, such as the pieces of old earthenware, belong to the thirteenth century. As this would be about the time when the palace was being re-edified, it is possible that the articles in question may have been pitched into what would then be the west bay of the loch. One of the bones found is the jawbone of a wolf. Others are supposed to be those of the original Scottish ox, the wild boar, stag, roebuck, &c. Some of the 'finds' are no doubt interesting, and perhaps none more so than specimens of the old-fashioned earthenware, which, as we have said, are believed to belong to the time of King Robert the Bruce."

It was mentioned in the "JOURNAL" last week that a new "irregularity" had been unearthed in connection with the Perth Corporation Gas-Works. The "Dundee Courier," which does not seem to hold a mandate for the policy of keeping the pot of dissent boiling, lays bare in all its nakedness this latest "corrupt practice." It consists of nothing less than this—that whereas for some years the Gas Commissioners have been in the habit of voting £15 annually towards the expenses of the employees' excursion, the actual disbursements have been found latterly to mount up to £40; and the accounts have been in the habit of being passed by a Convener initialling them, without their being brought before a Committee at all. The Convener this year refused to pass them, very properly, I think, because, if £15 was the amount voted, it should not have been exceeded without the due formalities being observed. It is proposed this year to restrict the payment from the funds of the Gas Commission to the

£15, and to make up the balance by subscriptions from the workmen "and others." I am afraid the "others" will have to bear the burden; and rightly, too, because the workmen would not be the parties who led to the increased outlay. I am afraid that this increased outlay has been necessitated by too many other than workmen attending the outing, and being treated to better fare than the workpeople. If so, there need be no sympathy with any who may be called upon to subscribe for their day's amusement. If the Commissioners were minded to take a day by themselves, and to have some friends with them, there would be no harm; and an outlay of £40 upon the occasion would not be amiss. But if they go out with the workmen, they should be as the workmen. It is quite right that the practice which has been discovered should be put a stop to, and that the pleasures of the staff should be paid for in a manner which will permit of no cavil; but it is scarcely a subject which is worthy of being magnified into an "irregularity." At the same time, the voting of £15 for the day's outing is a species of giving and yet withholding, because it is not sufficient for the purpose. The Commissioners should either defray the whole, whatever it is, or have nothing to do with it.

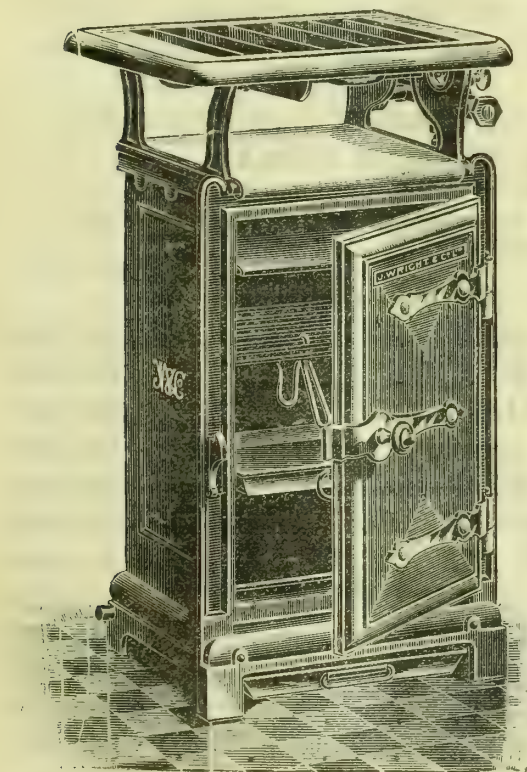
The water supply to Edinburgh and Leith has, during the summer which is just closing, given the officials of the Water Trust some anxiety. There was at no time fear of a famine this season; but the pressure fell so low that some parts of the district were with difficulty supplied, and warnings were issued against waste. There was also the possibility of another dry winter, with the result of a deficient supply next summer.

During the past year, the revenue of the Aberdeen Corporation Water Department amounted to £25,741, or, with a balance of £1872 brought forward from the preceding year, to £27,613. The expenditure included: Maintenance of works, £6564; interest, £6712; management, £687; and balance of cost of Deacon meters and repairs at the Mannofield and Invercannan reservoirs, £1575. A sum of £1000 has been set aside towards the renewal of the main aqueduct, making this fund £2000; and £9041 has been placed to sinking fund. The balance is £2034.

At a recent meeting of the Greenock Water Trust, it was reported that the income for the past year was £19,289, and the expenditure £19,087; leaving a surplus of £202. The estimates for the current year show an income of £19,319, and an expenditure of £19,300; giving an estimated surplus of £19. Provost Erskine moved the adoption of the minutes, which, besides containing the statement of finances, bore a recommendation from the Committee that the existing rates of assessment—namely, 6d. in the pound for the domestic water-rate, and 1d. in the pound for the public water-rate—be continued for the current year. The Provost commented with satisfaction on the state of the Trust's finances, and pointed out that they had at present 120 days' water supply, as compared with 163 days' supply at the corresponding period of last year. The minutes were adopted.

**Increase in the Price of Gas at Falmouth.**—Owing to the high price of coal as the result of the strike in South Wales, the Falmouth Gas Company announce an increase in the price of gas, after the 30th prox., of 4d. per 1000 cubic feet; making the price 3s. 4d., less the usual discounts.

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Aug. 27.

**Sulphate of Ammonia.**—The demand has been well sustained throughout the week; and all ready parcels have been picked up at hardening prices. There has also been some anxiety to secure September delivery; and a considerable portion of the September make has been sold at about the level of spot prices. The closing quotations are £10 2s. 6d. per ton f.o.b. Hull; and £10 5s. per ton f.o.b. Leith and Liverpool. Consumers have come forward more freely; and there has been a larger proportion of direct business than has been the case recently. There has been less interest in the further ahead position; but early in the week £9 17s. 6d. per ton was paid for October-March, f.o.b. Leith. The quotation at the close is £10 per ton f.o.b. Leith, ordinary terms; London, Beckton terms, £9 15s., October-December delivery.

**Nitrate of Soda** is firm in all positions; and the difficulty of securing tonnage is beginning to point to a shortage of supplies for the early spring months. The spot quotations are 7s. 7½d. per cwt. for ordinary, and 7s. 9d. per cwt. for refined quality.

LONDON, Aug. 27.

**Tar Products.**—The week has shown no change of moment in the value or volume of business done. Benzols are changing hands at the extremely low prices now quoted; and although buyers are asking for forward contracts at these rates, none but urgent sellers are disposed to sell ahead at them. Naphthalene is more inquired after, and is said to be scarce, owing to the improved demand for creosote at prices better for the distiller with the naphthalene left in it. Carbolic acid is steady; and there are buyers in all positions at prices quoted below. Anthracene keeps low, with no fresh move on the part of buyers, who are evidently waiting to see how far pressing sellers will reduce that article. At such prices as are now prevailing for anthracene, manufacturers would be foolish to separate it from their oils; much more to recover it by distillation. At the low rates now obtaining, the anthracene market should rectify itself by lessened production, though this may take some time.

The average quotations of the week are: Tar, 12s. 6d. to 16s. 6d. Pitch, east coast, 24s.; west coast, 20s. Benzols, 90's, 9½d.; 50's, 9¾d. Toluol, 1s. 1d. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 1d. Crude, 30 per cent., naphtha, 4½d. Creosote, 2½d. Heavy oils, 42s. 6d. Carbolic acid, 60's, 1s. 11½d. Naphthalene, pressed, 60s.; salts, 32s. 6d. Anthracene, "A," 4d.; "B," 3d.

**Sulphate of Ammonia** has enjoyed a strong market during the week. There is some hesitation on the part of buyers to go on at the higher prices now quoted; but as there are no stocks of the article in this country, it looks as if they must pay the price makers ask. Prompt values are £10 2s. 6d. to £10 5s., less 3½ per cent., according to port of shipment.

**The Wallingford Corporation and the Gas-Works.**—The Wallingford Gas Company have refused the offer of the Corporation to purchase their undertaking for £7500; this sum being the estimate of the valuer employed by the Town Council.

COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—The month closes, as anticipated, with a very general upward move in prices. The leading Manchester colliery firms—acting in conjunction with representatives of important collieries in the immediately surrounding district—have decided to advance all descriptions of round coal, except the very best house-fire qualities, 10d. per ton; steam and furnace coal, 10d.; nuts, 10d.; and burgie and slack, 5d. These advances apply to the pit and wharf prices, and also to the delivered rates to private consumers. In other Lancashire districts, the advance ranges from 6d. up to 1s. per ton on round coal; but the maximum advance is only being carried out in exceptional cases. With regard to burgie and slack, it is doubtful to what extent the advance will be put in force, as on this class of fuel prices have been hardening up for the last two or three months. At present, it is scarcely possible to give actually precise quotations, as the advance in prices is not sufficiently definite in all cases. But it is probable they will settle down to something like an average of 10s. 6d. to 11s. per ton at the pit for best Wigan Arley; 9s. to 9s. 6d., for Pemberton four-foot and seconds Arley; 7s. 6d. up to 8s., for common round coals; with slack ranging from about 3s. 9d. to 4s. 6d. for the lower and medium qualities, up to 4s. 9d. and 5s. 3d. for the best descriptions. As regards trade generally, the better qualities of round coal have been moving away in average quantities for the time of year, with steam and forge coals in active demand for inland requirements, and burgie and slack also generally meeting with a ready sale, though supplies are not at all scarce in the market. In the shipping trade, there has been a continued brisk inquiry which has been sufficient to take away any surplus supplies of round coal which colliery proprietors have had to offer, with the result that pits have been kept on practically full time, and little or nothing has been going into stock during the last few weeks. Delivered at ports on the Mersey, ordinary steam coal has been fetching 9s. 6d. to 10s. per ton; and special qualities, 10s. 3d. to 10s. 6d. Delivered at the Partington tips of the Manchester Ship Canal—where a large trade has been done recently—the price is about 11s. per ton.

**Northern Coal Trade.**—The pressure for coal continues undiminished in the North-Eastern coalfields; but there are signs that the demand will soon be reduced by the return of the Welsh miners to work. There is still a strong demand for best Northumbrian steam coals. Prices are firm at about 14s. 6d. per ton f.o.b.; while second-class steam are 12s. 6d., and steam smalls 7s. 6d. The gas coal trade is very brisk; and the general tendency is towards firmness in price. Two local gas companies are now in the market for tenders; and it may be taken for granted that there will be a considerable advance in the quotations when compared with those that have ruled under the expiring contracts. Prices vary a little more for occasional cargoes—up to 10s. per ton f.o.b. being asked; but there is only a limited amount for sale beyond the quantities under contract. Prices of gas coke are steady.

**Scotch Coal Trade.**—Great activity still characterizes the coal trade in Scotland, and will probably continue to do so for some time. Except in Fifeshire, the question of wages is likely to be amicably adjusted with the

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| WINDSOR STREET WORKS, BIRMINGHAM . . . . .                   | 2,000,000           | MONTREAL . . . . .                              | 500,000           |
| SALTLEY WORKS, BIRMINGHAM . . . . .                          | 2,000,000           | BELLEVILLE . . . . .                            | 250,000           |
| COLCHESTER . . . . .                                         | 300,000             | OTTAWA (Second Contract) . . . . .              | 250,000           |
| BIRKENHEAD . . . . .                                         | 2,250,000           | BRANTFORD (Remodelled) . . . . .                | 200,000           |
| SWINDON (New Swindon Gas Co.). . . . .                       | 120,000             | ST. CATHERINES (Remodelled) . . . . .           | 250,000           |
| SALTLEY WORKS, BIRMINGHAM (Second Contract) . . . . .        | 2,000,000           | KINGSTON, PA. . . . .                           | 125,000           |
| WINDSOR STREET WORKS, BIRMINGHAM (Second Contract) . . . . . | 2,000,000           | PETERBOROUGH, ONT. . . . .                      | 250,000           |
| HALIFAX . . . . .                                            | 1,000,000           | WILKESBARRE, PA. . . . .                        | 750,000           |
| TORONTO . . . . .                                            | 250,000             | ST. CATHERINES (Second Contract) . . . . .      | 250,000           |
| OTTAWA . . . . .                                             | 250,000             | BUFFALO, N.Y. . . . .                           | 2,000,000         |
| LINDSAY (Remodelled) . . . . .                               | 125,000             | WINNIPEG, MAN. . . . .                          | 500,000           |
| ROCHESTER . . . . .                                          | 500,000 Cubic Feet. | COLCHESTER (Second Contract) . . . . .          | 300,000           |
|                                                              |                     | YORK . . . . .                                  | 750,000           |



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## EDITORIAL NOTES.

## The Trade Union Congress.

THE Trade Union Congress held at Bristol last week was characterized by the ordinary elements of such assemblies. Much as the rest of the public would like to take these "Parliaments of Labour" seriously, it is difficult to do so in view of the nonsensical nature of a large part of the usual proceedings. The business of the congress began with a performance by the Parliamentary Committee, consisting of the passing of a resolution "deprecating" the action of the Judge and Jury at the last Glamorgan Assizes, in sending a strike leader to prison for "alleged intimidation." The congress might as usefully have "deprecated" the spring tides of the Severn. The report of the Parliamentary Committee was the customary hotch-potch of Party politics and Trade Union principles. It was admitted to be impossible to "boast of the successful" "passing of any prominent legislative measure directly" "promoted by the congress;" one reason for this failure being, probably, that the congress is not in the habit of promoting schemes of legislation of a character that Parliament can ever accept. The report goes on to declare that "it must be obvious to everyone who has watched the" "proceedings of Parliament during the last two or three" "years, that it is useless to expect any active measures of" "industrial reform from the House of Commons." And this of a Parliament that has passed the Workmen's Compensation Act, and given much labour to the preparation and passing of other measures, chiefly in the interest of the poorer classes! The address of the President of the congress, Mr. J. O'Grady—a local Trade Unionist—was a long and laboured composition, containing, however, a few pointed remarks. Commenting upon one of the subjects respecting which the congress is continually passing resolutions, the President asked: "What is the" "good of these heroic resolutions, if there is no intention" "of carrying them into effect?" What, indeed! But this question strikes at the root of such functions as the congress itself. When speaking of the Workmen's Compensation Act, the President showed that he had not taken counsel with the Parliamentary Committee in preparing this part of his address, because he called it "one of the" "most revolutionary of the laws relating to labour that" "the century has yet given birth to." Mr. O'Grady's remarks upon the Act were among the most interesting passages of his address; he being the first representative working man, not belonging to the stock company of labour leaders, to state in public his opinion of the law. He looks at the probable effect of the Act upon trades dangerous to life and limb, and takes the broad view that far too many workpeople are killed and injured in British factories. Unless these trade accidents can be prevented, the Act will be a costly affair for some employers—and a good job too, says Mr. O'Grady, who is for making such accidents too dear for employers to permit them, and for securing adequate compensation for those that cannot be prevented. Of course, as a Trade Unionist, the President condemned the Act for permitting contracting out. But, taking it as a whole, he thought that in it workmen have something to rejoice over, and that they should be prepared to give the Act a fair and impartial trial. This is certainly good sense.

In his comments upon the engineers' strike, the President allows the public to get a peep into that remarkable organ, the mind of a working man who is before all things a Trade Unionist. He admits the failure of the engineers' strike; but the first lesson he learns from it is that of the "absolute futility of attempting to gain any considerable" "reduction in the hours of labour by Trade Union action" "alone." Mr. W. Thorne could have told him something about that. It is admitted that the employers in the engineering trade beat the men by the superior use of their own weapon—organization. Therefore, Mr. O'Grady thinks, there is nothing else for the men to do but organize still more highly. The time is ripe for the federation of all trades! This, we are told, brings us within measurable distance of Collectivism; when we learn, without surprise, that such is the end of Trade Unionism. So, by an easy and pleasant round, the President brings his audience to the point from which he and most of them started. For, of course, they were Collectivists all along. "Having" "agreed, then, that the objective of Trade Unionism is



"Collectivism, as the only possible outcome of a long series of its own actions, as the only logical expression of the trend of modern industry, and the certainty that it implies the only solution of the social problems that face us to-day, as practical men we must use every agency at hand, industrial and political, to work consciously towards that goal." So the Snark is a Boojum after all! Employers generally will take note of this official identification—not for the first time—of Trade Unionism with Collectivism; and when next they are confronted with a Trade Union demand, they will know what is behind it. One of the local newspapers has been startled at what it has learnt from the President and the congress as to the aims of Trade Unionists. It remarks: "They do not seem to care anything for freedom of dealing between man and man, for the cheapness of articles of consumption which must come from the encouragement of foreign imports, for the increased burden of general taxation which would certainly come if the State as an employer of labour were to consider only, as it would be expected to do, the wages paid to workmen, nor for anything at all but the realization of an idle, selfish, mischievous dream." This is the sober truth.

#### End of the South Wales Strike.

EVENTS moved swiftly during the past week towards the termination of the South Wales strike upon the lines laid down by the employers from the beginning. The outlook in South Wales began to brighten just when matters seemed to be at their very worst. We gave last week the heads of the new terms of settlement that emerged from the joint conference held on Saturday week. The men's leaders—who, by the way, ill deserve the name—had abandoned all the high-sounding principles for which they were supposed to be contending, and retained only the demand for the recognition of a minimum wage, which the employers once more rejected. The whole business might have been settled on the Saturday, but for the reluctance of the men's representatives to take the responsibility for giving up their cause. As it was, the men were allowed until Thursday to make up their minds. They agreed to accept the masters' terms; and, accordingly, the strike is at an end. It is hardly necessary to remark that it should never have been begun; for a more aimless, foolish revolt of men against the conditions of their employment is not recorded in the history of human industry. It will be some time before coal from the stopped pits comes again to market. The colliers and all those who are directly or indirectly dependent upon them have suffered terribly, and all in vain, as well-informed onlookers predicted from the first would be the case. The coalowners have also lost heavily in money; but they have gained in repute for consistency, wisdom, and loyalty to their principles. Best of all, they have shown themselves to be masters of their own business. Like the engineering employers, they have justified themselves upon every point of their combined action.

It is impossible to overestimate the value of this complete discomfiture of the powers of industrial anarchy which have dominated South Wales since April last. Nothing is lacking to the proof thus given that sound economic principles, inspiring united action, persevered in for a sufficiently long period, are bound to win against all the forces that sentimentalism, time-serving politics, and economic heresy can marshal against them. Coming after Bethesda, the engineers' fiasco, and the firm stand of the Admiralty against Trade Union arrogance in the dockyards, this South Wales defeat should help to convince the ordinary workman—and even the hack politician and the popularity-hunting newspaper—that a strike has become a game for two to play. Even the delegates at the Trade Union Conference must have realized the truth that their performance is only a modern kind of puppet show, when on the morrow of their passing a bombastic resolution expressing "deep sympathy with the Welsh miners in their prolonged struggle," and condemning the "arbitrary attitude taken up by the colliery proprietors," these same miners agree by an overwhelming majority to accept the employers' terms. Not one jot or tittle of the employers' case was relinquished in this settlement. The workmen's representatives tried at the last to save the monthly holiday instituted by the men some years ago, and styled "Mabon's day." But the employers stood firmly for the abolition of what has proved to be a demoralizing and wasteful suspension of work; and it has gone the way

of the independent umpire, the minimum wage, the reduction of output, the demand for a big advance, and all the other sacred and necessary points of the strikers' charter. Of course "this congress" could easily express "deep sympathy," but could not affect the settlement one iota. Trade Unionist resolutions of this character are kept "in blank," so to speak, and the spaces filled in with the names of the strikers who happen to be making the "noble effort," and the employers whose "arbitrary" conduct is to be condemned. The thanks of the community are due to Sir William Thomas Lewis and his colleagues for their wise and courageous action in meeting the grave emergency created by the men's revolt. The employers did not court the conflict; but when it was forced upon them, they showed that they meant to win, and they have done so "all along the line."

#### The Board of Trade Report on the Gas Orders for the Year.

THE Board of Trade report on their proceedings for last session under the Gas and Water Works Facilities Act has been issued. It recounts that all the Gas Orders applied for were granted, except two—Churwell and Freshwater. In the former case, the undertaking was already in existence without parliamentary authority; and in the latter, the application was for permission to construct and maintain new gas-works. The Churwell application was withdrawn by the promoters in consequence of their having agreed to sell the undertaking to the Morley Corporation, who had a Bill in Parliament for this and for various other purposes. The Freshwater Order failed through the opposition of the Local Authorities. Coatbridge and Slough asked for and obtained the sliding-scale. In six other cases the Board of Trade fixed a maximum selling price, reserving power to alter the maximum or substitute for it a sliding-scale after three years. The usual minimum of 15 candles for the illuminating power of the gas to be supplied was varied in two instances. Crossgates is to have 16 candles; and Cannock, 14 candles. The latter decision is interesting as showing the regard paid by the Department to local conditions. The Cannock Order is of a special character in other respects, owing to an agreement having been arrived at between the Company and the Local Authorities concerned. These provisions relate to the limitation of dividend on the original capital to 7 per cent.; the sale of mortgages by auction or tender; the prescription of a higher minimum pressure and a lower illuminating power than usual; and the sale of the undertaking in special circumstances. Clauses were inserted in the Budleigh Salterton and the Crossgates, Halton, and Seacroft Orders as to the supply of gas for public lighting; in the Cannock and Crossgates Orders, for the protection of mineral rights; and in the Budleigh Salterton and Cannock Orders, as to the breaking up and repair of streets. This is the whole story of the dealings of the Department with the Orders submitted for inquiry and sanction; and, as usual, the discretionary powers vested in the Board appear to have been exercised with judgment and intelligent appreciation of local needs.

#### The History of the Gas Supply of Birmingham.

JUDGING by an extract from the "Birmingham Daily Post" which will be found in another column, it has just been remembered in the Midland Capital that gas lighting is now a hundred years old, and that Murdoch, the inventor of this particular application of coal, was for some time of his useful life a local worthy. It is interesting to note that, although gas lighting on a considerable scale was actually first tried and made successful in Birmingham, the organization of the industry as a public undertaking was not effected there, but in London. The reason for this was that Murdoch and those who were associated with him in this enterprise regarded it as a trade speciality of their own. There is other evidence to show that Boulton and Watt—Murdoch's partners—were in some respects narrow-minded, not to say selfish and grasping in their business methods. At any rate, they did not see the potentiality of development as a public service which was undoubtedly inherent in Murdoch's invention; but Winsor, the unpractical man of ideas, did see it, and became the true father of gas undertakings as they exist to-day. It is significant of the fact and the persistence in Birmingham of Murdoch's way of treating gas, that the first public works for the supply of the new illuminant were laid down by a private trader. Eventually two Gas Companies



came into existence in Birmingham and the surrounding district. It is almost ancient history how these two undertakings became municipalized, and how one of the chief products of the operation was the Right Hon. Joseph Chamberlain, who made the conversion the stepping-stone for his own elevation from the condition of a provincial politician into the grade of a statesman. As the tale of the progress of the old Companies is told by our Birmingham contemporary, it comes out clearly that the gas consumers of the district fared quite as well under the old *régime* as they have done in the new. "As years rolled by, the scale was frequently revised, invariably in favour of the consumer. . . . In 1873, the price was 2s. 7d. for a consumption of 25,000 cubic feet and under, and 2s. 3d. "where the consumption reached 100,000 cubic feet." These are the prices ruling to-day, although the output of gas has more than doubled. Of course, somebody has benefited by the process of municipalization. Birmingham is a handsome city now, compared with the higgledy-piggledy town it was a quarter of a century ago. The gas consumer has paid for a good deal of this improvement; "betterment" in the old sense has done the rest. But when the advantages of the municipalization of the gas supply in the case of Birmingham are cited, as is frequently done, let it not be overlooked that the obsolete old Gas Companies did just as well for their customers as the grand new City Corporation does to-day.

#### The British Association at Bristol.

THE regrettable destruction of the Colston Hall, Bristol, by fire last week will in all probability affect but little the prospects of this year's meeting of the British Association, which opens in the city to-morrow. One can only rejoice, if it was fated that the celebrated hall should be destroyed by fire about this time, that the catastrophe occurred during the holding in it of the Trade Union Congress instead of the following gathering; for it is quite possible to bear with equanimity the intelligence that all the archives of the Trade Union Congress "went up" in the flames last Thursday. Nobody is likely to be one penny the worse for the disappearance of the minutes of this egregious assembly; but if it had been the papers of the British Association that had been thus sacrificed, the loss might have been serious. The day has passed when the British Association meeting was looked to as the occasion when the particular gain of science for the year would be introduced to the world. We cannot nowadays wait for this yearly function, when science has found something new in the borderland between the known and the unknown, where its pioneers work. Art is long, and time is fleeting; and the instant a fresh discovery is made, it is published, in order that busy hands and brains all the world over may test and try what can be made of it in the cause of the advancement of knowledge and for the benefit of mankind. The President of the Association this year is Sir William Crookes, one of the most distinguished and enterprising of English chemists. It is reported that the presidential address will deal with the world's wheat supply, in connection with the fixation in the soil of atmospheric nitrogen, and the philosophy of manuring. It is appropriate that this year's President should be a chemist and physicist; for much that represents the latest progress of science lies in the domain of these important branches of study. Professor Crookes will accordingly have to deal with such important subjects as the liquefaction of hydrogen; the constitution of matter at the absolute zero of temperature; the newly-discovered gaseous elements; Röntgen ray developments; "the fourth state of matter;" and so on. It is expected that in the Chemistry Section Professor Ramsay and Dr. Morris Travers will introduce their new discovery "Neon" to the world which has so long actually breathed it without being aware of the fact. In the Economic Science and Statistics Section, the President, Dr. J. Bonar, will deal in his address with "Old Lights and New in Economic Study"—a most suggestive title. Mr. A. L. Bowley is to read a paper on "Wages;" and papers are promised on "Labour Co-partnership," "Municipal Enterprise," and "Electrical Enterprise and Municipalities." Some interesting subjects will be dealt with in the Mechanical Science Section, which will be presided over by Sir John Wolfe-Barry. The influence of earth currents upon the corrosion of gas and water pipes will be discussed in this section by Professor Fleming. Altogether, the programme of the meeting is of a very high character.

#### WATER AND SANITARY AFFAIRS.

MAJOR-GENERAL SCOTT appears to have been pressing upon the attention of the Local Government Board the scheme for connecting the Grand Junction system with that of the New River Company, so as to enable the latter to render greater assistance to the East London Company. This so far agrees with our remark of last week that if General Scott knew of any engineering device that could bring a further supply of water into the East London district, he would give the Company and the consumers the benefit of that knowledge. That we have not under-rated the difficulties of any such an enterprise is shown by the circumstance that the execution of this plan is estimated as likely to occupy "some months." We should presume that General Scott reckons on more rapid progress; for in the communication addressed by the Board to the East London Directors, the latter are urged to carry out the scheme "at the earliest possible moment," with a view to the increase of the supply which is "urgently required." If indeed the work can be done so quickly as to meet the present want, it comes as a most unexpected and welcome relief. But there is another project, already in hand, and rapidly proceeding, which offers a more speedy result. In this remarkable scheme—by which a supply is to be brought into the East London Company's district from the works of the Southwark and Vauxhall Company—we seem to meet with a justification of the remark attributed to Mr. Bryan, that the East London Company were under the necessity of going "further afield." It looks like a stroke of genius to devise a scheme for drawing five million gallons per day from the Southwark and Vauxhall works through the Tower Subway into East London. Two miles of 20-inch pipe are required to establish the connection; and deep shafts have to be constructed at the extremities of the tunnel. But the contractors are doing everything short of the miraculous in order to effect the connection in time to relieve the drought.

The energy displayed by the East London Company in coping with the difficulties by which they are now beset, deserves a better reward than the virulent and unreasonable attacks by which they are being perpetually assailed. Doubtless Mr. Bryan and his colleagues, together with his Board of Directors, are too busy in devising and carrying out measures in aid of the supply to pay much heed to what is either written or spoken to their detriment. Help is now obtained from the New River Company to the extent of six million gallons of water per day in place of four millions. The pipes of the Kent Company in the Blackwall Tunnel furnish half a million gallons. The Thames is supposed to yield its ten million gallons, though there is a report that the quantity actually pumped has to be somewhat less, in order to avoid bursting the pipes. But the Lea is running so low that the reservoirs of the East London Water Company are fast giving out more than they receive; and the prospect is full of anxiety. On Saturday a further restriction of the supply took place, and was clearly inevitable; the water being turned on daily for two periods of two hours, in place of two periods of three hours. Still the cruel waste goes on, water flooding the sewers from house-taps perversely left open, although the Local Government Board have addressed a circular to the Sanitary Authorities of East London, asking them to assist as far as possible in impressing upon the water consumers the urgent necessity of avoiding all waste of water under the circumstances which now exist in the district. It is easy, in the present critical state of affairs, to blame the Water Company, and accuse the Directors of want of foresight. But what foresight were they to exercise? The case would be infinitely worse if they had not, in defiance of the County Council, and in the face of much discouragement in Parliament, carried their Bill in the session of 1894. It is true that the works then authorized were insufficient, and they had to seek further powers in a subsequent session. These latter works, for which the Act allows seven years, are to be completed in three years from the present time. But supposing the two schemes had been welded into one, and had been laid before Parliament in 1894, it may be safely averred that the Bill would either have been rejected or the scheme cut down. The Company have proposed more, and have done more, than the County Council approved. Yet the Directors are held responsible for the present deficiency in the supply. If the



County Council had prevailed in 1894 as they did in 1893, it is perfectly certain that East London would now be suffering a veritable water famine. That the consumers have a supply for four hours per day instead of one hour, is something for which they are indebted to the Company and not to the Council. As for the existence of a drought, the statistics of the rainfall and the experience of other towns abundantly prove its reality.

It is recorded in our news columns that the Directors of the Maidstone Water Company have instructed their Manager to carry out a daily examination of the springs which furnish the local supply. There is also to be a rigid supervision of the springs, night and day, so long as the hop-pickers are in the neighbourhood. This may be taken in relation to the remarks contained in the recent report by the Local Government Board Inspectors as to how far the regulations of the Board in reference to the duties of Medical Officers of Health, and the statutes which regulate the powers and obligations of private Water Companies, are sufficient to ensure a reasonable amount of protection to the public health. It will be seen that in this case the officials of the Maidstone Company exercise supervision over the supply, and we hear nothing of the Medical Officer of Health. There is, indeed, a question as to the power of such an officer to inspect the works of a private Company. This difficulty arises especially where the works are situated outside the Medical Officer's district. The Maidstone authorities were unquestionably lax with respect to the drainage of their borough; and their care of the water supply seems to have been fatally perfunctory. Thus we are told in the official report that, while the Directors of the Water Company relied on the quarterly reports made by Mr. M. A. Adams, "there was never any systematic inspection of the works from a sanitary point of view." The Town Council and the Company are both blamed; but the question of authority still remains to be settled. Had anybody examined the surroundings of the Farleigh springs, it would have been seen that they were "obviously and abominably filthy." But nobody looked, and nothing was known. The zeal of Mr. Adams in the performance of his duties is placed beyond question; but, as a matter of fact, he never so much as saw the sources of the supply furnished to the Farleigh area. It has been argued in the London County Council that what happened to Maidstone in the visitation of typhoid fever, might happen to London. But the cases are in no respect parallel. We believe General Scott has no legal right to visit the works of the London Water Companies; but he is never denied such access. With respect to the quality of the London Water Supply, there are the analyses furnished to the Local Government Board by Sir E. Frankland, as well as the daily examinations furnished to General Scott by Sir W. Crookes and Professor Dewar. The law may be defective; but very much depends on the view taken of their powers and responsibilities by the authorities concerned. It is very possible that the regulations of the Local Government Board with respect to the inspection of the water supply will undergo some amendment, and perhaps even a change made in the statutory regulations.

**The Forthcoming Meeting of the Institution of Gas Engineers.**—We learn from the Secretary of the Institution (Mr. Thos. Cole) that the autumn meeting will be held in Manchester on the 29th and 30th inst. The arrangements have not yet been completed; but we understand that the first day will be devoted to visiting the gas-works of the Corporation, under the guidance of the President (Mr. G. E. Stevenson, M.Inst.C.E.), their Consulting Engineer, and other places of interest in the city, and on the second the members will in all probability have an excursion to Windermere.

**Eastern Counties Gas Managers' Association.**—The next meeting of this Association will be held in the Council Room, Romford, on the 15th inst., under the presidency of Mr. W. D. Child, the Engineer and Manager of the Romford Gas Company. According to the programme issued by the Hon. Secretary and Treasurer (Mr. J. H. Troughton, of Newmarket), the members will assemble at the gas-works shortly after noon, and partake of light luncheon courteously provided by the Directors of the Gas Company. They will then, under the President's guidance, inspect the gas-works, and proceed to the Council Room for the transaction of the business. Two new members will be proposed for election; and after the delivery of the President's Inaugural Address, Mr. Harry Wimhurst, of Sleaford, will read a paper on the "Workmen's Compensation Act, 1897." There will be a short drive in the afternoon, and the usual dinner on the return.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 545.)

BUSINESS was decidedly more brisk on the Stock Exchange last week, thanks to a succession of mild excitements. First came the Tsar's circular, which, though little practical result in the direct line was expected from it, was regarded as operating in favour of peace. Then the report of an arrangement in Delagoa Bay was a welcome item; and this was capped by the actual settlement of the Welsh coal strike. So prices profited accordingly. Things in general would indeed have been better still, had it not been account week with a closed Saturday at the end of it, which disposed operators to postpone extensive dealings until the re-opening. The Money Market was much firmer. There was a very brisk demand for accommodation from the Stock Exchange; and discount rates hardened under the United States requirements of gold. But in the Gas Market none of the influences which were swaying other departments prevailed to galvanize it into activity; and a quieter week on the whole it would be difficult to find, though there was a little more life in it on the closing day. In Gaslights, a few dealings took place at about 293, until Thursday, when some stock was let go at 291½; and the quotation was pushed down a couple of points. But it rallied on Friday, and fully commanded the old price, though the quotation was left standing. The secured issues were very quiet but strong; and the "H" advanced in value. South Metropolitan was extremely quiet, and made no sign. The same may be said of Commercials. The Suburban and Provincial Companies were as inactive as usual. Several of them were quoted *ex div.* on Wednesday, and gained more or less by the operation; the only exception being Tottenham "B," which (perhaps inadvertently) was put too low. The Continental undertakings were firm generally. Imperial advanced, and Union and European were steady; but Tuscan had a fall. Among the rest, Oriental proceeded with its recovery from artificial depression; and Bombay and River Plate debenture advanced. The Water Companies were as nearly stagnant as they could be. New River was slightly better; and East London a little worse.

The daily operations were: Next to nothing on Monday; but the tendency was all in favour of improvement. Gaslight "H" and Imperial rose 2 each; River Plate debenture, 1; and Oriental, 1½ paid, 1. Tuesday was just as quiet; and the only move was a fall of 1 in Tuscan. Transactions continued on Wednesday to stand at the nearest point to absolute inaction. Oriental old and new rose ½ each. Thursday's business was as limited as on any other day. Gaslight "A" receded 2. East London Water also fell 2. On Friday, there was more doing, and prices were better. Bombay and Oriental 1½ paid rose ½ each. In Water, New River rose 2. On Saturday, the Exchange was closed.

### THE REPORT OF THE PETROLEUM COMMITTEE.

#### SECOND NOTICE.

WE broke off the last notice of the Petroleum Report at the interesting point where the Committee pass from considering the transport, storage, and sale of petroleum to its use for illuminating purposes. The first thing to be dealt with under this head is the flashing-point of petroleum intended to be burnt in lamps. It is obvious that a number of considerations arise in connection with this aspect of the flash-point. We certainly cannot compliment the Committee upon the manner in which their report approaches this division of the inquiry. The matter is most awkwardly arranged, inasmuch as the report discusses the probable effects of "prohibiting by law the sale or use of petroleum below a certain high flash-point for illuminating purposes," before considering what the term flash-point really signifies in this connection. The effect of this mal-arrangement is most unfortunate, as lending colour to the case, sedulously set up by that section of the oil-trade interest which has a high-flashing oil to sell, that the flash-point is everything, and that nothing else—chemical composition, construction of the lamp, or what not—matters to the question of whether a mineral oil is a safe lamp oil or not. It will be helpful to place the real question upon a clearer, more logical basis than the rambling statement offered by the Committee.

Petroleum, then, is the name of a liquid composed of a variety of fluid hydrocarbons, which may be present in any sample in different proportions, and render it more suitable for use for some purposes than for others. All petroleum possesses the quality of volatility in the open air. It evaporates, as iron rusts, at different rates under different conditions. It is inflammable, and its vapour is also inflammable. And we know that when an inflammable substance becomes intermingled with air in certain proportions, it constitutes an explosive mixture. All petroleum being volatile—some samples more so, or rather more rapidly so at ordinary temperatures than others—it becomes a question of that universal science which is only systematized common sense to know how to distinguish the degrees of this quality, with regard to the consideration of public safety from



the realization of its undesirable potentialities of accidental ignition and explosion. How shall we agree upon what is a safe petroleum with reference to its degree or rate of volatility at ordinary temperatures? If a sample gives off its vapour so rapidly at temperatures which are attained by our atmosphere that the vapour will "flash," or ignite, at an open flame, under such conditions, it is evidently an article requiring careful handling. It means that if such a petroleum is exposed to such a temperature in any locality which is so enclosed that the vapour cannot freely escape as fast as it comes off, it is only a question of time for the atmosphere so confined to become explosive. The rate of evaporation being proportionate to the temperature, the lower the flashing-point the more dangerous the petroleum for keeping or using at ordinary atmospheric temperatures.

The flash-point has nothing to do with the composition of the oil, or anything besides its volatility at the stated temperature. When the value of this simple physical characteristic of the volatile petroleum was first recognized, it was decided that, since an atmospheric temperature of 100° Fahr. is never reached in this country, petroleum which did not evaporate so rapidly at this convenient figure on the thermometric scale that the vapour would ignite at an open flame, might be regarded as practically safe to store and handle. There was no word about its burning qualities in this classification. The law which formulated the flash-point was not concerned with the use to which the petroleum to which it applied might be put. All it said was that petroleum which flashed at the stated point was petroleum within the meaning of the Act. As time went on, and experience of the trade was gained, it became apparent that the method of testing the flash-point—by heating the petroleum to the required temperature in an open cup—was defective. An improved apparatus for testing was devised by the same expert—Sir Frederick Abel—who translated the original unreliable 100° "open" test into 73° "close" test. The alteration was solely a matter of the instrument; but what a potholer has been raised over it by interested advocacy working upon ignorance!

As the flash-point had nothing to do with the composition of the petroleum, neither had it any relation to the suitability of petroleum for burning in lamps. The utilization of mineral oil—in the first place, the so-called "paraffin oil"—for this purpose was independent of the flash-point. The problem was to make a lamp to burn the new kind of oil; and this problem was solved only too completely, for the market was eventually flooded with lamps, selling at a penny apiece, that would do it easily. From the commencement of this trade, however, it became apparent that mineral oil, by reason of its volatility, could never be ranked for safety with the old-fashioned vegetable and animal oils. Nothing was said in the trade about the flash-point as indicative of the dangerous quality of a burning oil, until the paraffin oils manufactured from shale were beaten in price by American kerosene. Then there was trouble; and the paraffin oil interest, seeking a weapon other than price to attack the foreign intruder, fastened upon the flash-point, which happened to be lower in the case of the latter commodity. How successful the *ruse* has been in enlisting a certain amount of fervid, if vague, public sentiment in its favour, is shown by very many evidences; but principally, for our present purpose, by the circumstance that the Petroleum Committee have agreed by the narrowest majority to recommend the raising of the dividing line between petroleum spirit and petroleum oil to the flash-point of 100° Abel close test.

It is easy to exaggerate the importance of this victory, such as it is. It does not advance the solution of the problem of rendering the oil burnt in mineral oil lamps safe, in the same sense as vegetable or animal oil is safe—that is, incapable of giving off an inflammable vapour, or of communicating fire without the aid of something analogous to a wick. Reverting to the reasons assigned for the adoption of the flash-point as an indication of the practical safety of mineral oil for transport, storage, and handling, it is to be remembered that the principle underlying the selection of the critical temperature was that the commodity could never be exposed to such a temperature by natural agency. It is clear, therefore, that if for the operation of natural agency the action of the incidental heat of combustion of a lamp is to be substituted as giving the temperature of equal safety in the use of the oil for burning, what is needed is to substitute the maximum temperature attainable by a burning lamp for that of the atmosphere in the previous case. But this logical conclusion is just what nobody was able to advise the Committee to accept. What flash-point would render a mineral lamp oil absolutely safe, as colza or sperm oil are safe? The somewhat startling reply is *infinity*.

If we use a suitable lamp, naphtha, benzoline, anything in the way of petroleum spirit down to pentane—which evaporates so quickly that drops poured out of a bottle in a man's hand never reach the floor—can be burnt as safely as the stuff used in "Lucigen" or Wells lights. In order to place the question of safety of the oil upon an intelligible basis, it is necessary to postulate the kind of lamp meant to be used to burn it. This was permitted to be understood by the Petroleum Committee. There is the excuse for this looseness of treatment of the question, that everybody knows what is meant by a petroleum lamp. Assuming this knowledge, the next question is as to the conditions necessary to be observed in using such lamps, so as to ensure a condition of absolute safety. Here the inquirer is

again brought face to face with the infinite. It seems to have been accepted implicitly by the Committee, upon the admissions of their witnesses, that to require the raising of the flash-point of mineral oil above the temperature existing at any time in the lamp reservoir was impracticable. Yet this admission yields the whole case for high-flashing oil, as a certain guarantee of safety, and falls back into the region of opinion on the question of degree.

The report contains ample proof of the emptiness of this question, treated as one of degree. Let it be clearly understood that petroleum can be had of any flash-point, from nothing up to 528°, or thereabouts; the latter being cylinder lubricating oil. Taking petroleum lamps as they are, Professor Dewar opines that if absolute safety is to be sought by way of the flash-point, this must not be lower than 212°. Lord Kelvin is less exacting; being of opinion that 120° would be a high enough flash-point. Mr. Spencer, of the London County Council, would like to see the flash-point at 120°; but, in view of the awkward fact that a sufficient supply of such a lamp oil could not be had, he would be content with 100°. Lastly, the Lamp and Stove Makers' Association fancied that accidents with lamps would be less frequent if the use of oil for domestic purposes at a lower flash-point than 100° were prohibited. Naturally, the Scottish contingent favoured a flash-point more convenient to themselves than to their trade rivals. The important consideration to be borne in mind with regard to this part of the case is that the presumed advantage of raising the flash-point from 73° to 100° (Abel close test) is purely a matter of opinion, as the supposed improvement of the oil is one of degree—and a small degree—as compared with the lowest named point of complete safety.

Now for the other side, which is concerned to prove "that the flash-point does not indicate the real safety of the oil; that safety depends on the chemical constituents of the oil; that in some high-flash oils the heating properties are so great as to send up the temperature very rapidly, and that they are consequently not safer than, if so safe as, low-flash oils which heat less quickly."

#### PERSONAL.

Mr. F. CHAMBERS, the Manager of the gas-works at Uckfield, has obtained a similar position at Dunbar, N.B.

Mr. Alexander Aitken having resigned the secretaryship of the Stranraer Gas Company, it has been conferred on Mr. W. G. BELFORD.

Mr. H. POHMER, an Assistant-Engineer on the works of the Imperial Continental Gas Association at Hanover, has been awarded the second prize of 5000 marks in the competition instituted by the authorities of the town of Königsberg for the plans of the new gas-works to be erected by them.

Mr. T. LANCASTER, the foreman at the Colne Gas-Works, has recently secured, out of 46 applications, a similar appointment at the Cambridge Gas-Works. Previous to commencing his new duties, the workmen subscribed for a beautiful timepiece, which was presented to him on Monday last week by the chief meter inspector, Mr. W. Boothman, who complimented him on the progress he had made in his profession during the past three years. Mr. Lancaster briefly thanked the men for their gift.

The eminent services of Colonel S. A. SADLER to Middlesbrough have been repeatedly recognized by the Corporation and the community, but never before in such a handsome and generous manner as on Tuesday last. The regard in which he is held was amply demonstrated when, although he had previously filled the office, he was chosen for the mayoralty during the Jubilee Year. The manner, however, in which Colonel and Mrs. Sadler performed the duties which crowded upon them in that exceptionally busy year, deserved more than ordinary praise; and a Committee was formed to consider the best course to adopt to fitly recognize their labours. It was decided that a portrait of Colonel Sadler should be painted by Mr. F. Bramley, A.R.A., and placed at the disposal of the former, and also that a magnificent tiara of diamonds should be presented to Mrs. Sadler. The decision of the Committee met with hearty approval; and the subscriptions which were sent in amounted to more than £750. The interesting function of presenting the gifts was performed, at the Town Hall on Tuesday, by Sir Lowthian Bell, in the presence of a large and distinguished company, whose enthusiasm must have been very gratifying to the subjects of their esteem. Colonel Sadler has resolved that the portrait shall become the property of the town; and it is to be hung in the Council Chamber.

**Waverley Association of Gas Managers.**—The 75th half-yearly meeting of this Association will be held at Duns next Thursday, under the presidency of Mr. J. M'Laren, the Manager of the Duns Gas-Works. We learn from the programme issued by the Hon. Secretary (Mr. W. B. M'Lusky) that the business will consist of the consideration of the report of the Committee on the efforts of the North British Association of Gas Managers for standardizing meter-unions, and an address by the President; and discussion will be invited on any subject affecting the gas industry. In the afternoon the members will dine together, and subsequently inspect the gas-works, which they will doubtless find improved since their visit to the town in April, 1890.



## OBITUARY.

## ARTHUR MARSHALL CHAMBERS.

It is with regret that we have to chronicle the death of Mr. Arthur Marshall Chambers, J.P., which occurred very suddenly at Scarborough at midnight on Sunday of last week. The deceased gentleman, who was in his 56th year, had been connected, from the time he reached his majority until his death, with the well-known firm of Messrs. Newton, Chambers, and Co., proprietors of the Thorncliffe Iron-Works and Collieries. Previous to 1881, when the limited Company was formed, he was a partner in the firm, and managed the several collieries carried on by it—a position in which he succeeded his father. Since 1881, he had been Managing-Director to Messrs. Newton, Chambers, and Co., Limited, so far as the collieries are concerned; Mr. George Dawson being the Managing-Director of the iron-works. His knowledge of all matters connected with the coal trade, local and general, was extraordinary, and warranted his selection to the important post of President of the Coal-owners' Federation. This position he held throughout the great strike of 1893; and it can be stated, without fear of gain-saying, that he justified the confidence placed in him by his colleagues, who, at the conclusion of the strike, presented him with a substantial cheque. Mr. Chambers had also occupied other prominent positions in the mining world. In 1890 and 1891, he was President of the Mining Association of Great Britain; and this year he was President of the Federated Institution of Mining Engineers. He also took an active interest in general local affairs, and in the question of technical education.

## JOHN HOPKINSON.

In the "JOURNAL" last week, we recorded briefly the death, as the result of an Alpine accident, of Dr. John Hopkinson, F.R.S., the eminent electrician. We learn from accounts which have since come to hand that the unfortunate gentleman, who was making a tour through the Zermatt district, started on the morning of the 27th ult., accompanied by a son and two daughters, from Arolla to ascend the Petite Dent de Veisivi, one of the striking points dominating Evolena, in the Val d'Hérens, running south from the Rhône Valley at Sion. Dr. Hopkinson was a practised mountaineer; and the party went without guides. As they did not return at the time they were expected, Mrs. Hopkinson and her friends became anxious. After dark two search parties were despatched, and a third at four o'clock on the morning of the 28th. At daybreak, Dr. Hopkinson and his children were discovered roped together and all dead on a moraine at the foot of the highest cliffs.

Dr. Hopkinson was the eldest son of Alderman Hopkinson, an ex-Mayor of Manchester. He received his early education at the Lindow Grove School and Queenwood College. In his sixteenth year he went to Owens College, Manchester, and afterwards to Trinity College, Cambridge, where he passed as Senior Wrangler and first Smith's Prizeman in 1871; being appointed a fellow and tutor of his college. While at Cambridge, he obtained the degree of Doctor of Science of the London University. He paid special attention to lighthouse machinery, in which he introduced many improvements, especially the "group-flashing" apparatus; and he was for about six years Engineer to Messrs. Chance Bros., of Birmingham. He left their service to establish himself in Westminster as a consultant, and took up electrical engineering. His principal achievement in this sphere of work was the electric light installation in Manchester, where he adopted for the first time the "five-wire" system, which was a development of the "three-wire" system of which he was the inventor. His work in connection with dynamos has been very important; and in a paper read before the Institution of Mechanical Engineers in 1879, he first introduced the methods of graphically depicting certain phenomena by means of characteristic curves, the employment of which has become as common and as useful in dynamo work as indicator curves are in engine work. Early in 1883 he made improvements on the Edison dynamo, which may be said to be the parent of the great advances which recent years have developed. In the same year he was appointed to lecture at the Institution of Civil Engineers; and on that occasion he developed certain points in the theory of alternate currents which were subsequently carried further in a paper read before the Society of Telegraph Engineers. During the next three years he worked out the theory of the dynamo machine on a thoroughly satisfactory basis. He was elected a member of the Royal Society in 1878. During 1890 one of the Society's medals was awarded to him; and in the same year he was elected President of the Institution of Electrical Engineers—a position which he held during a subsequent year. He was a member of the Senate of the London University, a member of the Council of the Institution of Mechanical Engineers, and Professor of Electrical Engineering at King's College, London.

Mr. GEORGE FURLEY, J.P., who was for many years Chairman of the Canterbury Gas and Water Company, died last Saturday week, in his 81st year.

The death of Mr. CHARLES PARSONS, of Burnley, occurred last Thursday. He was a respected and active member of the Corporation; and last year he succeeded to the chairmanship of the Gas Committee on the death of Alderman Collinge. He was only in his 38th year.

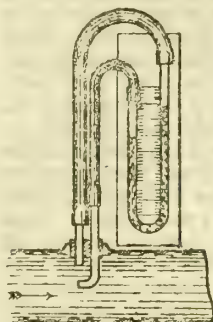
## NOTES.

## Repairing Reservoirs by Cemented Hoop Iron.

A recent number of the "Engineer" contained particulars of the application of the iron and cement system of construction to the repair of a brick reservoir at Orleans. The reservoir had a length of 173 feet, a width of 105 feet, and a depth of 18 feet, and held 6500 tons of water. It was built with lime mortar mixed with a certain proportion of furnace slag, and lined with a layer of lime, sand, and slag,  $\frac{1}{2}$  inch in thickness, composed of two parts of sand and one of slag. For some time after the completion of the work, which was very carefully and leisurely executed, the reservoir was left dry, and showed no signs of "threads," cracks, or fissures of any description. No sooner, however, was it filled than it commenced to leak with great and dangerous rapidity. All reservoirs "weep" to some extent after filling, even when built of the best portland cement mortar; but the leakage is only of a temporary character, and, as a rule, ultimately ceases without interference. In the present instance, the leaks multiplied to so great an extent, both in number and intensity—something like 16,000 gallons passing out every night—that there was but one course to adopt, and that was to run the water off, and thoroughly re-line the reservoir. It was evident that the absence of portland cement in the composition of the coating or lining layer was the cause of its failing to be water-tight. The mixture of ordinary lime, sand, and furnace slag or dross possesses no setting properties when exposed to the action of water; and any attempt to renew the lining with the same materials would have been a wasteful expenditure as well as a failure. It was therefore determined to re-coat the interior of the reservoir with a lining composed of an iron network embedded in a layer  $1\frac{1}{2}$  inches thick of portland cement. Previous instances of the success of this process fully warranted the adoption of it for the case quoted. The result was most satisfactory.

## Measuring the Rate of Flow of Air Currents.

Some experiments intended to ascertain the amount of atmospheric resistance to a moving train were carried out at the Purdue University, U.S.A. For the purpose of the experiments, model trains were exposed to strong currents of air in a wooden conduit. The velocity of the air was indicated by the instrument shown in the accompanying illustration. It is a simple



form of Pitot tube, consisting of a water-gauge connected with two tubes. The opening of one tube faces the current, while that of the other is normal to it. It will be seen that as both sides of the gauge-glass are in connection with the flowing stream, the difference of the height of the liquid columns cannot be due to the pressure within the pipe, but must be a result of the motion of the stream. The relation between the displacement of the gauge and the velocity of the flowing stream is expressed by the formula  $v^2 = 2gh$ ; where  $v$  is the velocity of the stream in feet per second, and  $h$  is the difference in height of the gauge columns in feet, measured in terms of a substance having the same density with the one whose velocity is to be determined. The inner leg of this arrangement was made adjustable to different lengths, so as to enable the velocity of the stream at various points of the conduit to be explored. It was found by this means that though considerable unevenness of flow existed at the initial end of the conduit, the eddies disappeared at a distance of 35 feet from the inlet (from the Sturtevant blower), and from this point onward the flow followed lines which were approximately straight. In the centre of the conduit there was a comparatively large vein, all portions of which flowed with exactly the same velocity. The experiment was carried on at velocities from 36 feet per second, corresponding to a pressure of 1.6 lbs. per square foot, up to 149 feet per second, corresponding to a pressure of 26 lbs. per square foot.

## The Inflammability of Gaseous Mixtures.

MM. Le Chatelier and Boudouard have communicated to the "Comptes Rendus" the results of a systematic investigation they have made to determine the inflammability of gaseous mixtures. They found on beginning their work that previous inquiries in the same direction—unfortunately too few—had not resulted in showing any precise relationships between the different phenomena which come into play. In order to have a complete theory of this action, it is necessary to take into account not only the combustible gases, but also the combustible vapours, which comprise a large number of compounds met with in organic chemistry. The experimenters operated always with the same known quantity of the explosive mixture—viz., 2 litres; and the experiments were repeated until they obtained two separate weights, varying by at least 10 per cent., representing respectively the limits at which inflammability did not exist and at which it commenced. They took the mean of these two numbers as representing the limit of inflammability. In the result, putting aside hydrogen and bisulphide of carbon, the



inflammability of which is very great, it came out that for all the other bodies examined the heat of combustion of the inflammable mixture, taken for one and the same molecular volume, is comprised between 9 and 13 calories. For most of them it falls between 12 and 13 calories—numbers which do not vary more than the possible errors of experiment. The authors consequently think themselves justified in stating in a general manner that the limit of inflammability of the greater part of the carbon compounds is the same, and corresponds with a heat of combustion of about 12.5 calories. It is also found that the amount of oxygen consumed in the combustion of the compounds varies very slightly from 11.5 of the total volume of the mixture. This seems to show that one carbon compound is practically as good as another as a heat-source under these conditions. Coal gas, mixed with air in the proportion of 8.1 per cent. by volume, took about 9 volumes of oxygen for its complete combustion, and developed 10 calories for the combustion of the molecular volume = 23.5 litres at 15°.

## TECHNICAL RECORD.

### PACIFIC COAST GAS ASSOCIATION.

The Annual Meeting at San Francisco.

(Continued from p. 482.)

Mr. E. C. Jones, of San Francisco, read a paper on "An Efficient Oil-Heater." Acknowledging the necessity for pre-heating in connection with the use of petroleum for enriching, he pointed out that crude petroleum was a mixture of many different oils, some of which vaporized at low temperatures, while others stood a very high temperature. Peruvian petroleum did not give off any vapour under 302° Fahr., while that from California emitted 40 per cent. of its volume under 302° Fahr.; and a temperature barely sufficient to vaporize the one, might secure to a great extent the destructive distillation of the other. So the action of the superheater should approach that of complete fractional distillation; the heat being applied gradually. Finding that none of the oil-heating devices on the market were entirely satisfactory, the author designed an apparatus consisting of four 8-inch iron pipes, each nearly 20 feet long, having a number of 2-inch boiler-tubes passing through from end to end. Steam is admitted into the 8-inch tubes; and the oil to be heated is caused to circulate through the 2-inch tubes. A cast-iron head is secured to each end of the 8-inch tubes; and special means are necessary to ensure steam-tight joints. Copper rings of I shape section are used, with a cement composed of black oxide of manganese and shellac, mixed to a proper consistency with alcohol. The exterior of the tubes is coated with non-conducting composition; and being set perpendicularly, very little floor-space is needed. The apparatus as described is sufficient to serve two 12-foot generators, making a million cubic feet of gas per 24 hours; and it can be easily enlarged to any extent. Working with a steam pressure of 100 lbs., equivalent to a temperature of 328° Fahr., the petroleum is delivered at the outlet at a temperature of 275° Fahr. The author also thought it would be advantageous to place the heater horizontally, so that the steam could be admitted at the bottom and the oil at the top, as a more gradual heating would thus be secured; and he had lately increased the number of 2-inch tubes to seven, which was an improvement.

Mr. Guldin opened the discussion by remarking that he understood the author had largely increased the surface of the oil-heaters, since their first introduction, and further that the arrangement described was intended to deal with oils that did not distil at 328° Fahr. In his experience, it was not necessary to actually distil or vaporize the oil in the heater. Some of his best results were obtained with a temperature not higher than that of exhaust steam; and he depended more on mechanical distribution of the oil in the liquid form, than on actually vaporizing. He gathered that the author actually vaporized a large percentage of the oil; and in this respect his own experience differed. He found very little advantage from using live steam instead of exhaust steam; and though he delivered the petroleum into the carburetter, whereas the author admitted it to the generator, he did not think that made much difference. The author had increased the number of tubes from four to seven; and he would like some information as to the advantage thus gained. He thought the four tubes were quite sufficient. He would be glad to know if any economy of oil was secured by using high pressure instead of exhaust steam. He also criticized the structure of the apparatus, and thought better results would be obtained by reversing the action, and causing the steam to circulate through the small tubes; the petroleum to be heated being admitted to the outer case. A larger store or reserve of heated oil would thus be continuously available, and the heat would be utilized to better advantage. He also asked if the partial vaporization did not cause irregularity—first a burst of vapour, and then of liquid—in the delivery. His desire was to show that the main object was to get up a pressure that would aid the effective mechanical spraying of the liquid into the generator, rather than actually to vaporize it. It appeared that, in the author's apparatus, the steam was returned direct to the

boiler, without traps or other apparatus; and this was a great advantage.

Mr. Adams said he had experienced much difficulty from the irregular delivery noted by the last speaker—first vapour, then liquid. At first he was able to get a temperature of 300° at the delivery; but lately he could not obtain over 140°. He did not know the cause, but thought there must be a deposit of carbon somewhere in the apparatus. He used a mixture of Los Angeles with other oils. He had employed steam-heaters, and also those actuated by the waste gases. The President had used heaters on the principle last named; but they gave a great deal of trouble on account of irregular heating. He therefore went back to steam heating, and was much in favour of a steam-heater that would maintain a temperature just under 300°. The Secretary said he had used a steam-heater, both with live and exhaust steam; but he thought the apparatus proposed by the author was a great improvement, and would give it a trial.

Mr. Jones, in replying, said that the 12-foot generator required about 90 gallons of oil for a ten minutes run. The four tubes first used only held 60 gallons; and he introduced seven tubes to secure a storage capacity equal to one run's consumption, so that the whole quantity had at least ten minutes in the heater before it was injected. There was no reason why exhaust steam should not be used; but there was no advantage in it. In the arrangement described, the heater was really a part of the boiler, and was so well protected by jacketing with non-conducting material that there was no loss of heat. He considered that the seven tubes gave better results as regarded economy of oil than four. There was 40 lbs. pressure on the oil at the injector, which was preferable to 20 lbs.; and he had not experienced the irregular delivery that had been mentioned. The Los Angeles oil alone would not cause trouble, as it did not begin to vaporize under 480° Fahr.; but it might give deposits of carbon, rendering periodical cleaning out a necessity.

Mr. C. M. Converse, of San Francisco, read a paper on "Gas Coke for Generator Fuel." He first pointed out that there were different qualities of coke, and that the hard clean coke from Youghiogheny coal was very different from that yielded by a mixture of South Prairie, Vancouver, and East Greta. After using coke a few days, the generator became choked with clinker, and had to be let down, as it could not be kept clear. Mixing anthracite with the coke was tried; but unless about one-third was used, there was no advantage over "all coke," beyond that they were able to use up the whole of the slack, which could not be done when using anthracite alone, and the screenings sometimes represented 50 per cent. of the bulk. Then shorter blasts were tried. The rule was to blow up the anthracite for ten minutes under 9 inches pressure. But this was too much for coke; and with six minutes blast, and nine minutes run, cleaning the fire after every six or eight runs, they got on satisfactorily for several weeks. He passed on to mention the reasons which confined them, in California, to the use of foreign anthracites or coke for the generators.

Mr. Rice said that, like the author, he was reduced to the use of inferior fuels. But he had obtained a coke from Colorado which mixed well with them; and by using half and half he was able to get along, and do much better than with coal alone. Mr. Gregory had with advantage used coke in conjunction with Welsh anthracite. Mr. Britton started using coke in his generators with one-tenth at first, and had gradually got up to one-half without trouble or disadvantage. Of course, all depended on the market price of coke; and if anyone could obtain a price for it that came near that of anthracite, they would not be bothered with it in the generators. He strongly recommended New Mexican coal, which, taken all round, was as cheap as Welsh anthracite. Mr. Crockett said one point had not been brought out very clearly by the author. He was under contract for 17,000 to 18,000 tons of Welsh anthracite, not a ton of which had been delivered. He also had a contract for 6000 barrels of oil per month, which was delivered, and had to be used or stored. Under these circumstances, it was absolutely necessary to get a substitute for the anthracite; and so they fell back on coke. This illustrated the difficulties of working in places so far away from the supply of raw materials. The President had tried anthracite and coke mixed, but found that, by the time the anthracite was at a proper temperature, the coke was burnt to ashes. He had employed coke by itself; and the only difficulty was the short runs—five minutes blowing and six minutes working—which kept the men jumping, and increased the fuel account. Perhaps one reason for this was that his apparatus did not take so deep a fire as some. There was, of course, a great difference between coke that contained 3 per cent. of ash, as compared with other kinds that went up to 16 per cent. Mr. Guldin said that, in the East, they obtained quite as good results with coke as with anthracite. The treatment of coke in the generator should, of course, be very different from that of anthracite, which was much heavier. There was a great difference in the weight of a charge of anthracite, and that of a charge of coke. He had employed coke from Illinois and Iowa coal, which was not much better than the local coals. In estimating the quantity used, the boiler fuel should always be kept separate from the generator fuel, as the consumption of steam was an uncertain quantity. Mr. Jones said that the ash in a pound of coke represented that in 1½ lbs. of coal; and therefore, he could not follow the statement that it was possible to do as well with coke as



with coal. Mr. Adams said that, notwithstanding the shorter runs, the make per 24 hours with coke would not be more than 80 per cent. of that possible with anthracite.

Mr. Converse, in replying, said he used about 45 lbs. of coke per 1000 cubic feet of gas made, including boiler fuel, which was not booked separately. He did not know about the make per 24 hours; but he produced over 21,000 cubic feet per run with anthracite, and only 12,500 cubic feet per run with coke.

DR. STRACHE'S IMPROVEMENTS IN LIGHTING BY WATER GAS.

(Concluded from p. 483.)

The incandescent burners for lighting by means of water gas have lately been very much improved. Five sizes are made; but those which give values of 25 and 120 candles are the most popular. The consumption of gas varies from 42 to 60 cubic feet per 1000 candle-hours.

Acetylene has been tried as a carburetting agent for water gas. It is true that two great defects of acetylene—viz., its liability to explode readily and the smokiness of its flame—were greatly modified by the addition of water gas; but the high price of acetylene, and the large proportion of phosphuretted hydrogen in it, restrained its use. The absolute smokelessness of the water-gas flame, the cheapness of the light, and the complete harmlessness of the products of combustion, were no longer pre-

served when acetylene was added to the gas. With regard to the contamination of the air by phosphoric acid derived from the phosphuretted hydrogen of the acetylene, the removal of that impurity from the gas presents a problem of great difficulty. The cost of lighting is immensely increased when acetylene is added to the water gas. Thus 1 cubic foot of water gas yields about 20 candle-hours; and 1 cubic foot of acetylene about 42 candle-hours; or the acetylene affords only about double as much light as the water gas. With carbide at £25 per ton, the cost of raw material for the production of 1000 cubic feet of acetylene is about fifty times that of the raw material for producing the same quantity of water gas. Light from acetylene consequently costs about twenty-five times as much as light from water gas. Mixtures of the two gases give light at intermediate cost; but it is to be observed that at least 25 per cent. of acetylene is required to render a water-gas flame luminous to an extent which is serviceable. Carburetting water gas with benzol in the cold can be pursued with greater advantage than can enrichment of water gas with acetylene.

The carburetting of water gas by means of mineral oil cracked by heat forms a subject quite distinct from lighting by uncarburetted water gas. Evidently, however, the plant for the production of the latter which has been already described would, with slight adaptations, serve for the manufacture of carburetted water gas. The uncarburetted gas, however, has the advantage of giving light much more cheaply.

The following table gives some interesting comparisons of the figures relating to a light of 1000 candle-hours produced by

|                        | ASSUMED VALUES PER 1000 CUBIC FEET OF GAS. |                     |                                     |                                | Consumption per 1000 Candle Hours. | 1000 CANDLE-HOURS. |                 |                                       |                                |
|------------------------|--------------------------------------------|---------------------|-------------------------------------|--------------------------------|------------------------------------|--------------------|-----------------|---------------------------------------|--------------------------------|
|                        | Cost.                                      | Calories Developed. | Cubic Feet of Carbonic Acid Formed. | Cubic Feet of Oxygen Consumed. |                                    | Cost.              | Heat Developed. | Cubic Feet of Carbonic Acid Produced. | Cubic Feet of Oxygen Consumed. |
| Water gas—             | s. d.                                      |                     |                                     |                                | Cubic Feet.                        | Pence.             | Calories.       |                                       |                                |
| Incandescent light . . | 2 0                                        | 70,787              | 390                                 | 470                            | 52'40                              | 1'25               | 3,710           | 20'4                                  | 24'6                           |
| Coal gas—              |                                            |                     |                                     |                                |                                    |                    |                 |                                       |                                |
| Open flame . . . . .   | 4 10                                       | 141,575             | 530                                 | 1220                           | 366'50                             | 21'26              | 51,880          | 194'2                                 | 447'1                          |
| Incandescent light . . | "                                          | "                   | "                                   | "                              | 84'50                              | 4'90               | 11,970          | 44'8                                  | 103'1                          |
| Acetylene . . . . .    | 49 6                                       | 339,780             | 2000                                | 2500                           | 28'20                              | 16'75              | 9,580           | 56'4                                  | 70'5                           |
| Electric light—        | Per Kilo watt.                             |                     |                                     |                                | Kilowatts.                         |                    |                 |                                       |                                |
| Incandescent . . . . . | 0 7'2                                      | 830                 | ..                                  | ..                             | 4'07                               | 29'30              | 3,380           | ..                                    | ..                             |
| Arc . . . . .          | "                                          | "                   | ..                                  | ..                             | 1'14                               | 8'21               | 946             | ..                                    | ..                             |

various means. [The tables given by Dr. Strache refer to 1000 Hefner-unit-hours. We have adopted the generally accepted ratio, 1 Hefner unit = 0.877 English standard candle, for the compilation of the annexed table from those given by him.—ED. J. G. L.]

The table shows that light from uncarburetted water gas is cheaper than that from any other source. Among other advantages of the light may be mentioned the following: (1) Its beautifully pure white colour, and its brilliancy; (2) the small amount of heat produced per unit of light developed; (3) the small amounts of carbonic acid produced and of oxygen consumed, and consequently the trifling extent of the vitiation of the atmosphere; (4) the absolute freedom of the flame from smoke and smell; (5) the gas is not mixed with air before it issues from the opening of the burner, and therefore the flame cannot strike back, as in bunsen burners; (6) the durability of the mantles, which are tougher and harder than those commonly used for coal gas; (7) the absence of the need for chimneys; and (8) the little tendency of water gas towards explosion. A mixture of air and gas is inflammable when it contains 3 per cent. of acetylene, or 6 per cent. of coal gas, or 11 per cent. of water gas.

Against these advantages can be brought only one disadvantage—viz., the higher toxicity of water gas. This may be overcome by imparting a strong smell to the gas, so that escapes of unconsumed gas to the air are readily detected. In fact, when water gas was introduced in the General Hospital at Vienna, many unsuspected leaks in the services, which had previously been used for coal gas, were detected, owing to the powerful and penetrating smell which had been imparted to the water gas. The majority of the accidents connected with the use of gas arise, however, from explosions, and not from poisoning; and the risk of explosion with water gas is at a minimum. There must be present in the air of a room 11 per cent. of water gas before an explosion can occur. If, therefore, a room of 3500 cubic feet capacity be assumed to be perfectly air-tight, so that no trans-fusion takes place, about 388 cubic feet of water gas would have to escape into it before the explosive limit would be reached. A burner of 100-candle power would deliver this quantity of gas to the room in 73 hours.

For industrial purposes, water gas has many very generally acknowledged advantages. It has been found excellent while in use in the laboratory of the Pathological Institute of the General Hospital at Vienna. Owing to the fact that water gas gives a smokeless flame in burners which are not of the bunsen type, it is easily possible to obtain a flame of any shape or size.

YEADON'S WASHER-SCRUBBER.

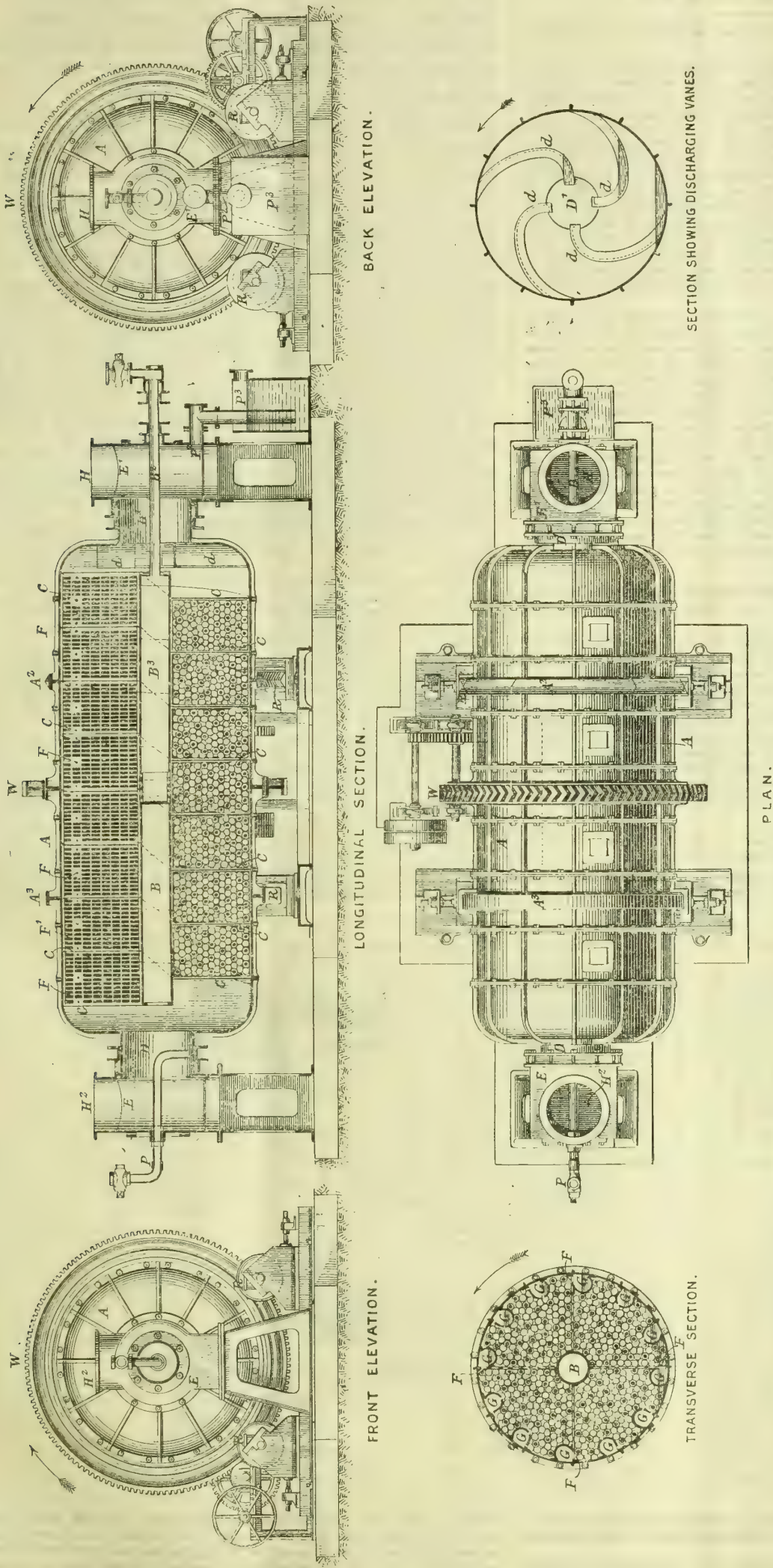
In the "JOURNAL" for July 19 (*ante*, p. 152) an illustrated description was given of a mechanical purifying-machine invented by Messrs. Yeadon, Son, and Co., of Leeds. We have now the opportunity of similarly describing a washer-scrubber which has been invented and is being brought out by the same firm. It will be seen, by a comparison of the two inventions, that the same general principle has been utilized in both—viz., a revolving cylinder fitted with an internal central tube and spiral screw, with modifications in detail to suit the different purposes for which they are separately intended.

It will be seen from the illustration that inside the revolving cylinder A, and running nearly its entire length, is a central tube B, closed at one or both ends. Between the outside circumference of this tube and the internal surface of the cylinder there is fixed the continuous spiral screw C C, which also runs nearly the whole length; both edges of this screw being fitted with angle-iron for securely fixing it to the cylinder, and made perfectly gas-tight. The tube is thus carried by the cylinder to which it is attached by the spiral screw; the whole revolving together. The ends of the cylinder are rounded off to a smaller diameter, as at D D<sup>1</sup>, and made suitable for revolving in stationary mouthpieces E E<sup>1</sup>, at each end. These mouthpieces are fitted with adjustable glands to keep the ends gas-tight; E<sup>1</sup> being for the inlet, and E for the outlet of the gas. The edges of the spiral screw being gas-tight, the gas must follow the space formed by the spiral screw. In different parts of this spiral screw, and at suitable distances, are fixed any number of perforated division-plates F, through which the gas has to pass. These plates thus divide the area contained in the screw into a series of chambers, each of which is filled in with wood balls; the plates preventing them working through the cylinder.

In any part of the mouthpiece E a pipe P is inserted for the inlet of the water into the cylinder. At the bottom of the mouthpiece E<sup>1</sup> is fixed a sealed outlet-pipe P<sup>2</sup>, ending in the cistern P<sup>3</sup> for the escape of the ammoniacal liquor or foul water after it has passed through the cylinder. The cylinder end D<sup>1</sup> is fitted with spiral or coil pipes d, by means of which the ammoniacal liquor is raised from the bottom of the cylinder in revolving, and delivered automatically through the small end and the sealed pipe P<sup>2</sup>.

At the back of each of the perforated division-plates, and close to the internal surface of the cylinder, is fixed a bucket G for raising the water lying at the bottom of the cylinder, and pouring it over the wood balls, so as to keep their surfaces





constantly wet and dripping, carrying the water forward with the next division of the screw. Other auxiliary buckets, as at G<sup>1</sup>, perforated or solid, are fixed to the internal surface of the cylinder, to pour the water on to the balls; the number, size, and perforation of these buckets being adjusted to keep the balls constantly wet, and to carry the water continuously forward through the spiral screw.

On the outside of the cylinder there are bearing-rings A<sup>2</sup> and A<sup>3</sup>, turned so as to revolve truly on the bearing-rollers R underneath. One of these rings, as at A<sup>2</sup>, is made of  $\Lambda$  shape, with the bearing-rollers to suit, to prevent the cylinder working endwise. There is also fixed on the circumference of the cylinder a toothed wheel W, driven by any suitable gearing, for communicating the revolving motion.

The pure water is admitted through the pipe P, and, after going through the cylinder, escapes by the sealed outlet-pipe P<sup>2</sup>. The gas entering at H meets the water, and, after passing through the cylinder, escapes at the outlet-pipe H<sup>2</sup>. If found advisable, an inlet-pipe connection can be arranged to the centre or any other part of the central tube, as at B<sup>2</sup> and B<sup>3</sup>, from any outside cistern, by means of which ammoniacal or other liquor can be admitted there into the screw space to assist in the washing of the gas.

In some other rotating washers, a large area of washing space is lost in consequence of nearly one-half of each drum being always immersed in the water, in addition to the loss of space outside and between the drums themselves. By the use of the Yeadon washer, the patentees claim that, with the exception of

the area occupied by the small central tube, the whole of the internal cubic area of the cylinder is utilized for the purpose of the gas coming in contact with the wet surfaces of the balls, and passing freely through—thus requiring proportionately much less length and diameter than with other rotating washers; and that, in addition, by the gas flowing regularly and continuously through the space formed by the spiral screw, it is more evenly diffused and brought into contact with the wet surfaces of the balls. They also claim that, by dispensing with the ordinary internal shaft, complicated drums, and other frictional surfaces, the washer is simpler, less liable to get out of order, more easily repaired, and requires less motive power; thus securing greater efficiency, with a considerable saving in first cost, motive power, and repairs.



## REGISTER OF PATENTS.

**Treating Oxide of Iron.**—Mooney, F. M., of Dublin. No. 19,590; Aug. 25, 1897.

The patentee claims as his invention: Treating the residue from the burning of spent oxide by saturating the residue with water, removing and neutralizing any free acid that may exist in the residue when moistened, and mixing therewith "suitable fibrous matter," whereby the residue is rendered available for re-use. He says he has found that this result is arrived at much more expeditiously, and with greater certainty, by causing the residue from the burning of the spent oxide to be drawn from the kilns in the heated state, and while still hot to be immersed in water, and allowed to settle down. The excess of supernatant liquor or water is then drawn or run off; and the residue, when sufficiently drained or dried, is intimately mixed through a disintegrator, or by other suitable means, with some fibrous or light organic matter—such as peat-mould or sawdust, or some cheap or waste material, "in such proportion as may be required to obtain the proper degree of openness or porosity necessary to allow of the free passage of the gases to be purified through the mixture in the usual way."

For the efficient absorption of sulphuretted hydrogen by hydrated oxide of iron, the patentee points out that it is necessary for the oxide to be thoroughly saturated or permeated with water, and practically clear of free mineral acid. These two requirements are said to be cheaply and expeditiously satisfied by the method above described; for "when the burnt oxide is drawn from the kilns or burners and immersed while hot in water, in the cooling of the hot residue that immediately ensues, the water is drawn or absorbed into practically all parts of the particles of the oxide of iron that constitutes the residue, and the excess or supernatant water that is drawn or run off as described will be found to contain a certain amount of free acid that has been washed from the burnt residue. This free acid, if not removed or neutralized, would interfere to some extent with the subsequent absorption of the sulphuretted hydrogen in the usual way; and if any such free acid remain in the residue after all the excess water has been drained off, it may, if necessary, be neutralized by sprinkling with weak alkaline liquid."

**Increasing the Light of an Argand Burner.**—Hawes, M. H., and Farrington, R., of Shoe Lane, E.C., and Hand, W. H., of Richmond. No. 29,304; Dec. 10, 1897.

By this invention the illuminating power of any flame—gas or oil—of annular cross section is increased by placing within the flame-ring a central core-body or plug of refractory material in close proximity to, but not touching the flame; provision being made for access of air to both the outside and inside of the circular wall of flame. The material of which this core is composed is preferably a mixture of 75 parts (by weight) of pipe clay, 5 parts of asbestos, 10 parts of oxide of magnesium, 5 parts of calcium hydrate, and 5 parts of zirconium. The patentees are careful to point out that the refractory body is not intended to be an incandescent body in the ordinary meaning of the term. The flame does not impinge upon it, and is intended not to touch it at all.

**Prepayment Gas-Meters.**—Sutherland, A. G., and Wright, G. F. & G. E., of Birmingham. No. 2004; Jan. 25, 1898.

This prepayment mechanism for gas-meters is of the kind wherein a sleeve sliding upon, but rotating with, a spindle that is actuated by the

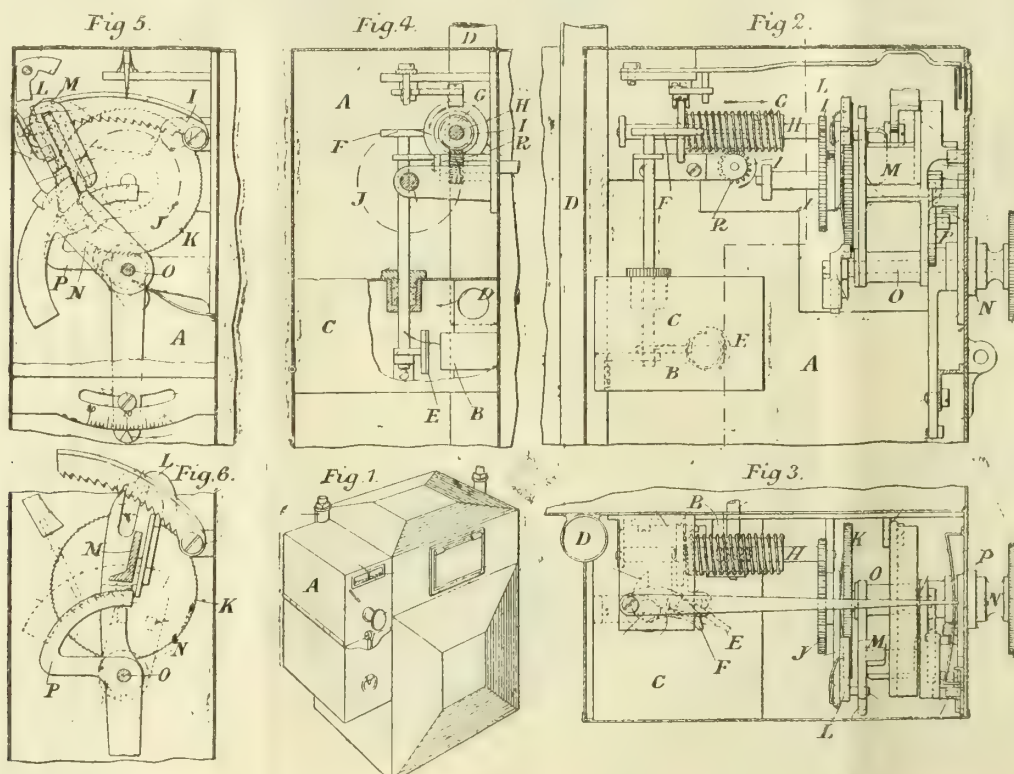
coin, has an external screw-thread, into which takes a toothed pinion rotated by the mechanism, and which acts as a screw nut to the threaded sleeve, causing it to be screwed forward on the rotation of its spindle by the coin-actuated mechanism, and thereby to effect the opening of a gas-admission valve by means of intermediate gear; while on the passage of gas through the meter, the consequent rotation of the pinion effects the moving backward of the threaded sleeve, and the closing of the admission-valve.

Fig. 1 gives a perspective view of a meter with the mechanism attached. Fig. 2 shows an enlarged vertical longitudinal section through the prepayment mechanism; fig. 3, a sectional plan; fig. 4, a vertical section on the line X X; fig. 5, an end view with the coin-cradle in position for receiving a coin; and fig. 6, the same view with the cradle moved into the forward position for delivering the coin.

The gas is supplied to the meter by the pipe D, and passes through a closed chamber C within the box A, and issues from the chamber through the pipe B, provided with a valve E which, when closed, stops the supply of gas. The valve is carried by an arm projecting from a spindle, the partial rotation of which in one direction or the other opens or closes it. The spindle carries on its upper end an arm or lever F, having a projection against which can bear a flange on the end of a sleeve G, which has an external screw-thread, and is mounted upon a spindle H, so as to be capable of sliding longitudinally thereon, but caused by a feather-and-groove (or other suitable means) to rotate therewith. The spindle carries a pinion I gearing with a toothed wheel J fixed on another spindle, upon which is also fixed a second toothed wheel K. Engaged with this wheel is a pawl L mounted on an arm, that can rock freely, and having a stud projecting into a slot of the coin-cradle M, which can rock upon a fixed axis O. This coin-cradle is adapted to receive a coin when in the position shown in fig. 5; being then opposite a slit in the box A.

At the right-hand side of the coin-cradle is a quadrant arm P, also mounted loose on the axis O, having serrations on its top edge and a laterally projecting stop at one end, and having a downwardly extended tail-piece with an index pointing on an arc scale, which indicates the number of unit volumes of gas to be supplied for a penny or any other coin. As this quantity will vary according to the price of gas, the tail-piece, and consequently the quadrant arm P, can be adjusted in position relatively to the scale, and secured in such adjusted position by means of a screw passing through a slot in the bar S carrying a scale. By this adjustment, the stop of the arm P is brought nearer to, or farther from, the extreme left-hand position of the coin-cradle shown at fig. 5; and thus in varying the extent of stroke of the coin-cradle, a variation in the quantity of gas supplied for the value of a coin is also effected.

On the same axis as the coin-cradle is also mounted loose an arm N, fitting closely against the side of the cradle, and connected to an external knob or button by a boss passing through the side of the casing, so that by turning the knob the arm can be rocked backwards and forwards on the axis O. The arm N also has a stud, which corresponds in position with notches formed in the contiguous side of the cradle M, so that if, when it is rocked by the button, there is no coin in the cradle, the stud will pass backwards and forwards through the notches without actuating the cradle, and therefore without moving the admission-valve E. If, however, a coin is introduced into the cradle, so as to occupy the position shown in dotted lines in fig. 2, while the arm N is in the position shown in fig. 5, then on turning the arm to the right the stud will, after passing through the left-hand notch, bear against the portion of the coin which projects between the two notches; and in pressing the coin against the front side of the cradle, it will push the latter forward on its axis O. By this motion of the cradle, the arm with the pawl L will also be turned forward on



its axis; and in effecting a corresponding partial rotation of the wheels K and J it will also, through the wheel I, rotate a spindle H and a threaded sleeve G.

In gear with the underside of the threaded sleeve G is a pinion R on a spindle, which passes through the meter casing to the meter mechanism, and is connected with it so as to be rotated in the direction of the arrow 1

in fig. 2 when gas is passing through the meter. If now, while the pinion R is either stationary or is being slowly rotated, the sleeve G is rotated in the direction of the arrow in fig. 4 by the rocking motion of the coin-cradle, the sleeve will be advanced a certain distance in the direction of the arrow shown in fig. 2, by working on the teeth of the pinion R, as in a nut.



**Manufacture of Water Gas.**—Coyne, J., of Pittsburg, U.S.A. No. 7592; March 29, 1898.

In the words of the patentee, this is "an improvement in the art of manufacturing gas." It consists in "passing air upwards through an incandescent body of carbonaceous material and a superincumbent charge of fresh fuel ignited from the incandescent body and hot gases passing therethrough, and then commingling the gases so produced with steam or steam and oil, and passing such commingled gases and steam or steam and oil through an incandescent body of carbonaceous material in such manner that the gases will be subjected to a gradually reduced heat." The details are not set forth in the specification apart from a series of eight sheets of detail drawings.

**Gas Lamps and Burners.**—Loeser, I., and Lecomte, A., of Paris. No. 10,008; May 2, 1898.

This is another of the double-chimney form of argand burner designed for use with or without an incandescent mantle. Just what difference exists between this burner and many other similar burners introduced of late years, it is difficult to discover from the specification, which has evidently been carefully prepared in Paris and sent to England through an agent in Brussels. The result is a curious mixture of words, a fair sample of which appears in the three claims to the invention, which are given in these words: "We declare that what we claim is: 1. The principle of the suspension and the centring of the inner chimney of a heat-recuperating apparatus, the supporting point being taken on the burner itself or on a part screwed thereon, or on the glass tube or outer chimney, being but slightly heated, for the purpose to prevent the softening and the deformation of the inner glass-chimney; the centring and supporting of the inner chimney being obtained by a recuperator, punched circles, claws, these parts serving at the same time to support the shade of the lamp, or still further by the outer glass-chimney itself. 2. A supporting-guide chimney, operating as a recuperator and a peculiar burner-cap or crown, to help the heating of the air and avoiding the action of the air-currents. 3. The application of the principle of suspending and centring the chimney to all kinds of burners with or without incandescent mantle, or of gas or oil lamps.

#### APPLICATIONS FOR LETTERS PATENT.

- 17,997.—MILLER, C. A. & F. J., "Acetylene gas-lamps." Aug. 22.
- 18,063.—GUSTAFSON, K. G., "Acetylene gas apparatus." Aug. 22.
- 18,072.—JONES, B., "Acetylene gas-generators." Aug. 23.
- 18,075.—BENNETT, J. F., and MOORWOOD, T. P. & H. S., "Gas or vapour producers for gas and oil engines." Aug. 23.
- 18,133.—KREMER, J., "Acetylene gas-generators." Aug. 23.
- 18,149.—STERNE, A. J., "Gas-igniting devices." Aug. 23.
- 18,171.—CHECKLEY, R., "Acetylene gas-generator." Aug. 24.
- 18,178.—WALKER, W., "Acetylene gas-generators." Aug. 24.
- 18,182.—ANDERSON, W., "Anti-vibrating arrangement for incandescent gas-burners." Aug. 24.
- 18,212.—SMITH, J. F., "Chandeliers and fittings for acetylene and other gases." Aug. 24.
- 18,220.—ENGASSER, E., "Generating acetylene gas." Aug. 24.
- 18,293.—GINZLER, J. C., "Coin-freed gas or other fluid meters." Aug. 25.
- 18,328.—RHODES, E., "Gas and like meters." Aug. 26.
- 18,345.—NIEL, A., "Regulating the flow and pressure of gas." Aug. 26.
- 18,403.—TWEDDIE, R. O., "Anti-vibrator for incandescent gas-burners." Aug. 27.
- 18,406.—HAWKYARD, J., and BRADDOCK, J., "Supplying gas or other fluid on prepayment." Aug. 27.
- 18,411.—WRIGHT, J. W. B., and DARWIN, H., "Atmospheric burners for gas heating-stoves." Aug. 27.
- 18,435.—VAN PRAAG, D. J., "Acetylene gas-generator." Aug. 27.
- 18,436.—MATTHYSSENS, G., "Acetylene producers." Aug. 27.

## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

#### Gas Consumption by Cookers.

SIR,—I have recently been asked to state what annual average consumption might be expected from a medium-sized packed and enamelled gas-cooker. My own experience points to an average of 25,000 cubic feet per annum. It occurs to me, however, that it might be interesting to your readers if some engineers who have separate meters attached to such cookers (list price about £6 to £7 with, say, a 14-inch square oven, three boiling-burners, and a separate grill) would give their average annual consumption and any other relative information. The circumstances in various houses are, of course, widely diverse; but, after all, an average can be struck, and it is valuable in ascertaining whether a consumption below this amount may not be increased (involving necessary instruction in all the uses a gas-cooker may be put to on the part of the visiting official), or, in the case of an excess, the inquiry as to whether waste may not be taking place.

I trust some engineers will favour you with their figures—omitting, of course, any makers' names.

132, Queen Victoria Street, E.C., Sept. 3, 1898. E. W. T. RICHMOND.

#### The Value of House Cisterns.

SIR,—Dr. C. Hallen and other Medical Officers of Health have written that the reason why there are no cisterns at the East-end is because the local Sanitary Authorities have condemned them, and have ordered their removal so that a direct connection with the main might be made, because they hold that cisterns are unsanitary for drinking and cooking purposes. They have evidently never seen, or have ignored, the report of Colonel Ducaut and Dr. Barry, Inspectors of the Local Government Board, on the East London water supply, which was made to the President, the Right Hon. H. Chaplin on Nov. 11, 1895. The following

extracts from this report may at the present time be of public interest: "Incidentally we would refer to the advantage to the consumer of having a small storage of water in every house. It was shown that, throughout this scarcity, persons occupying houses provided with cisterns suffered no inconvenience. No doubt ill-designed and badly-placed house cisterns are open to objection from a health point of view; and nothing could be further from our intention than to advocate any return to the old defective cisterns, with their moveable wooden covers. But we do advocate the provision of properly-designed cisterns. By a properly-designed cistern we mean a cistern which shall be so constructed as to exclude alike the possibility of the entrance of dirt from the atmosphere and the accumulation of any deposit from the water itself, whilst at the same time the water in the cistern is under the same pressure as the water in the main itself—in other words, the cistern that would satisfy us is merely a local enlargement of the water-main. Such a cistern is, in our opinion, subject to none of the objections commonly urged against the use of cisterns. Under the best arrangements, there must be times when short periods of interruption of a constant service will occur; and at such times the want of water for domestic purposes, for flushing water-closets, sealing water-traps, &c., is calculated to lead to conditions injurious to health which should not be allowed to exist, and which a proper use of really efficient cisterns would guard against. . . .

In our opinion, the inconvenience experienced by consumers was much aggravated by the want of proper means for domestic storage of water. . . . That for the protection of the consumer against unavoidable temporary intermissions of the supply, we consider that there would be distinct advantage in having properly-designed means of storage of water in houses."

I enclose a rough sketch of a form of cistern which would meet the requirements the Inspectors' report. But surely it is not beyond the inventive powers of sanitary engineers to devise several forms of properly-constructed covered cisterns, which will not only exclude dirt, but which by adequate packing will prevent variations in the temperature of the water.

A. H. SMEE,

Chief Medical Adviser, Gresham Life Assurance Society, Limited.

Aug. 30, 1898.

**Southport Corporation Gas Undertaking.**—A Southport contemporary states that the Corporation Gas Committee have decided to proceed on the lines advocated by a number of the members of the Council at their last meeting (see ante, p. 388), and appoint an expert to report on the whole working of the gas undertaking.

**Effect of the Adoption of Incandescent Gas Lighting.**—At the recent half-yearly general meeting of the East Ardsley Gas Company, the Chairman stated that there had been a falling off to the extent of about £140 in the revenue from the sale of gas, chiefly owing to the Great Northern Railway Company fitting up all their premises with incandescent gas-lights.

**Belfast Gas Profits and the Borough Fund.**—In response to a deputation (headed by the Lord Mayor), the Gas Committee of the Belfast Corporation have agreed, subject to the legality of the course being ascertained, to transfer £5000 from their surplus to the borough fund, which is in a low condition at the present time, owing to the large and increasing demands made upon it for sanitary purposes and other objects of a similar nature.

**Gas-Works Extensions at Ashford.**—Mr. W. E. O. Meade-King has held an inquiry at Ashford in regard to an application by the District Council for the permission of the Local Government Board to the raising of a loan of £14,000, for thirty years, for extensions and alterations at the gas-works. The Consulting Engineer (Mr. E. H. Stevenson) gave an account of the proposed improvements. He said the present works were hardly large enough for the size of the town. The maximum output was 220,000 cubic feet of gas a day, which was only equal to the consumption at the present time. The consumers last winter complained that the pressure was not high enough. The new works would comprise a retort-house, 48 retorts with regenerative furnaces, and a telescopic gasholder capable of storing 140,000 cubic feet of gas. If these alterations and extensions were carried out, the works would be capable of producing 330,000 cubic feet a day.

**Sales of Stock and Shares.**—Some original consolidated stock of the Newmarket Gas Company was recently sold at from £162 to £165 per £100 lot. At a sale of shares at Grantham, £20 original shares in the Grantham Gas Company were sold for £42 5s. and £42 10s. each; and new shares for £31 5s. apiece. On the same occasion, £10 shares in the Grantham Water Company fetched £28 12s. 6d. and £28 15s. each. At a recent sale at Gosport, some £25 shares in the Gosport Gas Company realized from £45 15s. to £46 10s. apiece. At the office of the Newcastle and Gateshead Gas Company last Wednesday, Mr. Robert Mack sold by auction £12,500 of the Company's 3½ per cent. debenture stock. It was put up in lots of £100 each; and the average price obtained was about £110 17s. 6d. The best price was £113 10s., and the lowest £110 10s. Five lots were sold at £113 10s.; 5, at £112; 28, at £111; 5, at £110 17s. 6d.; 17, at £110 15s.; 10, at £110 12s. 6d.; and 55, at £110 10s. The sale realized £13,856 7s. 6d. At Airdrie on the same day Mr. A. Morrison exposed for sale 1000 new ordinary £10 shares in the Airdrie & Coatbridge Water Company. The prices realized ran from £13 10s. to £14 2s.; the average being £13 17s. Among a batch of miscellaneous shares sold by Mr. W. G. Stansfield at Bradford last Thursday were fifty £5 fully-paid shares in the Metropolitan Gas Company of Melbourne, which realized £7 7s. 6d., and four "A" shares in the Clayton, Allerton, and Thornton Gas Company, which found a purchaser at £16 17s. 6d. At Alfreton on the previous day, 72 £1 shares in the local gas company were sold—half at £2 0s. 6d., and the remainder at £2. For five original £5 shares, £13 10s. each was obtained.



## MISCELLANEOUS NEWS.

### THE GAS AND WATER ORDERS OF THE PAST SESSION.

The report of the Board of Trade on their proceedings under the Gas and Water Works Facilities Act, 1870, during the past session was issued last week. It states that in December, 1897, eighteen applications for Provisional Orders were made to the Board—eleven relating to gas, and seven to water undertakings. The amount of capital proposed to be authorized was £299,750 by shares and £76,687 by loans; and of the total amount, £205,000 of share and £49,250 of loan capital related to gas undertakings, and £94,750 of share and £27,437 of loan capital to those for the supply of water.

The applications for Gas Orders were in respect of Budleigh Salterton, Cannock, Churwell, Coatbridge, Colwall, Crossgates (with Halton and Seacroft), Freshwater, Great Marlow, King's Lynn, Slough, and Whitchurch (Salop). Three of the applications—viz., those relating to Coatbridge, King's Lynn, and Slough—were in respect of undertakings already authorized by Parliament. The Coatbridge Company applied for authority to raise additional capital; the King's Lynn Company, to construct additional works and raise more capital; and the Slough Company applied to acquire by agreement additional lands and to construct works. One application—that of the Freshwater Gas Company, Limited—was for authority to construct and maintain new gas-works. The remaining seven applications were for power to maintain and continue works already existing without parliamentary authority; and in the Budleigh Salterton and Great Marlow cases, it was also desired to construct additional works. Objections were lodged against several of the applications, and were fully considered by the Board of Trade. The Churwell and Freshwater applications were not granted. In the other cases, Orders were granted subject to certain modifications and amendments.

The Churwell application was withdrawn by the promoters in consequence of their having agreed to sell the undertaking to the Morley Corporation; the latter having promoted a Bill in Parliament for this and other purposes. In the case of the Freshwater application, the consents of the Freshwater and Totland Parish Councils were not obtained; and the promoters asked the Board to dispense therewith. The Board thereupon appointed Lieut.-Col. G. W. Addison, R.E., to hold an inquiry at Freshwater, and to report to them on the matter. Upon consideration of his report, they refused to dispense with the consents of the Local Authorities; and the application was therefore not proceeded with.

The sliding-scale of price and dividend was adopted in the Coatbridge and Slough Orders. In the former, the initial price per 1000 cubic feet of gas was fixed at 2s. 11d. for reduction, and 2s. 6d. for increase of dividend. In the latter, the initial price was fixed at 4s. 5d. within the authorized limits of supply other than the parish of Datchet, and 4s. 8d. within that parish. In the following Orders, a maximum price per 1000 cubic feet of gas was fixed; power being reserved to the Board, after three years, to alter that price or substitute a sliding-scale: Budleigh Salterton, 5s.; Cannock, 4s. 6d.; Colwall, 5s. 8d.; Crossgates, Halton, and Seacroft, 4s. 6d.; Great Marlow, 4s. 10d.; Whitchurch, 4s. 7d.

In the Crossgates Order, the minimum illuminating power of the gas to be supplied was fixed at 16 candles, and in the Cannock Order at 14 candles. In the remaining Orders, the usual minimum of 15 candles was prescribed where necessary.

The supply of gas in bulk beyond the limits was authorized, subject to the usual limitations, in the Budleigh Salterton, Cannock, Colwall, Crossgates, Great Marlow, and Whitchurch Orders. The usual clauses as to the sale of additional capital by auction or tender, and limits of dividend, the creation of insurance and reserve funds, the testing of gas, the quantity of land to be taken by agreement, &c., were inserted; and, where necessary, the Gas-Works Clauses Acts, 1847 and 1871, were incorporated.

In the Cannock Order, provisions of an unusual nature were inserted as the result of an agreement between the promoters and the local authorities concerned. They related to the limit of dividend on the original capital to 7 per cent., the sale of mortgages by auction or tender, the prescription of a higher minimum pressure and a lower minimum illuminating power of gas than are usual in Acts and Orders, the sale of the undertaking to the District Council in certain circumstances, &c.

Special clauses were inserted in the Budleigh Salterton and Crossgates Orders as to the supply of gas for public lighting, in the Cannock and Crossgates Orders for the protection of mineral rights, and in the Budleigh Salterton and Cannock Orders as to the breaking up and repair of streets.

Two Bills to confirm the Orders were introduced into the House of Lords on the 26th of April. The Bills passed through the various stages without opposition, and received the Royal Assent on the 25th of July.

The applications for Water Orders were in respect of Broughton-in-Furness, Ightham and Wrotham, Portsmouth, Ross, St. Neots, South Hayling, and Wrexham.

The Broughton and the Ightham and Wrotham applications related to new undertakings; the St. Neots application was to substitute works on a new site for those authorized by the St. Neots Water Act, 1897, the proposed site of which had been found unsatisfactory; the South Hayling application was for additional works and extension of limits of supply; and the Portsmouth, Ross, and Wrexham applications were for additional capital in respect of existing undertakings.

The promoter of the Ightham and Wrotham Order (Mr. Hale) was unable to procure the consents of the Local and Road Authorities; and he applied to have them dispensed with. The Board of Trade thereupon appointed Lieut.-Col. H. A. Yorke, R.E., to hold a local inquiry and report on the case. In the course of his report, he said the case did not appear to be one which called for any elaborate analysis of the arguments and evidence produced before him at the inquiry, or for any criticism in detail of the various clauses of the Order. He was unable to find in Mr. Hale's proposals, or in the arguments put forward on his behalf, any valid reason for dispensing with the consent of the Wrotham Urban District Council, or for granting the Order not only against their wish, but

also in opposition to the views of the largest ratepayers. The Council were prepared to carry out a scheme which would give a better and purer supply of water than that proposed by Mr. Hale; and the Inspector thought they should be afforded an opportunity of performing this public duty. He therefore advised the Board not to grant the application; and they acted accordingly.

The consents of the St. Neots Rural District Council and the Huntingdon County Council were not forthcoming; and, on the application of the promoters, Colonel Yorke was appointed to hold a local inquiry and report on the matter. Upon consideration of his report, the Board decided to dispense with the consents, and to make an Order, subject to necessary amendments. In accordance with section 4 of the Gas and Water Works Facilities Act, 1870, a special report was made to Parliament on the subject. The Order, as already stated, was applied for by the Company to enable them to abandon the works authorized by their Act of 1897, and to construct others on a new site. Colonel Yorke reported that, as this site was contiguous to that already sanctioned by Parliament, and as the strata from which the water was to be derived were the same in both cases, there did not appear to be any reason why the change should not be authorized, especially as the surface of the ground round the new site was less liable to pollution from manure than was the case at the original site. Under these circumstances, he recommended the Board to grant the Order, subject to certain alterations agreed upon with the St. Neots District Council. Acting upon the recommendations contained in the report, the Board decided to grant the Order with the alterations above referred to.

With the exception of the case of Ightham and Wrotham, all the applications were granted; and Provisional Orders were made with such amendments in detail as were required to satisfy reasonable objections, or to protect the interests of consumers.

A Bill to confirm the Water Orders was introduced in the House of Lords on the 2nd of May. The Broughton Order was petitioned against by the Furness Railway Company; but a protective clause, which had not previously been asked for, having been agreed with the promoters, the petition was withdrawn. No further opposition was offered to the Bill; and it received the Royal Assent on the 2nd of August.

The total number of Orders made by the Board since the passing of the Act is 443, of which 435 have been confirmed by Parliament.

### MORECAMBE GAS COMPANY:

#### Annual Meeting—Extension of the Works.

For some time past, considerable extensions have been in progress at the Morecambe Gas-Works; and their completion was on Tuesday last celebrated by a special luncheon given to the shareholders and others at the King's Arms Hotel.

Prior to the luncheon, the annual meeting of shareholders was held—the CHAIRMAN (Mr. W. G. Welch) presiding. The annual report and balance-sheet to the end of June, noticed in the "JOURNAL" for the 23rd ult., were submitted. The Chairman, in his address, entered at some length into the increase of capital from time to time, and the manner in which it had been used; and he gave particulars of the extensions that have been made. The report was unanimously adopted; and the dividend recommended was declared.

With regard to the extensions that have been carried out, it may be mentioned that the old retort-house was 91 feet long by 42 feet wide. This has been lengthened, and the side wall taken out, so as to give space for the new retort-bench. The new portion is 40 ft. 6 in. wide; and the retort-house, as enlarged, is now 120 feet long by 82 ft. 6 in. wide. The old portion of the retort-house it is intended to utilize as a coal-store. Down the centre of the house, and supporting both roofs, is a large girder with one support in the centre; an open space being thus given over the whole of the house. The new retort-house is erected in two sections of four through arches each; and each arch contains 16 retorts 22 in. by 15 in. by 10 ft. long—making a total of 128 mouthpieces. The retorts are heated by sixteen of Drake's patent regenerator furnaces. Each section of bench is fitted up complete with ironwork, self-sealing mouthpieces, &c.; each bed having an arrangement of valves whereby any eight retorts can be put off without interfering with the others. Eighteen-inch steel foul mains extend round the retort-house, and connect to the present condenser. A chimney has been erected between the two sections of the retort-stack, sufficiently large for working the whole eight through beds. On each side of the retort-bench subways 8 feet wide have been provided for working the regenerators; and an inclined approach has been formed at one end, with a steps' approach at the other. The whole of the retort-bench, furnaces, &c., have been put into a concrete envelope; the bottom being 4 feet thick and the sides 18 inches thick, on account of the difficulty experienced both in connection with water and the nature of the soil. When in full work, these benches will be capable of producing over a million cubic feet of gas per day. The whole of the work, including the retort-house, roofs, bench, &c., has been carried out by Messrs. Jonas Drake and Son, of Halifax.

At the close of the meeting, the shareholders adjourned to the King's Arms Hotel for luncheon. Mr. WELCH occupied the chair; and among those present were Mr. Matthew Simpson, the Vice-Chairman of the Company, Mr. Robert Birkett, Mr. Robert Briggs, Mr. W. O. Roper, and Mr. Marsland, of Messrs. Jonas Drake and Son.

The toast of "The Queen and Royal Family" having been honoured, The CHAIRMAN, in proposing "Prosperity to the Morecambe Gas Company," expressed the pleasure that the Directors felt in seeing so many present that day. It was rather an important occasion in the history of the Company. They had greatly extended the works, which were now in very good order. He then gave some interesting particulars to illustrate the progress made by the Company since the inception of the undertaking. The works, in their original form, were built in 1858, at a cost of £2100. The first dividend paid was one of 5 per cent.; and the last (1898) was at the rate of 12 per cent. The capital outlay of the Company, which amounted to £2200 in 1858, had increased until in 1898 it reached £43,000. The make of gas had also shown a large increase. In 1875, the production was about 6 million cubic feet per annum. In 1880, it was 9 million cubic feet—or half as much again.



In 1885, it rose to 10 million cubic feet; and in 1890, to 18 millions. In 1895, the amount was 31 million cubic feet; and in 1898, 55 millions. They would thus see that in 1875 the make averaged half a million cubic feet a month; whereas at the present time they were producing 4½ million feet per month, and the retort-house was capable of turning out six times this amount. Referring to the *personnel* of the present Board, the Chairman remarked that Mr. Robert Birkett was one of the original Directors; Captain Briggs joined the Board in 1865; Mr. Simpson had been a Director 20 years; and he himself had been on the Board 19 years. Their Manager (Mr. W. Duff) had been with them 31 years; and Mr. Edward Clark, one of the Auditors, for 20 years. The Directors felt thoroughly satisfied with the present position of the Company. The gas undertaking had in the past fully answered the expectations that had been entertained. From time to time the Directors had formed very sanguine schemes with regard to the future; and they had never yet been disappointed. They were looking forward to still greater developments in the next little while.

Mr. W. O. ROPER, in proposing "Prosperity to Morecambe," incidentally referred to the loss which electrical science had sustained by the appalling accident to Dr. John Hopkinson and his three children. Mr. Roper also referred to the advantages Morecambe enjoyed in the shape of pure water and pure gas; and, in conclusion, he observed that with the works they now possessed, and the various undertakings that the Local Authority had in hand, Morecambe ought to prosper in the future even more than it had done in the past.

Mr. CLARK, with whose name the toast was coupled, responded.

The CHAIRMAN proposed the "Health of the Contractors." He said the Engineer and the Directors felt perfectly satisfied with the manner in which the work had been carried out by Messrs. Drake and Son.

Mr. MARSLAND responded to the toast.

The "Health of the Chairman and Directors of the Company" was next proposed by Mr. F. S. SMITH.

Mr. SIMPSON, in replying, alluded to the diligence and energy with which the District Council carried out their work in Morecambe—resulting advantageously both for landowners, householders, and visitors to the town.

The proceedings then closed.

## THE EXPLOSION AT THE PLYMOUTH GAS-WORKS.

### The Adjourned Inquest.

The adjourned inquest on the body of Aaron Parkes, fitter, of Hollinwood, Lancashire, who died from injuries sustained through an explosion at the Plymouth Gas-Works on July 19 (see *ante*, pp. 217, 267), was held last Friday, by Mr. R. B. JOHNS, the Borough Coroner.

Mr. PEARCE, Solicitor, appeared for Messrs. Cutler and Sons, the manufacturers of the water-gas plant at the works; and the Gas Company were represented by Mr. J. THOMAS, the Secretary, and Mr. A. WHARTON, the Manager.

The CORONER explained that the inquest was adjourned from the 28th of July for the attendance of other men injured in the explosion. As he understood, it was merely a question of whether there was any negligence or responsibility upon any of the people who were employed at the time in connection with the work. Messrs. Cutler and Sons had put up the water-gas plant, which had been completed for some time, and was handed over to the Company. In July they were engaged in the erection of additional plant, when something went wrong in connection with the first set. Mr. Ernest Cutler, who represented the manufacturers, was on the works at the time, and his attention was called to this; and it was while he and others were endeavouring to rectify what was wrong, that the explosion occurred. Apparently Mr. Cutler relied upon one of the workmen named Cole to do certain things, and Cole relied upon Mr. Cutler; and it was because of a misunderstanding that the accident happened.

Mr. S. Cutler produced and explained plans illustrating the water-gas plant and the mode of operating it. He said it happened in this process that deposits of carbon took place, and it was occasionally necessary to clear away this obstruction to the free passage of the gas. When there was a stoppage, it was shown to the people in charge of the plant by means of pressure-gauges on the operating floor. On the 19th of July, there was such a stoppage; and it was necessary to open the vessels and locate it. His son, Mr. Ernest Cutler, had been sent on that day to Plymouth to see what progress was being made with the work of erecting the new plant, and he was asked to assist in rectifying the stoppage in the original set, which they handed over to the Gas Company last December. The right course to have taken was, after the water-seal of the washer had been removed, to see that the valve between the washer and the scrubber was closed, because, though there was another valve which cut off communication between the scrubber and the gasholder, there would be a small portion of gas remaining in the scrubber; and, for the purpose of safety, the valve between the scrubber and the washer should have been closed. As he understood, this was not done; and the consequence was that, when the cover was removed from the manhole of the scrubber, a draught was caused, which drew the gas in the scrubber back to the top of the superheater, where it ignited, flashed back to the scrubber, and caused an explosion. His son was not a gas manager; but he understood the working of the plant, as did also the man Cole who was assisting in opening up the plant.

Mr. Ernest Cutler said he was an engineer, residing at Blackheath, and employed by Messrs. Cutler and Sons. On the 19th of July he arrived at the works of the Plymouth Gas Company in connection with the contract which the firm were carrying out for the erection of new sets of water-gas plant. While there, his attention was drawn to a stoppage in the plant erected last year. It would be indicated by pressure-gauges on the operating floor of the plant. In order to locate a stoppage, the usual process was to open the washer. The first step to be taken was to fill up the washer with water, in order to drive the gas into the scrubber, and to cut off communication between the scrubber and the holder by closing the valve. Then the water would be drawn off from the washer, the valve between that and the seal-cup closed, and the lid of the manhole in the washer removed. He was told at seven o'clock on the evening of the 19th that

there was a stoppage. He had been on the works all day, and was about to leave. He instructed Cole, who brought him the information, to flood the washer and take off the lid. At that time he expected to be away an hour; but he returned in about twenty minutes. He saw the water running out of the washer, and thought the operation had been completed. Accordingly he told the deceased and a man named Bayerstock to take the lid off the manhole in the scrubber. When this was done, he put his head into the manhole, but withdrew it because some water fell on him. Immediately afterwards the explosion took place, and if he had not withdrawn his head he must have been killed. Deceased, Bayerstock, Cole, and another man were near; and all of them were burned. He should not have ordered the manhole cover to be removed if he had not assumed that the valve between the scrubber and the washer was closed. The practical effect of the valve being open was that the gas could travel to the top of the superheater; and the seal of the washer being removed, there was nothing to prevent it lighting-back to the manhole. If the valve had been closed, the accident could not have occurred. Their firm had erected similar plant at Hornsey, Hastings, Southend, Buenos Ayres, and many other places; and there had been no accident prior to this.

By the JURY: The deceased and Bayerstock were fitters, and were not practically acquainted with the working of the plant. He did not give any definite instruction to Cole to close the valve, his time and attention being occupied in efforts to locate the stoppage. Cole was conversant with the working of the apparatus, of which he was an operator in the employ of the Gas Company.

The CORONER: It is clear that the Gas Company have nothing to do with this, however.

Mr. PEARCE: No; the question of financial responsibility does not arise in this inquiry.

A JUROR: If Cole had carried out the orders given to him, the accident would not have happened.

The CORONER: I do not think we have got quite so far as that. No definite instructions were given to him in reference to this valve. It seems to me that the witness and Cole were relying entirely upon each other.

Frank Cole said he was employed by the Plymouth Gas Company as an operator of the water-gas plant. He complained to Mr. Ernest Cutler of the obstruction; and Mr. Cutler, who was about to leave the works, told him to flood the washer by the time he came back. He did this; and on Mr. Cutler's return he informed him that he had done it, and was waiting further instructions. Mr. Cutler then told him to let the water out; and he let it out of the washer alone. After he had done this, there was considerable water in the scrubber, which was sealed. Mr. Cutler then said he was to let the water out of the scrubber; and while he was doing this Mr. Cutler stood by. The water had hardly got out of the scrubber, passing through the washer, and witness was looking round to see that there was no light burning near, when the explosion occurred. He did not see the lid of the manhole removed. Witness's experience of the working of the water-gas plant dated from December last, when the plant was taken over from Messrs. Cutler and Sons.

By the CORONER: They tried on the previous day to remove the obstruction. If Mr. Cutler had not been present, he should have opened up the plant, and tried himself to find the cause of the stoppage.

By Mr. PEARCE: He was one of the men instructed by Messrs. Cutler and Sons in the working of the plant. He agreed that the effect of the water-seal was to prevent the gas flowing back; and the water having been let out of the washer, the proper thing was to shut off the valve between it and the scrubber. The only time they performed this operation before was the previous day, when they looked for the obstruction, but did not find it.

Mr. Russell, Medical Officer of the South Devon and East Cornwall Hospital, Plymouth, stated that the deceased was admitted on the 19th of July suffering from burns, and died on the 27th of the month from the effect of his injuries.

The CORONER said it seemed unnecessary to prolong the inquiry. There were other witnesses; but they could not throw more light on what had taken place than they already had. The cause of the explosion had been very clearly explained.

A JUROR: It was clearly an accident; no one is to blame.

The remainder of the Jury concurred; and a verdict to this effect was returned.

## THE QUALITY OF THE GAS AT PORTSMOUTH.

### A Large Excess of Ammonia.

According to a local paper, an important report was made to the Finance Committee of the Portsmouth Corporation last Thursday, with reference to the composition of the gas supplied by the Portsea Island Gas Company; and the matter was of such a nature that it was decided to hold a special meeting of the Committee next Thursday to consider it again before reporting to the Council. It appears that the gas contains an unusual quantity of ammonia. For some time past the results of the tests for this chemical have been very good, only very slight traces of it having been found; but rather more than a week ago the test revealed no less than 20 grains of ammonia per 100 feet. As the legal quantity must not exceed 4 grains, the excess is considerable. The Directors of the Company have written to the Committee to the effect that the presence of the ammonia was due to neglect. At the time the letter was written, there was about a million cubic feet of gas in the holders with the excess of ammonia, but efforts were being made to eliminate it. Subsequent tests show that these efforts have been to a certain extent successful; the latest record being 14 grains per 100 feet. The Committee have had the Medical Officer of Health's attention drawn to the matter, with the object of finding out the effect of ammonia upon the health of people living in gas-lighted rooms. It is further stated by our local contemporary that the Company have had a good deal of trouble lately in maintaining their gas free from impurities, which have played havoc with the pipes, especially in some of the northern parts of the town. An expert has been called in by the Company to help them to remedy the state of affairs, which is described as being very bad.



## RICHMOND GAS COMPANY.

The Half-Yearly General Meeting of this Company was held on the 25th ult.—Mr. T. J. CARLESS in the chair.

The ENGINEER and SECRETARY (Mr. T. May) having read the notice convening the meeting, the report and accounts were presented. The latter showed that the sale of gas in the six months ending June 30 produced £17,943; and residual products, £4076. The total revenue was £22,083. The expenditure on the manufacture of gas was £12,569; on distribution, £1903; and on management, £1667—the total expenses being £17,237. There was consequently a balance of £4846. The profit and loss account showed a balance of net profit available for distribution of £7137; and the Directors recommended dividends of 5 and 3½ per cent. for the half year.

The CHAIRMAN, in moving the adoption of the report, said he had nothing very special to bring before the proprietors. The Company had done a good, steady half-year's work; and he congratulated them on the result shown in the accounts. The capital expenditure in the past six months had been confined to the outdoor department; there being a sum of £206 for new mains chargeable under this head. The works were capable of meeting an increased demand for gas; and it would be seen that the business was in a very healthy condition. Turning to the revenue account, he pointed out that coal had cost £655 more than before. A large number of service mains had been laid; and the whole district was now well supplied. The lighting of the public lamps showed a large increase in amount; the installation of incandescent burners, new lanterns, and the extra work involved in the maintenance of the system being largely responsible for this. The improvement in the lighting of the town would be apparent to all. As regards the receipts, the increase in the sale of gas was another matter for congratulation. Last year it amounted to 12 per cent.; and this year they were able to record a further sale of 3 per cent.—the prepayment department accounting for about half. The number of consumers was still increasing; and gas for cooking purposes was apparently more popular than ever. The prices ruling for coke were lower than they had been for some time past; but the receipts from sulphate of ammonia had been more satisfactory. Passing on to the profit and loss account, there was a balance of £7137, which allowed of the payment of the usual dividend, and left £3156 to be carried forward. In addition to this, they had an invested reserve fund of more than £5000. He thought the proprietors would agree that these figures spoke for themselves.

Mr. CLARKE seconded the motion; and it was carried.

A vote of thanks having been passed to the Chairman, he proposed a similar compliment to Mr. May and the other officers for the good work they had done in the half year. The proposition was cordially received, and duly acknowledged.

## PROVINCIAL GAS AND WATER COMPANIES.

## Gas Companies.

The shareholders of the Cheltenham Gas Company were informed by the Chairman (Mr. R. Ticehurst) last Thursday that the business of the Company during the past half year had been most satisfactory, and that there had been an increase in the consumption of gas of upwards of 6 million cubic feet as compared with the corresponding period of last year. No new capital had been raised since the previous meeting; but the Directors proposed, before the close of the year, to offer a batch of stock for sale. Coal had been dearer during the year; but satisfactory arrangements had been made with several collieries for a supply. In view of the prospect of increased business, they had purchased a strip of land in the vicinity of the works, which he thought would prove a valuable acquisition. The report and statement of accounts were adopted; and a dividend at the rate of 5 per cent. per annum was declared.

In moving, at the meeting of shareholders on the 25th ult., the adoption of the report, noticed in the "JOURNAL" last week, of the Directors of the Cork Gas Consumers' Company, the Chairman (Mr. G. Lynch) stated that, owing to the reduction made in the price of gas, the rental from the private consumers in the six months ending June 30 was nearly £400 less than in the corresponding period of 1897. This was, he thought, to be expected, as the increase in consumption which invariably followed a reduction in price had not yet had time to make up the deficiency in rental. The Company's prices would now compare favourably with those charged in any other city in the kingdom, taking into account the quantity of gas made and the conditions under which the Company worked. A gentleman who had been erecting some large machinery for a firm in Cork was surprised at the low price charged by the Company for gas for motive power; and he at once recommended that it should be used in preference to electricity, which the parties had intended to employ. It was now twenty years since the great gas scare of 1878, when gas shares fell to par, and it was supposed that they would shortly become valueless; many persons then, as now, speaking of electricity as the "light of the future." Though twenty years had since elapsed, and great improvements had been made in electric lighting, gas still held its own; and, strange to say, the consumption had largely increased in the cities where the light was most extensively used. In fact, in all towns, large and small, almost without an exception, the consumption of gas had increased side by side with the electric light. The inducements held out in Cork to parties to take the electric light looked attractive on paper at first sight; but they would, he believed, prove very disappointing in practice. Consumers would do well to make themselves fully acquainted with the very restrictive conditions under which they would be entitled to the benefit of the reduced prices named after the first two hours. There were 31 cities or towns in the United Kingdom where this system was in use, and in only six of them did the consumers get the benefit of an average consumption of over two hours. Owing to the earlier hours at which the shops closed in Cork, even less would be attainable. In the winter months, the heat of the gas would be missed, and other artificial heating would be required, which would add to the expenses. Some large drapery establishments elsewhere which had electric light had given it up and resumed the use of gas, owing to the way in which their silks, satins, ribbons, &c., became mildewed from damp. When parties came to have experience of electric meters, for

the use of which they would have to pay a quarterly rent, they would probably find much more cause to grumble than they did with gas-meters, which the Company supplied free of cost to the consumers. The report was adopted; and a dividend at the rate of 8 per cent. per annum was declared.

The Chairman of the Derby Gas Company (Mr. H. Swingler) was in the happy position, at the meeting of the shareholders last Wednesday, of being able to report increases in all branches of the business. In the first place, he announced that the capital expenditure had been £1322, £850 of which had been expended on stoves and meters, which was satisfactory, as it meant additional consumption. The revenue account also disclosed the satisfactory addition of 7 million cubic feet in the delivery of gas compared with the previous half year, in which an increase was also recorded. The advance was really more than it appeared, because it went on from half year to half year in the face of keen competition with the electric light; but there was an excellent field for both. There had also been a rise in the amount received for residuals; even in sulphate of ammonia there had been a satisfactory increase. A further 336 meters had been fixed; and the quantity of gas supplied through them brought in £600. The supply of gas cookers and fires continued to increase; and these accounted in a great measure for the extra quantity of gas consumed, especially during the summer months. The working expenses were again very satisfactory, and showed the good management of those who had charge of the various departments. The result was that, after paying the dividends, amounting to over £9000, there would be the very creditable balance of more than £3000 to be carried forward to the current half year. The report was adopted; and dividends for the half year at the rate of 10, 7, and 5 per cent. were declared. It was further agreed that the remuneration of the Directors and Auditors should be increased to 900 guineas per annum.

The 127th half-yearly meeting of the Douglas (Isle of Man) Gas Company was held on Monday last week—Mr. J. Kaye in the chair. The report presented by the Directors showed for the six months ending June 30, a net profit of £3685. This was an improvement as compared with the corresponding period of last year, notwithstanding the reduction made in the charge for meter-rents from the 1st of April last. Including the balance brought forward, there was a sum of £5465 available for distribution; and the Directors recommended that it should be disposed of by paying a dividend of 30s. per share (being the same as last year), placing £500 to the reserve fund, and carrying forward the balance. In moving the adoption of the report, the Chairman said he thought the results of the working would give satisfaction to the whole of the shareholders. The sales of gas showed an advance for the half year; and the revenue from coke a proportionate progress. There was also an improvement in sulphate of ammonia; but in tar there had been a considerable decline, and the market price had still further fallen. There had been no exceptional expenditure on the manufacturing plant; but in the distributing plant there had been an extension of a main to keep pace with the growth of the town. Having entered into an arrangement with the Town Council for the lighting of the whole of the town by incandescent burners—the lamps along the front of the bay to be increased in number, and to be provided during the season with triple incandescent burners—and the Directors being desirous of making the lighting of the sea-front especially as effective as possible under the conditions, they deputed the Manager (Mr. C. H. Kay) and himself to visit England in order to ascertain the latest and most efficient methods of gas lighting. They selected the new Welsbach burner; but as they could not get delivery of the number required in time, they reduced the order by one-half, leaving the others the ordinary Welsbach burners. He thought it was generally admitted that the lighting had been a great success. Though not so glaring as the arc electric lamp, it was a most effective and brilliant piece of lighting, especially considering the very moderate cost and the distance apart of some of the lamps; the light being much more equally distributed than would be the case with arc lighting. The Directors in this matter had not dealt with it from a profit point of view, but with a desire, even if at a loss, to make the lighting of the front as effective and attractive as possible. In order to show the efficiency and cost of the new incandescent gas-burner as compared with the incandescent electric light, he might say that a Board of Trade unit of electricity gave a light of from 15 to 16 candle power for 16½ hours at a usual cost of about 6d.; while a 2-feet new incandescent gas-burner would give a light of 50 candles for 50 hours at a cost of less than 4d., charged at the price of gas in Douglas. He thought this knowledge would be reassuring to gas shareholders, as showing that they had not anything serious to fear from the competition of electric light. The report was adopted; and votes of thanks were accorded to the Chairman and Directors, as well as to the Manager and Secretary and the staff.

At the recent half-yearly meeting of the Eastbourne Gas Company, the Directors reported a profit of £5528 on the revenue account for the six months ending June 30; the amount available for distribution being £16,680. They recommended that dividends at the rate of 14½ and 11½ per cent. per annum should be declared. This would absorb £6093, and leave a balance of £10,587 to be carried forward. In moving the adoption of the report, the Chairman (Dr. G. A. Jeffery) stated that the sale of gas in the past half year had increased by 5½ per cent., which, of course, was very satisfactory. The advance had been from 108,133,000 to 114,024,000 cubic feet. The profit was £5528, against £6366 in 1897—a drop of £838. This, on the face of it, looked rather serious; but he thought before he had finished he should be able to show the proprietors that it was not at all a serious affair. Coals had cost £612 more; and residuals had brought a return of £45 more. The net increase in the cost of coal was £566. The expenditure on manufacture was £300 less. Distribution cost £153 more; this being due, largely, to the adoption of coin meters. Rates and taxes in Eastbourne never get less. The Company were, on the present occasion, poorer to the tune of £229 on account of the increase in the rates and taxes. The quantity of gas produced was 119 million cubic feet, against 113 million cubic feet. The price of tar had utterly failed this year. They had a very good make of sulphate of ammonia, and the selling price had advanced. Since the last meeting, the Directors had been supplying coin meters; and there were 750 in use. They were readily sought for, and could hardly be supplied fast enough. Through 500 of these meters already 2 million feet of gas had passed. They had made a great deal more gas, but not quite sufficient profit to pay the dividends recommended. Last year the Directors made a bold experiment in reducing the price of gas 2d. per



1000 cubic feet. This entailed a loss of £1800. This year they had paid £566 more for coals. Moreover, they had lost, through the low price of tar, something like £300. This made a total of some £2666, which had been nearly wiped off by the profits accruing in the past half year. They did not expect cheap coals in the next six months; but he anticipated that they would get an increased amount from residuals. He believed that through the low price of gas they would command a considerably larger consumption than hitherto; so that he hoped when he met the shareholders this time next year to be able to announce a profit capable of paying the full maximum dividends, and possibly to recommend a further reduction in the price of gas. The works were in a most efficient state; and they thought of adding greatly to their capacity. Their staff had, one and all, done everything in their power to earn the dividend; and he was requested by the Directors to return their best thanks to them for their loyalty. Mr. Bennett seconded the motion; and it was carried. A vote of thanks having been accorded to the Chairman and Directors, a similar compliment was paid to the Manager (Mr. J. Hammond) and workmen, as well as to the Secretary (Mr. J. H. Campion Coles). These gentlemen having briefly replied, the proceedings closed.

The annual meeting of the Falmouth Gas Company was held on Thursday last—Mr. R. M. Tweedy, Chairman of the Board of Directors, presiding. In moving the adoption of the report, a summary of which appeared in the "JOURNAL" last week, the Chairman said many things had arisen to prevent them realizing the profit they would like to have made. The increase in the consumption of gas had not been what they expected when they reduced the price. This was a disappointment; but if there had not been a large rise in the price of coal, they would have gone on in the hope that the lower charge for gas would stimulate consumption, although they must have had to make smaller profits for a year or two. But the increase of 3s. 9d. per ton in the price of coal as compared with last year made a difference of 4½d. per 1000 cubic feet in the cost of gas; and the Directors thought it necessary to raise the price 4d. per 1000 cubic feet. It was gratifying to find that the Corporation had at last consented to fix some incandescent lights in the public lamps; and it was hoped before long the whole of the lamps would be fitted with these burners. They understood the Corporation were very anxious to secure the Company's property for the benefit of the town; and as a gas shareholder, he should be pleased to see it come about. Unless they were very much disappointed, the price the Corporation would have to pay them would quite satisfy all the shareholders. Evidently the Corporation thought they had a little gold mine; but he believed that, if they employed really experienced persons to look into the figures, they would not be so very sweet on taking over the works. Mr. Silverthorne, the expert employed by the Corporation, valued them at £38,750; but the Company did not fall in with his valuation. He was sorry to say a great many people in Falmouth fancied the Corporation were going to get the works at Mr. Silverthorne's valuation (laughter); but, of course, the Company would employ their own valuer. In a recent case elsewhere, the Corporation expert valued the works at less than Mr. Silverthorne's estimate; but the Gas Company wanted double the amount, and went to arbitration. The arbitrator's award was 75 per cent. beyond the Corporation valuer's price, and within a few thousands of what the Gas Company had asked. If they went to arbitration and obtained terms as good as these, the Falmouth Corporation would have to pay the Company considerably over £60,000. In addition to that, working capital would be needed, and officials, perhaps, have to be compensated. These and other things would bring the cost to the Corporation up to about £70,000. Now, 3 per cent. on £60,000 was £1800. Last year the profits of the Company were £1315. Where was the profit to come from for the Corporation? While as a consumer he should be glad to see the Corporation take over the works, as a ratepayer he should be sorry. The motion was carried; and a dividend was declared for the half year, making a total of 13½ per cent. for the year. The Chairman expressed a wish to retire from the directorate; but, at the earnest request of the shareholders, he consented to continue in office for another year. By this time, he said, they would know the intentions of the Corporation. If the works were to be taken over by the town, he would remain on until the matter was settled; if not, he should resign.

The half-yearly general meeting of the Farnworth and Kearsley Gas Company was held on the 25th ult.—Mr. J. W. Watkinson in the chair. The accounts presented showed that in the six months ending June 30 the receipts were £8042, while the expenditure was £5210; leaving a balance of £2832. The amount available for distribution was £5574; and the Directors recommended the payment of dividends at the rate of 10 and 7 per cent. per annum, less income-tax. In moving the adoption of the report and accounts, the Chairman congratulated the shareholders upon the sound financial condition and prospects of the Company. He referred to the fact that few concerns had been able to accumulate so substantial a reserve fund (which now stands at £13,000) in proportion to the amount of share capital issued—£73,474, including £4974 premium. This no doubt accounted for the present high value of the Company's stock and shares. More than 800 automatic meters were in use; and there was still a good demand for them among the working classes. The report was adopted, and the dividends recommended were declared. A hearty vote of thanks was given to the Chairman, Directors, and Auditors. The Chairman, in responding, referred in complimentary terms to the officers of the Company, and concluded by moving a vote of thanks to them. This was acknowledged by the Manager (Mr. T. L. Sheppard) and the Secretary (Mr. W. Bromley).

The report of the Great Marlow Gas Company, which was presented at the recent annual meeting, shows that the Company are considerably enlarging their means of doing business. During the past year, the mains have been extended to Bisham; and satisfactory progress has been made with an extension to Bourne End, the cost of which, with the Provisional Order lately obtained, will amount to about £5000. A dividend at the rate of 7 per cent. per annum for the second half of the year has been declared, making a distribution of 6½ per cent. for the year, as compared with 6 per cent. the previous year.

The report of the Hartlepool Gas and Water Company was summarized in our issue for the 23rd ult.; but some additional particulars were furnished to the shareholders by the Chairman (Mr. W. H. Fisher) at the meeting last Wednesday. He said he was glad to find himself in a position to move the payment of the maximum dividends on the whole of

the share capital, and in addition to carry forward a substantial balance. Their customers had also had the benefit of a reduction in the charge for gas, foreshadowed by him at the previous meeting. The revenue for the year was £30,436, against £30,386 in the previous twelve months. The production of gas was 358,811,000 feet, or an increase of 20,115,000 feet, which was equal to 6 per cent. There had also been a very satisfactory demand for prepayment meters; the number now in use being 1879—an increase of 694. The quantity of water supplied for domestic use was upwards of 668 million gallons, or an increase of more than 69 million gallons; while the quantity supplied for all purposes was 1134 million gallons. He referred to the Bill which had passed through Parliament, giving the Company power to borrow money, and to construct much-needed reservoirs for the storage of soft water. He also mentioned the opposition of the West Hartlepool Council to the scheme, and said that, although a lot of money had been spent on both sides, the Corporation had gained nothing more than the Company were prepared to grant if the matter had been discussed between them. The report was adopted.

At the recent half-yearly meeting of the Normanton Gas Company, the Chairman (Mr. E. Mitchell, J.P.), in moving the adoption of the report and accounts, stated that they showed an expenditure on the capital account of £802, part of which was for the extension of the purifying plant, and the remainder for extensions of mains and new meters. The revenue in the six months ending June 30 showed a satisfactory increase from the ordinary and the prepayment meters; the consumption of gas showing 17 per cent. increase on the corresponding half of last year. The residuals had produced a little more; but this was in consequence of the extra coal used. Referring to the unsatisfactory condition of the tar market, he expressed the hope that part of the deficiency would be made up by the better price realized for ammonia, the market for which was in a much better condition than it had been for some time past. In the expenditure, the chief items of note were the increase of coal due to the extra quantity required, and the repairs and maintenance of plant. The latter had been £277 against £62. This large additional outlay was necessary, owing to the renewal of the purifiers. The total income was £2821, and the expenditure £1740; leaving a balance of £1081. Against this was a charge of £60; leaving £1021 as profit for the half year. The balance available for division was £2978. The report was adopted. The Chairman proposed that the recommendation of the Directors for the payment of a dividend for the half year at the rate of 10 per cent. per annum be approved; and this was agreed to.

In the report of the Directors of the Reading Gas Company for the six months ending June 30, they announce a considerable increase in the quantity of gas sold in this period as compared with the first half of 1897. The yearly contracts for coal and for the sale of surplus tar have been entered into—the former at a further advance in price, and the latter at a considerable diminution. These circumstances will somewhat increase the cost of the manufacture of gas during the current year. The accounts accompanying the report show that the sale of 148,531,400 cubic feet of gas inside, and 4,830,000 cubic feet outside the borough, as well as 10,186,258 cubic feet for public lighting, brought in a revenue of £22,932; residuals produced £6354; and the total receipts were £29,341. The expenditure on the manufacture of gas amounted to £18,576, of which £13,179 was for coal; distribution came to £2533; and the total expenses were £24,576—leaving £4765 to go to the profit and loss account. The balance available for distribution was £17,531; and the Directors recommended the payment of the full statutory dividends. Under the supervision of Mr. E. Baker, 15,639 tons of mixed gas coal were carbonized in the six months covered by the report; the residuals produced being: Coke, 15,639 chaldrons; breeze, 199 loads; and tar, 163,481 gallons. The make of sulphate of ammonia was 172 tons.

The 91st half-yearly general meeting of the Stretford Gas Company was held yesterday. The report presented showed a profit, including the balance of £268 brought forward, of £4651; and the Directors recommended the declaration of dividends at the rates of 10, 7½, and 7 per cent. per annum. The quantity of gas made under the supervision of Mr. H. Kendrick, the Company's Engineer, in the six months ending June 30, was 104,035,000 cubic feet, of which 100,501,100 cubic feet were sold, and 698,100 cubic feet used on the works. In the production of the above-named bulk of gas, 6601 tons of coal and 2599 tons of cannel were employed. The cost of coal, including discharging, per 1000 cubic feet of gas sold, was 1s. 3-16d.; and the manufacturing charges, including repairs, 6-87d.—together, 1s. 10-03d. Nearly half the coal and cannel is carted from the railway station, a mile distant; the remainder being delivered by canal alongside the works. The price of gas, which after the current quarter will be reduced 3d., averaged 2s. 9-62d. per 1000 cubic feet. It was lowered by 2d. early in 1896.

The annual meeting of the Sunderland Gas Company was held on Thursday—Mr. James Stokoe presiding. In the course of his address to the shareholders, he stated that during the year 719 new consumers had been added; and there had been an increase of 19 million cubic feet in the gas supplied. In meter-rentals there had been an increase of £1692; and in the residual products, of £1252. The total increase in the revenue was £2943. This would have been very gratifying indeed; but the expenditure had been considerably larger. There had been an increase in wages of £1298; and in coal, lime, and leading of £3374. In rates and taxes there was an advance of £148; in repairs, a decrease of £1654; in salaries and Directors' fees, an increase of £583; and other items made a total increased expenditure of £3377. There was a balance on the year of £17,180. He was able to report that alterations at the Hendon railway siding had now been completed, as well as a new retort-house. This latter was most important, as it was capable of manufacturing, when in full operation, 50 per cent. more gas than was produced at present. There was a very serious increase in the price of coal, which would cost the Company £6000 more this year than last; but still he had no doubt that the Directors would be able to advise the continued payment of a maximum dividend. The report was adopted; and a dividend was declared of 5 per cent. on the original stock, and 4½ per cent. on the additional capital stock.

The half-yearly meeting of the Tonbridge Gas Company was held on Monday last week, under the presidency of Mr. J. Fagg. The Directors recommended dividends at the rates of 11½, 8½, and 5 per cent. per annum. The Chairman, in moving the adoption of the report, referred to the very large increase in the consumption of gas for cooking purposes and also for gas-engines. Owing to this, the size of the mains on the



works had been increased, and new condensers erected. Besides this, a large set of purifiers were in course of construction. The Directors thought the time had arrived for applying for additional powers to enable them to cope with the great increase in business. In seconding the motion, Mr. Lees congratulated the Directors on the highly satisfactory nature of the report, which showed that, notwithstanding a reduction of 2d. per 1000 cubic feet in the heaviest quarter ending March, the balance was £1660, which, added to the balance of £3008 brought forward, made a total of £4668 available for division. The consumption of gas continued to grow very rapidly; the increase for the half year being 4,127,700 cubic feet, or at the rate of 20·2 per cent. The report was adopted; and the dividends recommended were declared. After the ordinary business, a special meeting was held at which it was decided to apply for powers to raise additional capital, extend the limits of supply, and other purposes.

The 59th half-yearly meeting of the Waltham Abbey and Cheshunt Gas Company was held on the 26th ult., at the Company's offices, Waltham Cross. Mr. Alfred Kitt, Assoc.M.Inst.C.E., who presided, in moving the adoption of the Directors' report, noticed in the "JOURNAL" for the 23rd ult., remarked that the finances of the undertaking were in a very satisfactory condition, especially as the Company recently reduced the price of gas by 2d. per 1000 cubic feet. The report was adopted. At the conclusion of the ordinary business, a special meeting was held, at which it was resolved to sanction the issue of £10,000 additional share capital, authorized by the Company's Provisional Order of 1881, also of £3125 debenture capital under the borrowing powers thereby conferred.

The report of the Directors of the Wolverhampton Gas Company, which was noticed in last Tuesday's issue, was submitted to the shareholders at their meeting that day. In commenting upon it, the Chairman (Mr. Henry Ward) said he regretted that it had been deemed advisable to reduce the dividend to the extent of  $\frac{1}{3}$  per cent.; but the Directors hoped to be able to retrieve the diminution before long. A loss of £1044 had been sustained in the sale of coke, tar, and other residuals; and owing to the South Wales coal strike, they had had to pay £817 extra for coal and lime, while the contracts for coal for the whole year had had to be made at higher rates. Compared with the corresponding period of last year, there had been a decrease of £1060 in the sales of gas. The report was adopted. It was subsequently agreed to issue debenture stock to the amount of £12,370 for the purpose of meeting the mortgage charges—the interest to be  $3\frac{1}{2}$  per cent.

#### Water Companies.

Mr. E. Dennis, the Chairman of the Directors, presided at the half-yearly meeting of the Barnstaple Water Company yesterday week, and congratulated the shareholders on the satisfactory nature of the report presented. The disposable balance on revenue account was £1272. Dividends of 10 and 7 per cent. on the two classes of shares were declared, which absorbed £880, and left £392 to be carried forward.

At the ordinary general meeting of the Brymbo Water Company on the 24th ult., the Directors reported that during the year ending June 30 there had been an increase of £41 in the accounts relating to domestic supplies, while the trade supplies had gone up £345. The net revenue was £1928, which was brought up to £1939 by the balance brought from the previous account. Deducting the interim dividend and the interest on debentures and loans—together, £1061—there was a sum of £878 available for dividend. The Directors recommended that this should be at the rate of  $3\frac{1}{2}$  per cent. per annum. The Chairman (Sir Theodore Martin, K.C.B.), in moving the adoption of the report, referred to the satisfactory increase in the trade supplies, which he hoped would still further improve. Owing to the Company's prosperity, they might, he said, have declared a 4 per cent. dividend. He alluded to the completion of the Pendines reservoir, which was capable of storing 96 million gallons of water, and had been constructed at the moderate cost of £10,000. The amount the Company had been authorized to raise was not quite sufficient to cover the whole of the cost; and instead of going to their bankers to raise what was necessary, he had put aside £1500 for the Company. They would have to spend money in laying mains, and so forth; and for this it might be necessary to raise an additional £3000 of capital. The report was adopted.

The half-yearly general meeting of the Leatherhead and District Water Company was held on the 23rd ult.—Mr. H. Rokeby Price in the chair. The Directors, in their report, stated that the receipts for the six months ending June 30 amounted to £1750, and the working expenses to £988; leaving a profit of £762, or £107 in excess of that for the corresponding period of 1897. To this had to be added £593, the amount brought from the previous half year; making a total of £1355. Deducting £149 for interest on debenture stock, there remained £1206 available for distribution. The Directors recommended a dividend at the rate of 4 per cent. per annum. This would absorb £599, and leave a balance of £607. The Chairman, in moving the adoption of the report, congratulated the shareholders on having had so satisfactory a half year. There had been no deficiency of water—the wells holding out capably. The report was adopted, and the dividend declared.

The half-yearly general meeting of the West Surrey Water Company was held on the 30th ult.—Mr. J. McMillan in the chair. The report of the Directors showed that the income for the six months ending June 30 amounted, after making provision for empty houses, irrecoverable rates, &c., to £4137; and the expenditure to £1710. Comparing the accounts with the corresponding half of 1897, the income shows an increase of £207; and the expenditure an increase of £233. The mains were extended by 1182 yards; and 145 new supplies were connected, representing a future rental of £253 per annum. The Engineer and Manager (Mr. J. K. Hill) reported that the whole of the Company's works were in good order. After transferring from revenue £200 to the contingency fund, the amount available for division was £2657, which the Directors recommended should be applied as follows: In payment of a dividend upon the preference shares amounting to £536; and a dividend at the rate of  $5\frac{1}{2}$  per cent. per annum upon the ordinary shares, amounting to £1279—leaving £842 to be carried forward.

**Cooking by Gas in Coventry.**—According to a report of the Gas Committee of the Coventry Corporation recently issued, the number of cooking-stoves on hire in the city on June 30 last was 2132, as compared with 1915 on the corresponding date last year; being an increase of 217, or equivalent to 11·33 per cent.

## ANOTHER STRIKE AT THE LLANELLY GAS-WORKS.

### The Town in Darkness.

For the second time within the course of a few months, there is a strike at the Llanelly Gas-Works. The present dispute was brought about by the dismissal, on Monday last week, of the foreman of one of the gangs for an alleged theft of coal, and the appointment, in his place, of the second man in the gang. Thereupon the men raised the old question of seniority; the vacant position being claimed by the brother of the dismissed man, who was in another gang. The Manager (Mr. A. R. Cawley) declined to yield to the demands of the men, whereupon they all went out on strike. Subsequently, however, the Directors gave way on the question of the appointment; and then fresh demands were made which could not be conceded. The result of the strike was that on Thursday night the town was greatly inconvenienced by a number of lamps in streets outside the centre of the town not being lighted at all; and during the night operations at the gas-works ceased. On Friday morning the Directors of the Gas Company notified to the Borough Council, the Great Western Railway Company, the Post Office, and the officials of all the public institutions, that no lamps would be lighted; and private consumers were informed that the supply of gas would be completely cut off. Having regard to the great inconvenience and danger in the town as a result of the proposed action of the Company, a special meeting of the Borough Council was convened, for the purpose of devising means by which the strikers could be replaced; and Mr. G. Watkeys, the Surveyor, was instructed to confer with the Manager, and offer him the labourers in the employ of the Council. Mr. Cawley courteously thanked the Council, and readily accepted the men offered. Later in the day the men were approached on the matter, but all refused to go to stoke at the gas-works under the circumstances; and the town was in total darkness. An attempt was made to obtain stokers from outside; and as soon as this became known, a large number of men and boys wended their way to the station. In the meantime, two arrived, and were met at the station by the Manager, and were driven to the works gates without the slightest disturbance. The police took possession of the works and the surroundings with commendable promptitude. The local Secretary of the Gas Workers' Union (Mr. Morgan) remained at the railway station all night with the object of handing the men, if they came, a circular instructing them that a strike is pending. It is reported that a large number of claims for damages have been sent in to the Company by tradesmen and works managers in the town who could not get sufficient pressure of gas for motive power, with the result that in fitting shops, printing offices, carpenters' shops, and all other places where gas-engines are in use, business was seriously interfered with. The Company's labourers and lamplighters refused to take the place of the stokers; and they were discharged. We learn by telegram that the works are now manned by non-unionists; and the town will be lighted this evening.

At the Llanelly Police Court, on Friday, the dismissed foreman, Theophilus Richards, was charged with stealing a pennyworth of coal, the property of the Gas Company. A police-constable deposed that he saw defendant with a lump of coal early on the morning of the 28th of August. He admitted taking it from the gas-works. Another constable gave similar evidence. Mr. Cawley deposed that defendant was in the employ of the Company as foreman stoker, and that he should have been on the premises at the time he was stopped by the police officer. He admitted, in cross-examination, that he had had some unpleasantness with defendant—in fact, he had not been able to get on with any of the men. Defendant pleaded "Not guilty," and asked to be tried before a Jury at the Carmarthen Assizes. The Bench acceded to the request.

## LEEDS CORPORATION GAS SUPPLY.

### The Price of Gas—The Annual Accounts.

The Gas Committee of the Leeds Corporation had a long discussion last Wednesday on the question of reducing the price of gas, which is now 2s. 2d. per 1000 cubic feet; and it was resolved that a special meeting should be convened to consider the whole matter. It appears that several points weighed strongly with members in favour of a reduction. One was the satisfactory progress reported by the General Manager of the gas-works (Mr. R. H. Townsley). Another was the fact that, in the course of a month or two, it will be possible, by means of the new appliances at the Meadow Lane works, to produce no less than 23 million cubic feet of gas per day. The quantity of gas made and sold per ton of coal carbonized during the first six months of the present year, is the largest known in the history of the undertaking. From every ton of coal, 10,412 cubic feet of gas were produced, and 9303 cubic feet sold. In the corresponding period of last year, the average amount sold was only 8862 cubic feet per ton of coal carbonized. An encouraging feature is that the rate of progress has been well maintained during the two months that have elapsed since this return was made up.

The draft report on the working of the department during the financial year ended March 25 last was also submitted to the Committee, and was approved. Owing to the awkwardness of the Lady-day date, many of the statistics supplied are for the year ended June 30. For instance, during the period named the quantity of gas sold reached the total of 2,573,691,000 cubic feet, or 40,694,100 cubic feet more than the previous year—an increase of 1·6 per cent. Yet the amount of coal and cannel carbonized was 1033 tons less than in the year ended June 30, 1897—a decrease of 0·36 per cent. The gas made measured 2,849,233,475 cubic feet—an increase of 36,769,717 cubic feet upon the year 1897, or 1·30 per cent. The gas sold per ton of coal amounted to 9152 cubic feet, compared with 8974 cubic feet the year before; and the gas made to 10,132 cubic feet, as against 9965 cubic feet in 1897. New mains to the extent of 19,122 yards were laid during the year; 6057 new meters were fixed; and 7779 meters were exchanged. Meters repaired numbered 6694; the cost varying from 5s. 11½d. to 6s. 0½d. per meter, as compared with 6s. 3d. and 7s. 1½d. the previous year. A resolution of the Committee to have all meters brought in and tested once in ten years is, by the way, now being carried out. The use of gas-engines and gas-stoves, it appears, is growing. There were 723 engines in use in 1897, and 805 in the year just ended, or an increase of 82. Gas-stoves are more numerous by 322; and prepayment stoves, introduced during the past twelve months to the number of 272, are rapidly advancing in favour. Prepayment meters, too, continue



to attract attention; and the number in use has increased from 1500 to 3200. From these particular sources, it is interesting to know, an income of close upon £3000 has been realized.

The revenue account shows a net profit of £24,359 on the year's trading. From this, the sum of £12,127 has been deducted for sinking-fund purposes; leaving a surplus sufficient to increase the reserve to £31,258. The sinking fund in March last amounted to £300,280; and of this £130,412 has been applied to the repayment of debt. The amount invested and ultimately to be applied in the redemption of debt is £169,867. Compared with the previous year, the income from the sale of residuals, &c., has increased by £6175. Expenditure has decreased by £3061 in wages, purification, and repairs; and has increased, so far as the cost of coal is concerned, by £4137. Large additions have, of course, been made to capital account to effect the improvements now noticeable at the several works. The amount of increase, in round figures, is £61,840, which includes £21,000 on the new reformatory-house, £3501 on coal-stores, £4000 on a purifying-house, £2982 on washers, £1131 on stoking machinery and other extensions at Meadow Lane, £8183 on extensions at the York Street works, £5292 on gas-stoves, and £4481 on meters. The average illuminating power of the gas, as shown by the Corporation tests, is 18.25 candles; and according to the City Analyst, 18.18 candles.

#### GAS-WORKS EXTENSIONS AT NELSON.

Major-General Crozier last Tuesday inquired into an application by the Nelson Town Council for the sanction of the Local Government Board to the borrowing of £40,000 for gas-works extensions. The Town Clerk (Mr. R. Prescott) explained that the old Local Board acquired the gas undertaking in 1866; and owing to the growing wants of the district, the Brierfield Gas-Works were purchased for £20,000 in 1888. The statutory limits of supply were increased; and the £40,000 then applied for was for the development of the Brierfield works, which were better situated than those at Nelson. Alderman Wilkinson, the Chairman of the Gas Committee, stated that some of the money applied for had been expended; and an open borrowing clause had been obtained in respect of the gas undertaking. The annual output of gas was 190 million cubic feet, as compared with 6 millions thirty years ago. The storage capacity was equal to 2½ million cubic feet. The price of gas was 2s. 6d. per 1000 cubic feet in the borough, and 2s. 9d. outside. Mr. Pickover, a ratepayer, objected to the proposed expenditure. He thought the rates were getting too high, and that the debt of the borough was too large. He asked what the liability of the borough was; and if the proposed expenditure would lessen the price of gas, which, he contended, was more than it was in a great many towns in Lancashire. In reply, he was told that the rates were 2d. in the pound less than they were four years ago; that the outstanding debt, under the Public Health Act, was £101,505; and that the price of gas was less than it was in most Lancashire towns.

#### THE PUBLIC LIGHTING OF SALISBURY.

##### Gas versus Electric Light.

The Salisbury Town Council, at their meeting last Thursday, considered estimates from the Gas Company and the Electric Light Company respectively for the lighting of the City. The Electric Light Company submitted a scheme which, when compared with the cost of lighting during the past few years, showed a slight saving. But Mr. Norton H. Humphrys, the Manager of the Gas Company, sent in a scheme comprising the replacement of the present No. 5 flat-flame burners with No. 2 Welsbach (new pattern) burners, and No. 4 Welsbachs at the principal crossings, open spaces, &c., that afforded four times as much light for little more than half the cost. The Mayor, in commenting on the tenders, corrected several errors in the Electric Light Company's scheme, and pointed out that it would really cost more than the system at present in use. The Gas Company's scheme represented a saving of £341 per annum; and so he thought there was only one course to take. The offer of the Gas Company was accepted unanimously; but several of the members appeared to think that the reduced price was simply due to the pressure of competition, and did not recognize the fact that the new burners proposed to be used will not consume half as much gas as the flat-flame burners.

#### THE PAST AND PRESENT GAS SUPPLY OF BIRMINGHAM.

It is interesting to record the fact, says the "Birmingham Daily Post," that this is the centenary anniversary of the time when William Murdoch first applied gas lighting for illuminating purposes, on an extensive scale, in Birmingham. Murdoch was the inventor of gas-lighting, and thus became the founder of one of our most useful industries. He was a great public benefactor—how great can only be adequately appreciated by our oldest citizens, who can remember the days when tallow chandlers abounded, when the rushlight was the principal illuminant within the economic means of the working classes, and when gas was an expensive luxury. Those times have happily changed; and now gas is not only rapidly superseding oil and the wick in the humblest households, but more powerful illumination by electricity is gradually taking the place of gas in public buildings and prominent business establishments. What a difference has been effected in the lighting of Birmingham during the past hundred years! The manufacture of coal gas in these days may be similar to that carried on by Murdoch; but the methods of producing it have been immeasurably improved. Man's ingenuity has given us superior buildings, better appliances, improved machinery; and we enjoy the advantage of a more brilliant light at a cost of which our forefathers could not possibly have dreamed.

The first use of gas in London was in 1807, and the first gas company established was in the Metropolis in 1810. Birmingham, strange to say, was very slow to move in the same direction; but private use was made of the invention by several persons. In 1817, Mr. John Gostling erected gas-works, and laid pipes for the supply of gas by agreement with the Street Commissioners, and with private consumers. The first shop lighted was Pulteney's, at the corner of Moor Street, in 1818; but the

streets were not lighted by gas until April 19, 1826. In 1819, Mr. Gostling's business was converted into a company, under the name of the Birmingham Gas Company; and in 1825, the Birmingham and Staffordshire Gas Company was established—the former supplying the town only, while the latter extended its area almost to Wolverhampton. These two Companies remained in existence until 1875, when the undertakings were purchased by the Corporation on behalf of the town. Curiously enough, there are no available records which would enable a comparison to be made of the quantity of gas manufactured and distributed by the Corporation and by the old Companies; but the prices charged are an eloquent testimony to the advantages we enjoy now as compared with the time of our forefathers. From 1819 to 1825, two methods of charging the consumers were adopted—by contract and by meter indication. At first the number of consumers was small; and, according to their agreements, they were expected to turn out their lights within ten minutes of the time specified in the contracts, except on Saturday nights, when they were allowed an extra hour. Argand burners were used, and those who burned gas from dusk until nine o'clock at night were charged £3 10s. per annum if their burners had 16 holes; but if they only had 12 holes, the price was £2 12s. per annum. If the gas was not extinguished until ten o'clock, the prices were £4 10s. and £3 8s. respectively; eleven o'clock, £5 10s. and £4 4s.; and twelve o'clock, £6 10s. and £5. This scale was in respect to six days a week; but if the seventh day was contracted for, the prices were proportionately higher. When the meter system was solely adopted, the consumption was the more easily checked, and the scale of charges was altered. In 1825, the price was 15s. per 1000 cubic feet, less 5 per cent. discount for prompt payment; but it was subsequently reduced to 12s., and in 1834 to 10s. per 1000 cubic feet. In 1837, a scale was introduced whereby the consumers of less than 5000 cubic feet of gas paid 9s. 2d.; less than 25,000 cubic feet, 8s. 4d.; less than 75,000 cubic feet, 7s. 6d.; and above this quantity, 6s. 8d.—a discount of 7½ per cent. being allowed in each case. As years rolled by, the scale was frequently revised, invariably in favour of the consumer. In 1850, the price varied between 5s. 6d. per 1000 cubic feet for a consumption under 10,000 cubic feet, and 3s. 6d. for a consumption of 200,000 cubic feet and upwards; the discount being 5 per cent. In 1873, the price was 2s. 7d. for a consumption of 25,000 cubic feet and under, and 2s. 3d. where the consumption reached 100,000 cubic feet. Then, in consequence of the prosperity of the times, higher wages, and dearer coal, the price was slightly raised; and when in 1875 the Corporation acquired the undertaking, the charges ranged from 3s. to 3s. 6d. per 1000 cubic feet, with a discount of 5 per cent. The next year the price was reduced 3d.; and other reductions were subsequently effected until 1887, when the scale ranged between 2s. 3d. and 2s. 7d.—prices ruling to-day.

Though it is not possible to compare the development of the undertaking under the Corporation with the business done by the old Companies, the growth of the Gas Department will be apparent by contrasting the first year under municipal government with that which expired in March last. In 1875, the bulk of coal carbonized was 296,000 tons, but last year it had risen to 509,481 tons; and whereas the quantity of gas sold and used in 1875 was, in round figures, 2327 million cubic feet, last year the total had reached the enormous amount of 5074 millions. The surplus profit in 1875 was £25,339; and last year, £50,336.

#### END OF THE SOUTH WALES COAL STRIKE.

##### The Terms of Settlement.

A joint conference of the South Wales Coalowners' Emergency Committee and the Workmen's Provisional Committee was held at Cardiff last Thursday; this being the time limit of the employers' ultimatum issued on the previous Saturday. The men at their meeting on Wednesday virtually decided, by 61,912 votes against 37,077, to accept the masters' terms. The members of the Workmen's Provisional Committee arrived at Cardiff early in the day, and held a private consultation under the presidency of Mr. W. Abraham, M.P. The Owners' Emergency Committee also held a separate conference—Sir W. T. Lewis presiding. Soon after eleven o'clock, the two sides met, and the subject of the monthly holiday was first debated. The owners adhered to their refusal to sanction the continuance of the holiday; and eventually "Mabon," on behalf of the workmen, offered to forego it conditionally upon a play week being granted once a year in summer. The owners declined to accept this. Sir W. T. Lewis was particularly emphatic on the point; declaring that the holidays must be abolished, as they had entailed great loss and inconvenience to the employers in the past. About four o'clock in the afternoon, a decision was arrived at, and an agreement was signed by eleven of the men's representatives to return to work, on the masters' terms, on and from Sept. 1. Interviewed at the close of the conference, "Mabon," in a message to the miners, said the day had ended with terrible disappointment for all of them. It had been a fearful fight all day. They must accept the inevitable, and prepare to organize for better things. All that could possibly be obtained had been secured. Mr. P. D. Rees, one of the Workmen's Committee, who seceded, intimated that he had refused to sign the agreement because, in his opinion, the terms offered by the owners were not a whit better than those against which the men came out five months ago. The 12½ per cent. was no minimum at all. His advice to the workmen of South Wales was to organize as soon as possible, and then join in a strong body the Miners' Federation.

Late on Thursday night, official reports of the proceedings were issued. The owners' version stated that it had been agreed that work should be resumed at the associated collieries on and from Sept. 1 upon the following terms: (1) The terms and conditions of the sliding-scale agreement (known as the "old scale"), which terminated upon March 31 last, shall, together with clause 3 of the agreement of Feb. 17, 1893, be embodied in an agreement, which shall continue in force until the 1st day of January, 1903, and may be determined by six months' notice on either side, to be given on July 1, 1902, Jan. 1, 1903, or any other following July 1 or Jan. 1. (2) The monthly holiday known as "Mabon's day" shall be abolished, and no other holiday of a like nature will be permitted. (3) The wages payable up to Nov. 30, 1898, shall be 17½ per cent. above the standard of December, 1879. (4) An audit of the selling prices shall be taken for the two months ending Oct. 31, 1898, to regulate wages as from



Dec. 1, 1898, in accordance with clause 12 of the 1892 agreement. (5) If after the 1st day of September, 1898, the employers, by the very nature of this agreement, reduce the wages of the workmen below 12½ per cent. above the standard of December, 1879, the workmen shall have the right of giving six months' notice to terminate this agreement on the 1st day of any January or July next ensuing, notwithstanding the first clause of this agreement. The workmen's official report stated that the Employers' Emergency Committee agreed that all the workmen should be reinstated in their former employment as far and as soon as practicable. At a special meeting of the Coalowners' Association, the agreement was unanimously ratified. General satisfaction was expressed at the termination of the dispute, and at the resumption of friendly relations with the men.

### ELECTRIC LIGHTING NOTES.

It is reported that the Local Government Board have declined to sanction the borrowing by the Bury St. Edmund's Corporation of £20,000 for an electric lighting installation. It will be remembered that the application to the Board was strongly opposed by many ratepayers at the recent inquiry.

The Barnsley Town Council last Tuesday sanctioned an increase from £23,322 to £25,000 in the amount to be borrowed for the carrying out of the proposed electric lighting scheme. Remarking upon the suggested increase, the Mayor (Alderman Wray) said it was "believed" that they would be able to construct the works according to the estimates; but it would be unwise to apply to the Local Government Board for the exact sum they would want.

We learn from the "Electrician" that the municipal installation of electric lighting in Brussels comprised on the 31st of December last three stations, of a total power of 1650 kilowatts. The total length of streets was 40 kilometres, an increase of 22·6 per cent., with a development of cables of 226 kilometres. The number of consumers was 739. The number of lamps installed, reduced to units of 16 candles, was 47,391 (an increase of 28·8 per cent.), or a mean of 117 lamps per metre run of main. In this number are included, according to their value in units of 16 candles, 770 arc lamps and 28 motors. The maximum output during the year 1897, up to Dec. 23, was 8765 ampères, corresponding to about 17,530 16-candle lamps working simultaneously, or 37 per cent. of the number of lamps installed. The net profit was 222,411 frs. (£8896), or 4 per cent. on the cost of first establishment.

In the minutes submitted by the Electric Lighting Committee at the meeting of the Bury Town Council last Thursday was a report by the Borough and Electrical Engineers as to the manner in which the electric light undertaking had increased its scope. The report showed that while in March, 1897, 41 consumers used 2481 lamps, in August of this year 101 consumers had in use 6788 lamps. To the latter figures must be added a further 1725 lamps for which applications have already been received; making a total of 8513, and leaving a balance of 1487 to make up the full complement of 10,000 8-candle power lamps—the estimated total capacity of the present plant. The borrowing powers—£30,000—were almost exhausted, as there had been expended up to the end of July last above £28,000; while authority had been given to spend another £4000 on mains. The Committee had resolved that plans and estimates for an extension of the plant should be prepared, and that the Town Clerk should make application to the Local Government Board for power to borrow £20,000 to carry out the necessary works. The minutes were confirmed.

In their anxiety to secure at the earliest possible moment all the advantages attributed to electric lighting, the Redditch District Council have commenced the construction of works before obtaining the consent of the Local Government Board to the borrowing of the necessary loan. Their application for permission to borrow £11,000 for the installation, and £2500 for the land required, only came under the consideration of Mr. R. H. Bicknell, one of the Board's Inspectors, last Wednesday; and he felt it his duty to inform the Council that, by their premature action, they ran a very serious risk of not having the loan granted. It was submitted in support of the scheme that for a long time it had been felt that the public lighting ought to be in the hands of the Local Authority; but this was not practicable with gas, under existing conditions. The quality of the gas for many years had not been of the best; and the average price had been 4s. per 1000 cubic feet. The population of the district had largely increased of late; and, as the result of a canvass of the town, promises to take more than 3000 lamps had been made. It was also believed that electricity would be largely used by manufacturers for motor purposes.

Petersfield, in Hampshire, is not a very large, and possibly not a very wealthy, place; but a certain section—apparently a small one—of the worthy inhabitants appear to be anxious to spend their money on an electric lighting scheme. The District Council last June called in Mr. A. H. Preece, whose report recently came before the Council at what is reported to have been one of the longest meetings on record. The document had been previously considered by the Lighting Committee, who recommended, in accordance with the advice of the Engineer, the Council to proceed for a Provisional Order; and the Vice-Chairman (Mr. Cross), who is pushing the electric light question, gave notice that, at the meeting of the Council on the 22nd inst., he would move the adoption of this recommendation. The number of public lamps in the town is 91; and Mr. Preece suggests that they should be replaced by 4 arc lamps of 1000-candle power, 45 glow lamps of 32-candle, and 30 of 16-candle power; while with regard to private lighting, he thinks it would be sufficient to allow for 1000 lamps of 8-candle power fixed, with about 750 burning at one time. He reckons for a capital outlay of £3750, an annual income of £811, and an expenditure of £783—leaving a balance of £28. The income includes £500 for private lighting, which he says is only one-third of the present income of the Gas Company from private consumers; but he thinks there can be no doubt that, in many of the new houses now being erected, a large supply of electric light will be required. The estimated income is based on a charge of 7d. per unit, or, as Mr. Preece originally put it, "equivalent to gas at 4s. per 1000 cubic feet," as compared with the winter charge of 5s. at Petersfield. The 4s., however, was subsequently stated to be a clerical error for 4s. 8d.; and it appears that since 1895 the winter charge for gas has been 4s. 6d. Gas, therefore, has the advantage on the score of price. Comparing gas

and electricity light for light, Mr. Preece says an ordinary 5-foot burner gives, as a rule, 12-candle power, and therefore 1000 cubic feet of gas will afford 2400-candle power. A unit of electricity will give 300-candle power in ordinary electric lamps, and 8 units will thus furnish 2400-candle power. The report was very sharply criticized by Mr. Burley, who pointed out the absurdity of taking 12 candles as the light-giving power of a 5-foot burner, whereas the minimum was 14 candles, and the usual quality of gas in Petersfield 16 candles. He informed his fellow members of the Council that, by putting on an incandescent burner, they would obtain from the 5 cubic feet of gas from 60 to 100 candle power—a very different thing from 12 candles. Mr. Preece took electricity at 7d. per unit in order to compare it, price for price, with gas as he assumes it to be at Petersfield. But even if they compared it with incandescent light, which would be at least double, they would get electricity compared with gas at 8s. or 9s.; or, to take it in another way, the price of gas at Petersfield would be half the cost of electric light on his basis. How, he asked, did Mr. Preece get 7d. per unit? He threw in £500 as income from private consumers. He (Mr. Burley) thought they could not, as reasonable beings, expect such a large income; it was absurd on the face of it. If the Council were going in for providing the electric light for private consumers, they had no right to spend the ratepayers' money in such a direction unless they could make sure of a return; and he contended that the balance-sheet showed that they would make a loss. Was it on account of street lighting? If so, he maintained that they were not justified in proceeding with it until they had asked the Gas Company if they were prepared, light for light, to supply the town at the same or a less cost than Mr. Preece showed electric light could be provided for. The Gas Company had endeavoured to meet the Council in every possible way, and had offered to hand over the whole thing to them, and supply gas at the low rate of 3s. 9d. per 1000 cubic feet, in order that the town, through its representatives, might have entire control of the lighting—the Council simply taking the lanterns and columns at a valuation. He trusted they would pause before embarking on this great outlay. We cannot follow Mr. Burley in his criticism of the various weak points in Mr. Preece's report. Suffice it to say that he made out a very good case against the projected scheme; and he has held his ground in the newspaper correspondence which has followed his able defence of gas at the meeting of the District Council. Why, it may well be asked, should Petersfield wish to sink money in an electric light undertaking on such a balance-sheet as the one presented, when they have at hand the means of improving the public lighting, if they wish to do so, by the aid of incandescent gas-burners? If they were urged on by a clamouring crowd imperatively demanding the electric light, matters would be different. But this is not the case. The project does not appear to be very cordially regarded by the ratepayers, for they are pretty generally signing a petition to the Council against it. Mr. Burley, at the recent meeting of that body, reminded the members that the question of gas *versus* electricity had been gone into thoroughly by the Winchester Town Council, who had decided in favour of gas; and we may add that, as will be seen from a report which appears in another part of the "JOURNAL," the Salisbury Town Council have unanimously accepted the scheme for public lighting submitted to them by Mr. Norton H. Humphrys, the Gas Company's Engineer, in competition with the Electric Light Company. The examples of Winchester and Salisbury may be safely commended to the District Council of Petersfield.

### COAL IN THE EAST.

In view of the fact that the East, and especially the Far East, has for some little time been a subject of special attention by Europeans, to say nothing of the inhabitants of the Colonies and the great American continent, the following article, reproduced from "Engineering," dealing with the East as a coal supplier, may not be without interest to our readers:—

It is almost a commonplace to say that the production of coal and iron in any country determines the position of that country among the countries of the world. Probably in the future, as we become more acquainted with the forces of Nature, this may not be true to the same extent as it has been in the past; but we may rest assured that for many a day a cheap supply of coal and iron will be the most important factor in determining the extent and importance of the industrial operations in any part of the globe. If any proof were wanted in support of this opinion, it would be supplied by a recent report of the Board of Trade. The figures therein given show us that other nations, and notably the United States of America, are pressing us very hard in supplying coal to those nations which require it, and may, indeed, be able to import it into Britain at a price which would enable it to compete with British coal. The average value of coal at the pit's mouth in the United States for the year 1896 was only 4s. 9½d., whereas in the United Kingdom it was 5s. 10½d. The latter, of course, has the advantage in shipping facilities; but these figures are sufficient to show us that in the future we must expect severe competition in our coal trade from the United States. Probably the majority of those who are interested in the subject, or even have studied it from a statistical point of view, will admit the truth of what has been said about the United States, for the facts are well known and cannot be denied; but comparatively few, as yet, recognize the extent and amount of the competition in the coal trade which is growing up in other parts of the world. We recently showed that the Germans have been able to displace us in many of the European markets which we formerly supplied; but meantime we do not propose to make a general survey of the whole subject, but only to glance at the question of coal supply in the East, and consider how it is likely to affect industry and trade, and our relations to them.

Of all the countries in the East, Japan is the one which has attracted most attention on account of its industrial development and the probability of competition with British manufactures. But it does not seem likely ever to become a very important factor in coal production, because so far as is known, the coal deposits are not very extensive, and a great part of what is produced will be used up in the industries of the country. In 1883, the total production of coal in Japan was a little more than



1,000,000 tons, while in 1895 it was nearly 5,000,000 tons. The average market value at the first of these dates was 8s. 8d., while at the latter it had decreased to 5s. Within the past year or so, the price has considerably increased on account of the demand for home and foreign use. In 1883, the amount of coal exported from Japan was 390,000 tons, whereas in 1896 it had increased to 2,194,000 tons, chiefly, we understand, to China, Korea, Hong Kong, Burmah, the Philippine Islands, and California. The amount of British coal imported into Japan in 1883 was 9000 tons, whereas in 1896 it had risen to 49,000 tons, confined almost entirely to Welsh steam coal. Directly, therefore, the increase in the production of coal in Japan has not affected the British coal trade with that country; but indirectly the amount exported has, in many parts of the Far East, practically extinguished it. Moreover, when the coal deposits of Formosa, which are said to be considerable, have been developed, the competition from the Japanese will be greatly increased. Last year about 10,000 tons of coal were produced in Formosa. But that is only a fraction of the possible output; and we may rest assured that the Japanese do not intend any of the natural resources of Formosa to lie idle.

The coal production of China has hitherto been so insignificant that it is treated as a quantity which may be neglected in the report of the Board of Trade. The coal resources of China, however, appear to be immense, and if the one which we recently mentioned be a fair specimen, it is evident that China is destined to become a great industrial country. That one coalfield alone is said to be sufficient to supply the world, at the present rate of consumption, for more than 2000 years. It is certain that the Syndicate which has obtained such a valuable concession will waste little time in making the most of it. Indeed, it is already reported that the same Syndicate has obtained another concession in the province of Ho Nan to work the coal and iron mines in that region for a period of sixty years. The concession includes the right to construct the necessary connecting railways with the works to be undertaken by the same Syndicate in the province of Shan-si. It is stated on good authority that coal is found in every province in China; and when railways are constructed, the abundant cheap labour of the country will be attracted to the new industry, which, with all its attendant results, is certain to bring about many changes in the commerce and social conditions of China.

The Russians have now got hold of the resources of Manchuria, and when the Trans-Siberian Railway and its connecting lines have been completed, there will be an immense industrial development in that part of the world. Some time ago, an Imperial Russian Commission investigated the coal deposits along the line of that railway; and they reported that they had discovered upwards of fifty groups of workable coal seams. Their results have been confirmed by an American Commission sent out to investigate the subject; for the Americans are not by any means content with the vast resources of their own country, but seem to have their eyes on all quarters of the globe. With the development of the resources of Manchuria and of the Yangtze Valley, it is impossible to form any idea of the industrial and commercial changes which are likely to take place.

British India is rapidly increasing her production of coal. In 1883, it was 1,315,976 tons; while in 1896, it had reached 3,848,013 tons. The quantity of coal imported into India in 1883 was 712,900 tons; whereas in 1896, it had decreased to 494,960 tons. On the other hand, 136,719 tons were exported from India in 1896; so that it is safe to say that in a comparatively short time India will practically have ceased to buy coal from us. Indian coal is said to be specially adapted for steam raising; and some of it is reported to be as good as Welsh coal for this purpose. There is also a possibility of French Indo-China coming into direct competition with the coal of India in some of the Eastern markets. But the resources of that country are small compared with China proper; and capitalists are certain to put their money into coalfields which offer the best prospects.

The supplies of coal from Japan, British India, and China must cause the trade in coal between Australasia and the Far East to diminish, and ultimately to disappear; and already the competition is becoming very keen, so that the coal trade in the British colonies is exposed to the same difficulties as those which beset the mother country. In a recent article, containing a summary of the report of the Board of Trade, the "Statist" gave the following table showing the present annual coal-producing capacity of the Pacific and the Far East:—

|                                                                                                  | Tons.      |
|--------------------------------------------------------------------------------------------------|------------|
| British India . . . . .                                                                          | 4,500,000  |
| Japan . . . . .                                                                                  | 5,000,000  |
| Australasia . . . . .                                                                            | 6,000,000  |
| China, Formosa, Indo-China, Dutch East Indies, Borneo, and Eastern Siberia . . . . .             | 4,250,000  |
| British Columbia . . . . .                                                                       | 1,000,000  |
| Chili . . . . .                                                                                  | 500,000    |
| Natal and Transvaal (whose outputs are available for the Indian Ocean). . . . .                  | 1,750,000  |
| Total . . . . .                                                                                  | 23,000,000 |
| Exports from the United Kingdom to east of the Cape of Good Hope and west of Cape Horn . . . . . | 1,700,000  |
| Grand total of consumption . . . . .                                                             | 24,700,000 |
| Or (say) 25,000,000 tons.                                                                        |            |

Of this amount about 50 per cent. comes from British possessions; but when the sources of supply we have mentioned are developed, it is probable that the proportions may be very much changed, and, moreover, that not only will the demand for British coal be diminished in the countries of the Far East, but also that the competition in the other markets of the world will be intensified. This possibility should be carefully remembered by all concerned.

**Advance in the Price of Coke.**—A Yorkshire paper reports that there is almost a coal famine in Staffordshire. This time last year, our contemporary remarks, gas coke was a drug; but now it is scarcely to be obtained at any price. The cause is understood to be the great activity in the district industries, combined with the Welsh strike. A marked advance has taken place in prices. While contract rates are 8s. 6d. to 9s. per ton, quotations for current deliveries have increased to 12s., and may go still higher. Blast-furnace coke has advanced to 15s. and 16s.; and foundry, to 18s. to 20s.

THE DRY WEATHER AND THE WATER SUPPLY.

The Curtailment of the Supply at the East-End.

Continuing our record of the most noteworthy events, as far as readers of the "JOURNAL" are concerned, in what is persistently called, by a certain section of the Press, the "Water Famine" at the East-end of London, the first matter to be noticed is the inspection of the East London Water Company's reservoirs by the General Purposes Committee of the Hackney Vestry on the afternoon of the 27th ult. Permission to do this had been readily accorded by the Company; and about twenty members of the Vestry availed themselves of the opportunity of personally ascertaining the exact state of affairs.

They were first of all conducted over several of the Company's extensive reservoirs by Mr. J. V. Jeffree, the Resident Engineer. Roughly speaking, the reservoirs and works of the Company cover the whole of the eastern bank of the River Lea from Clapton to Tottenham—a distance of more than two miles; while the width averages half a mile. In this area the Company have nine reservoirs capable of storing 12,000 million gallons of water, the actual water area of the reservoirs being 280 acres. Mr. Jeffree first conducted the party to the Lower Maynard reservoir, near the Ferry Boat Inn, Walthamstow. The first stop was made at the culvert through which the water obtained from the wells at Waltham and from the upper reaches of the Lea passes from the upper to the lower reservoirs. The depth of the water flowing through this culvert was not more than 9 inches; but it was said that when the reservoir is full the depth is 25 feet. Mr. G. Chambers, the ex-Chairman of the Hackney Vestry, measured the distance of the water from the bank of the reservoir, and said it was 60 feet. It was stated that the depth of the water then in the reservoir averaged 4 feet; but the appearance of great banks of weeds in the centre indicated that the bottom was not far off. The reservoir was practically empty. On the west side of this reservoir, Mr. Jeffree pointed out the open aqueduct belonging to the Company which brings water from the Lea direct to the filter-beds. The stream in this aqueduct seemed to be practically dried up; but Mr. Jeffree said it brought down several million gallons of water a day. Continuing the walk, the party soon reached the Upper Maynard reservoir, at the head of which the water for storage is received. The culvert here was all exposed to view, and the water was falling from the apron over the rough stone ledges to the bed of the reservoir. The insignificance of the quantity coming in was disheartening to those who are feeling the pinch of the present scarcity. Returning to the starting-point, the party were conducted to other reservoirs on the Walthamstow marshes; but these were practically in the same state of emptiness, for the water was far below the culverts, and the bottom was exposed in the very centre. The most depleted in appearance was the largest of the new Warwick reservoirs, which were added a year or two ago. Here the bottom was exposed for acres; but Mr. Jeffree accounted for this by saying that the ballast had been unequally laid, and that the water-level of all the reservoirs was practically speaking the same.

One fact impressed the whole of the party—namely, that while the Company possess ample storage accommodation, they are unable to find water enough to fill the reservoirs. Mr. J. W. Whiter suggested to Mr. Jeffree that the Company should seek other sources of supply. Mr. Jeffree replied that they were now engaged in sinking wells; and he took the party to a spot where one was being sunk into the chalk about 200 feet below the surface. The well was not more than half completed, but it was yielding a million gallons of water a day. Some distance farther on the party were conducted over a completed well and engine-house. Here two engines raise between them 4 million gallons daily. Five million gallons are thus raised every day on the Company's own land. These two wells are only part of a scheme which is being carried out; the ground being tunnelled in all directions from a winding shaft, at the top of which the roar of rushing water 200 feet beneath could be distinctly heard. At this point rain, which had been falling in slight showers during the afternoon, came down in torrents; and it was decided to bring the visit to a close. Mr. Whiter, as Chairman of the Committee, thanked Mr. Jeffree for the courtesy he had displayed in showing the members over the works, and expressed a hope that the rain would continue, and put an end to the scarcity of water. On the way to the station at Walthamstow, the party saw the Racecourse reservoir and its companion on the other side of Copper Mill Lane—probably the two largest reservoirs the Company possess—and both were in the same depleted condition as the others. The heavy rain was very welcome in East London, and gave the sewers a much-needed flushing. The quantity which fell, however, had no appreciable effect on the stream in the River Lea; the ground being too parched to allow much water to find its way into the river.

The foregoing description shows the effect of the drought on the River Lea. It may be interesting, in connection with it, to give a few figures as to the nature and extent of that drought, furnished by Mr. G. J. Symons, F.R.S., the eminent meteorologist, which are quoted by the Special Correspondent of "The Times" who is investigating this question. And here it must be acknowledged that the leading journal is showing, as on previous occasions, its desire to present to its readers, and place on record for all time, a true and faithful account of the present difficulty. Mr. Symons shows that the rainfall recorded at his house in Camden Square for the past eleven months has been 15.31 inches, as compared with 23.57 inches, the average for the past ten years; being a deficit of 8.26 inches. At Broxbourne the deficit has been 8.41 inches; and at Southgate, 9.61 inches. The effect on the Lea is shown by the following figures, giving, in millions of gallons, the daily flow in each month in the past two years:—

|               | 1897-8. |               | 1896-7.  |
|---------------|---------|---------------|----------|
| Sept. . . . . | 35 ..   | March . . . . | 36 ..    |
| Oct. . . . .  | 28 ..   | April . . . . | 23 ..    |
| Nov. . . . .  | 25 ..   | May . . . .   | 28 ..    |
| Dec. . . . .  | 35 ..   | June . . . .  | 23 ..    |
| Jan. . . . .  | 48 ..   | July . . . .  | 15 ..    |
| Feb. . . . .  | 26 ..   | Aug. . . .    | 10-12 .. |
|               |         |               | 29       |

"Could anything," asks "The Times" Correspondent, "be more eloquent



than these columns?" He compares them with the two previous years of scarcity:—

|               | 1895.                     | 1896. | 1898. |
|---------------|---------------------------|-------|-------|
| April . . . . | 63 ..                     | 52 .. | 23    |
| May . . . .   | 44 ..                     | 28 .. | 28    |
| June . . . .  | 24 ..                     | 22 .. | 23    |
| July . . . .  | 26 ..                     | 18 .. | 15    |
| Aug. . . .    | (End of )<br>(drought) .. | 17 .. | 10-12 |

These figures seem to the compiler to show that "the Lea can no longer be relied upon as the principal asset in the East London Company's resources, and that consequently the calculations on which the Royal Commission based its finding must be reconsidered." The figures include the water brought from the New River Company. The writer referred to thinks the only hope—apart from copious rains—is that they may be able to spare a little more before long or that assistance from elsewhere may become feasible. And this is the situation in which consumers are deliberately wasting water in order to compel the Company to resume the constant service. He asks: "Can folly and wickedness go further?"

While on the subject of the cause of the present scarcity of water, let us hear what an authority on underground water supplies has to say on the matter. Writing to "The Times" last Tuesday, Professor Boyd Dawkins said: "In the present excited state of public opinion, caused by the want of water in the East-end, it will not be inopportune to review the facts as they are presented, without prejudice, to an outsider. It is so much easier to throw the blame on the East London Water Company than to go further and inquire into the reasons of the failure, that the public bodies interested have, with scarcely an exception, adopted the former course. The facts are these: The exceptional deficiency of rainfall, not merely during the last twelve months, but following an equally exceptional series of dry years, hitherto unknown in the annals of water supply, is the main cause of the deficiency. This deficiency has been aggravated by the abnormal heat of the last month, which has caused increased evaporation from the reservoirs and surface streams generally. It is obviously unfair to expect the East London Water Company to have anticipated this combination of circumstances, because they have never before come within the limits of engineering experience. It is difficult to see how any public body such as the Railway and Canal Commissioners, or even the London County Council, could have foreseen and guarded against meteorological conditions unknown up to that time. Under the circumstances, it was absolutely necessary to diminish the supply of water through the mains in the interest of everybody in the district. Looking at these exceptional conditions, it seems to the writer, after a study of London Water Supply for thirty years, little less than a miracle that the Water Company should be able to provide as much as 25 gallons per head (26 gallons on Aug. 24)—a quantity that is found sufficient for daily use in many other places, and that certainly does not imply anything of the nature of a 'water famine.' This is really due to the absence of the means of storing water among the poorer classes, who allow it to flow through their midst and largely to waste. With the provision of these, the water famine will cease. They are now being provided as fast as possible by the Water Company and the various Local Authorities. What more could be done? There is an important lesson to be learnt from this difficulty with regard to the future relating to an increased supply and increased facilities for distribution. The New River and Kent Water Works Companies have come to the aid of the East London Company by passing on to them their surplus water. The first of these is supplied largely, the second entirely, with water from deep wells in the chalk, in which the storage of water is so vast that the yield is not materially affected even by the existing drought. The last is dependent mainly upon surface waters, and draws upon the chalk water only to a limited degree. The large supply from the deep wells of the first two stands in striking contrast to the want of water of the last Company. It justifies the conclusion of the Royal Commission on Water Supply of 1893, that there is a large quantity of water in the chalk available for the future supply of London. It is obviously desirable, further, in the interest of the consumers, that the mains of the various Water Companies should be linked together, as in the case of the above three Companies, so that the surplus water of one may be used to supply the deficiency of another." This suggestion of effecting connections between the mains of the Companies was under the consideration of the Official Water Examiner for the Metropolis (Major-General Scott) and the Local Government Board early last week; and negotiations were on foot to carry it into effect. General Scott and Dr. Bruce Low have been in the affected district every day since the first curtailment of the supply.

Resuming the general record of the progress of events, the first meeting of the Joint Committee of the General Purposes and the Public Health Committees of the Hackney Vestry, which is charged with the duty of seeing that the public are put to as little inconvenience as possible during the present short supply of water, was held on Monday last week at the Hackney Town Hall—Mr. Whiter presiding. It was reported that the East London Water Company had sent a large supply of jars on the previous morning, and that the distribution had been continued throughout Sunday and up to eight o'clock on the following evening. During Sunday and Monday, 36,000 gallons of water had been supplied in the water-vans belonging to the Vestry, together with 1326 jars. A Joint Sub-Committee was appointed to carry out the Vestry's reference. After a long discussion, it was decided to invite each Local Authority served by the Company to appoint six delegates to attend a conference on the subject of the water supply for East London, to be held at the Hackney Town Hall on Sept. 15. The Solicitor reported that the complaint to be lodged with the Railway Commission was nearly ready for presentation. He was asked when the matter would be heard; and he replied that he was afraid the procedure would be a long and tedious one.

On Tuesday evening, a meeting was held in the Great Assembly Hall, Mile End, for the purpose of protesting against the action of the Water Company. Mr. Stuart, M.P., was in the chair. Among the letters read was one from Mr. F. N. Charrington, who hoped the meeting would "insist on the Government compelling the Company to avail themselves of the help of other Companies." Mr. Buxton, M.P., said the whole water supply of London should be under one representative body. The Government should be forced (in accordance with their repeated pledges) to deal with the London Water Question next session. Meanwhile, it was to be hoped that if the Company applied for the full water-rate where

they had not supplied the water, their demands would be met with a refusal. The Chairman said that for five years the East of London had almost yearly been destitute of water, because the Company would not exercise the power of purchasing it. The mains of other Companies formed a network all over London, and it was easy to connect them. If the Company liked to sacrifice a small portion of their dividends, they might easily connect themselves at twenty or thirty points with other Companies. Either at the Isle of Dogs or at Woolwich the Company could, at a small expense, connect themselves with the Kent Water Company, and by this means get an additional supply of 3 or 4 million gallons of water a day. The New River Company could give them more water than they did if they were connected with other Companies who had a surplus; and the Chelsea Company had 10 million gallons to spare, if they would only go to the expense to get it. The Company ought to be compelled by Act of Parliament to make such connections. There was a wider question at the bottom of all, and that was the independence of the Water Companies of any supervising authority. What they required was that they should be under the supervision of one central authority. If this were done, it would be an impossibility to have a dearth in any one part of the Metropolis; and until it was done, they would never see the water properly distributed. London's voice would be heard on this matter; and they must take care that the Government did not forget the water question. The following resolution was passed: "That this mass meeting of inhabitants of East London emphatically protests against the arbitrary action of the East London Water-Works Company in again reducing the supply of water to over a million people; thus causing not only a serious inconvenience, but grave danger to life and health." It was also resolved—"That, in the opinion of this meeting, it is of absolute necessity that the water supply of London should cease to be dealt with by monopolists, and at once placed in the hands of the London County Council, as representing the people of London."

A satisfactory arrangement which will materially help the Water Company in their present difficulty was completed on Tuesday. At six o'clock on the evening of that day, the New River Company increased by 2 million gallons the bulk of water allowed by them to flow down the River Lea to the intake of the East London Company; bringing up the quantity thus furnished to 6 million gallons. Furthermore, an agreement has been come to with the Southwark and Vauxhall Company for a connection with their mains by means of a 20-inch pipe to be laid, with the sanction of the General Hydraulic Power Company, in the Tower Subway. This, when completed, will be capable of delivering 5 million gallons of water daily; and it is understood that a district on the north side of the river will be isolated, and supplied entirely from this source. The pipe will be taken down a vertical shaft 58 feet deep, then turned at right angles, carried 1400 feet along the subway, and then up the shaft at the other end.

The President of the Local Government Board (Mr. Chaplin) arrived in London on Wednesday, and was engaged throughout the day at the offices of the Board. The Official Water Examiner reported on the state of the water supply at the East-end; and subsequently the following letter was sent to the Secretary of the Water Company by Mr. H. C. Munro, one of the Assistant-Secretaries of the Board:—

Sir,—I am directed by the Local Government Board to state that the President has had before him this morning the report of Major-General Scott, R.E., to the Board, referring to the steps which are being taken by the Directors of the East London Water Company with a view to obtaining a supply of water for their district from other Metropolitan Companies.

The Board have learnt with satisfaction that a connection has already been effected with the pipe system of the Kent Company through the Blackwall Tunnel, and that arrangements are in progress for connecting the system of the East London Company with that of the Southwark and Vauxhall Company through the Thames Subway, by which means it appears that a supply will be obtained from the reservoirs of the latter Company for use in the East London district.

General Scott has also informed the Board that the Directors of the New River Company are willing to receive water into their district from the Grand Junction Company, by means of a pipe connection suggested by their Engineer, with the object of releasing an additional quantity of Lea water for the use of the East London Company's district. General Scott reports that this project is quite feasible, and that it is very important that, as one means of increasing the supply which is urgently required, it should be carried out at the earliest possible moment.

The Board are aware of the additional storage works which are now in contemplation by the Company; but, having regard to the time which must elapse before such storage can be provided, it is urgently necessary, apart from the serious emergency which has now arisen, that every possible means of increasing the supply, at least in the meantime, should be adopted.

The Board feel assured that the Directors will realize the necessity for the adoption of the scheme referred to as one means of increasing the supply of the Company; and they trust that the necessary arrangements for the purpose may be made forthwith, so that the works may be completed as speedily as possible.

The Joint Committee of the General Purposes and Public Health Committees of the Hackney Vestry met at the Town Hall, and arrangements were made for meeting a further curtailment of the supply which was expected to be announced. During the day 200 jars were supplied and 24,900 gallons of water distributed. Six of the water-vans were employed until ten o'clock at night. A circular was ordered to be sent to the Clerks of the various Local Authorities in East London, inviting them to appoint representatives at a conference to be held on the 15th inst., "to take into consideration the failure of the East London Water-Works Company to fulfil their statutory obligations."

Last Thursday, owing to the continued absence of rain, the Directors of the East London Water Company were compelled to announce that, as from the following Saturday, the hours of supply would have to be reduced from three to two in the morning and afternoon respectively; bringing down the period during which the water would be on from six to four hours in the day. In making the announcement, the Company's Secretary (Mr. I. A. Crookenden) expressed, at the desire of the Directors, the earnest hope that the various Local Authorities would see the necessity of at once discontinuing road watering, inasmuch as the great draught of water for this purpose so reduced the pressure as to prevent the higher cisterns being reached during the two periods of daily supply. The Directors deeply regretted this necessity, but there was no help for it, owing to the unexampled deficiency of rainfall; and they left it with the authorities to use their great influence in their district to caution the



consumers, and prevent in every possible way misuse and waste of water which unhappily exist to a very large extent. A communication was addressed to all the Sanitary Authorities within the Company's limits of supply by Sir Hugh Owen, K.C.B., the Secretary to the Local Government Board, in the following terms: "I am directed by the Local Government Board to state that, from the information which they have received, they have no doubt that, notwithstanding the deficiency of water which unfortunately exists in the district of the East London Water Company, there is a large waste of water in the district; the waste being in some cases wilful, and in others the result of carelessness. The Board deem it right to draw special attention to the matter; and they feel sure that, in the interest of the public health, apart from any other consideration, the Local Authorities will assist, as far as possible, in impressing upon the water consumers the urgent necessity for avoiding all waste of water under the circumstances which at present exist in the district."

In addition to the auxiliary supply from the New River Company, and the promised supply from the Southwark and Vauxhall Company, the Directors of the East London Company last Thursday instructed their Engineer to proceed to carry out a suggestion made by the Local Government Board to effect a connection between the Grand Junction Company's mains and those of the New River Company, so that the latter Company may pass down to the East London Company, through their Lea intake, the quantity of water equivalent to that which the Grand Junction Company can supply to them. The East London Company hope to get another 4 million gallons a day by this means. The figures issued by the Company showed that during the first three days of the week 105 million gallons of water had been pumped into the district, or at the rate of from 25 to 26 gallons per head per day. To supply this quantity, the Company drew on their reserve for about 12 million gallons.

Last Friday, Mr. Crookenden addressed to Sir Hugh Owen the following letter in reply to the communication sent from the Local Government Board on Wednesday:—

Sir,—I submitted to my Directors yesterday your letter of the 31st ult., in which you were kind enough to express your appreciation of the efforts being made by the Directors to obtain auxiliary supplies of water during the present unexampled drought. The Directors have instructed their Engineer to immediately confer with the Grand Junction and New River authorities, with a view of forming a connection between those Companies, and thus enable the New River Company to release for this Company's use a quantity of water equivalent to that which the Grand Junction may be able to supply to them. As explained to General Scott, there appeared to be engineering difficulties; but it is hoped that they can be overcome. In any event, the suggestion will be pushed forward with all possible speed, and the Directors hope with practical success.

I am to assure you that the Directors meet very frequently, and that no effort is spared to obtain in any and every possible way help from other sources.

I may be permitted to take this opportunity of expressing what I am quite sure my Directors feel—namely, their high appreciation of the valuable intimation which your Department have conveyed to the Local Authorities as to arresting the existing and deplorable waste which takes place. Having regard to the quantity of water which is now pumped into the district per

head per day—namely, about 26½ gallons—it is manifest that, with ordinary care, no inconvenience even would arise to the consumers in this Company's district. There is, of course, as is well known, the deplorable want of storage cisterns in the great majority of the tenements supplied. But it is hoped that this state of things may, before another season approaches, be remedied; and in the meantime the Directors have ordered an unlimited supply of yessels to temporarily meet this neglect on the part of landlords.

I handed your representative yesterday a copy of the notice [enclosed] restricting the service of water to two hours in the morning and two hours in the afternoon. The Directors deem this absolutely necessary, having regard to the comparatively large consumption and loss of water which is still taking place.

You may rest assured that no effort will be spared in meeting the present state of things in the best available manner.

The Special Water Committee of the Hackney Vestry met at the Hackney Town Hall on Friday night to consider the letter of the Water Company announcing the further restriction of the supply, and the communication from the Local Government Board on the alleged waste. Mr. J. W. Whiter presided. Numerous complaints of total failure of supply were reported. On the consideration of the Local Government Board's letter, Mr. Whiter said the Committee received it with great surprise. They regarded it as a scandalous libel on the people of East London, and thought the Board should know better than to suggest that the people who were so much in need of water would waste it; and this, too, in the face of the assurance of Mr. Bryan to the Vestry deputation that the Company had no ground for complaining of waste. It was decided to write to the Local Government Board to this effect.

The recent great heat caused a water panic in Paris far more alarming than that in East London, because less immediately open to remedy. The daily allowance of water to each individual of the population in other great cities, according to the statistics of a Parisian contemporary, stands as follows: Constantinople, 15 litres (1 litre = 1.76 pints); Berlin, 70 litres; Vienna, 104 litres; London, 173 litres; St. Petersburg, 182 litres; Madrid and Buda-Pesth, 200 litres; Chicago, 636 litres. The daily allowance per head in Paris is 220 litres—96 litres for drinking, and 124 litres for washing, cooking, or other purposes. But this is the allowance "on paper," when the water-works are up to the mark, and the great filter-beds are supplied with the good, but somewhat warm, drinking-water of the Marne and the Dhuis. As mentioned last week, the Parisian has had to be put upon Seine water.

Two at least of the London evening papers—the "St. James's Gazette" and the "Pall Mall Gazette"—have set a good example to their contemporaries by sending a Special Commissioner to investigate the facts in connection with the so-called water famine at the East-end before heaping abuse upon the Water Company. Last Tuesday the correspondent of the latter paper published the results of his "look round" the famine-stricken districts. He said: "From what I have seen of the streets in the East-end—and my wanderings have led me through Poplar, Stepney, and the network of humble streets bordering on the Mile End Road—I am convinced that the reports of the 'famine' are alarmist and exaggerated. The stand-pipes are at frequent intervals, and seem to be attended to with regularity. The small number of people who take

## GAS AND WATER COMPANIES STOCK AND SHARE LIST.

Referred to on p. 528.

| Issue.         | Share. | When<br>ex-<br>Dividend. | Dividend<br>or Dividend<br>& Bonus. | NAME.                      | Closing<br>Prices. | Rise<br>or<br>Fall<br>in<br>Wk. | Yield<br>upon<br>Invest-<br>ment. | Issue.    | Share. | When<br>ex-<br>Dividend. | Dividend<br>or Dividend<br>& Bonus. | NAME.                                      | Closing<br>Prices. | Rise<br>or<br>Fall<br>in<br>Wk. | Yield<br>upon<br>Invest-<br>ment. |
|----------------|--------|--------------------------|-------------------------------------|----------------------------|--------------------|---------------------------------|-----------------------------------|-----------|--------|--------------------------|-------------------------------------|--------------------------------------------|--------------------|---------------------------------|-----------------------------------|
| £              |        |                          | p. c.                               |                            |                    |                                 | £ s. d.                           | £         |        |                          | p. c.                               |                                            |                    |                                 | £ s. d.                           |
| GAS COMPANIES. |        |                          |                                     |                            |                    |                                 |                                   |           |        |                          |                                     |                                            |                    |                                 |                                   |
| 590,000        | 10     | Apl. 15                  | 10½                                 | Alliance & Dublin 10 p.c.  | 22½-23½            | ..                              | 4 9 4                             | 75,000    | 5      | June 29                  | 6                                   | Malta & Medn., Ltd.                        | 4½-5½              | ..                              | 5 14 8                            |
| 100,000        | 10     | "                        | 7½                                  | Do. 7 p.c.                 | 16½-17½            | ..                              | 4 5 9                             | 541,920   | 20     | June 10                  | 5                                   | Monte Video, Ltd.                          | 14-15              | ..                              | 6 13 4                            |
| 800,000        | 100    | July 1                   | 5                                   | Australian 5 p.c. Db.      | 105-107            | ..                              | 4 13 6                            | 617,946   | Stk.   | Aug. 31                  | 9½                                  | Newc'de & Gatesh'd Con.                    | 230-240*           | +2                              | 4 1 8                             |
| 200,000        | 5      | May 26                   | 6                                   | Bombay, Ltd.               | 6½-7               | +½                              | 4 5 9                             | 252,355   | Stk.   | Jan. 3                   | 8½                                  | Do. 3½ p.c. Db. Stk.                       | 113-117            | ..                              | 2 19 10                           |
| 40,000         | 5      | "                        | 6                                   | Do. New, £4 paid.          | 4½-5               | ..                              | 4 16 0                            | 150,000   | 5      | May 26                   | 8                                   | Oriental, Ltd.                             | 71-73              | +½                              | 5 3 8                             |
| 880,000        | Stk.   | Aug. 12                  | 13                                  | Brentford Consolidated     | 275-280            | ..                              | 4 5 9                             | 135,000   | 5      | "                        | 8                                   | Do. New, £4 10s. pd.                       | 64-7               | +½                              | 5 2 11                            |
| 240,000        | "      | "                        | 9                                   | Do. New                    | 210-215            | ..                              | 4 3 9                             | 15,000    | 5      | "                        | 8                                   | Do. do. 1879, £1 pd.                       | 1½-1½              | +½                              | 4 11 5                            |
| 50,000         | "      | "                        | 5                                   | Do. 5 p.c. Prf.            | 140-145            | ..                              | 3 9 0                             | 60,000    | 5      | Mar. 11                  | 7                                   | Ottoman, Ltd.                              | 6-6½               | ..                              | 6 6 2                             |
| 159,375        | "      | June 10                  | 4                                   | Do. 4 p.c. Db. Stk.        | 130-135            | ..                              | 2 19 3                            |           |        |                          |                                     | People's Gas & 2nd M.<br>of Chicago J. Bd. | 103-108            | ..                              | 5 11 1                            |
| 226,320        | Stk.   | Mar. 30                  | 11½                                 | Brighton & Hove Orig.      | 268-273            | ..                              | 4 4 3                             | 500,000   | 100    | June 1                   | 6                                   | River Plate Ord.                           | 9-9½               | ..                              | 6 6 4                             |
| 938,500        | Stk.   | Aug. 31                  | 5                                   | Do. A. Ord. Stk.           | 195-200            | ..                              | 4 5 0                             | 848,070   | 10     | May 26                   | 6                                   | Do. 4 p.c. Db. Stk.                        | 99-101             | +1                              | 3 19 9                            |
| 420,000        | 20     | Mar. 30                  | 11½                                 | British                    | 58-54              | +½                              | 4 3 4                             | 250,000   | 10     | Apl. 29                  | 10                                  | San Paulo, Ltd.                            | 15-16              | ..                              | 6 5 0                             |
| 50,000         | 10     | Aug. 12                  | 11½                                 | Bromley, Ord. 10 p.c.      | 25-27              | ..                              | 4 5 2                             | 135,000   | Stk.   | Mar. 30                  | 10                                  | Sheffield A. . . .                         | 247-250            | ..                              | 4 0 0                             |
| 75,000         | 10     | "                        | 8½                                  | Do. 7 p.c.                 | 20-22              | ..                              | 3 17 3                            | 209,053   | "      | "                        | 10                                  | Do. B. . . .                               | 247-250            | ..                              | 4 0 0                             |
| 500,000        | 10     | Apl. 29                  | 6                                   | Buenos Ayres (New) Ltd     | 9-9½               | ..                              | 6 6 4                             | 447,427   | "      | "                        | 10                                  | Do. G. . . .                               | 247-250            | ..                              | 4 0 0                             |
| 98,122         | Stk.   | June 29                  | 4                                   | Do. 4 p.c. Db. Stk.        | 98-100             | ..                              | 4 0 0                             | 5,600,000 | Stk.   | Aug. 12                  | 5½                                  | South Metrop., 4 p.c. Ord.                 | 140-143            | ..                              | 3 14 7                            |
| 150,000        | 20     | July 14                  | 8½                                  | Cagliari, Ltd.             | 29-30              | ..                              | 5 10 0                            | 1,460,000 | "      | July 14                  | 3                                   | Do. 3 p.c. Db. Stk.                        | 101-104            | ..                              | 2 17 8                            |
| 100,000        | 10     | June 10                  | 7                                   | Cape Town & Dis., Ltd.     | 15-16              | ..                              | 4 7 6                             | 60,000    | Stk.   | Aug. 31                  | 9                                   | Tottenham and J. B. .                      | 280-290*           | +½                              | 4 2 9                             |
| 50,000         | 50     | May 3                    | 6                                   | Do. 6 p.c. 1st Mort.       | 58-60              | ..                              | 5 0 0                             | 60,000    | "      | "                        | 9                                   | Edmonton                                   | 200-210*           | +½                              | 4 5 9                             |
| 550,000        | Stk.   | Apl. 15                  | 13½                                 | Commercial Old Stock.      | 315-325            | ..                              | 4 3 1                             | 182,380   | 10     | June 10                  | 7                                   | Tuscan, Ltd.                               | 103-113            | -1                              | 6 1 9                             |
| 200,750        | "      | June 10                  | 10½                                 | Do. New do.                | 252-257            | ..                              | 4 1 8                             | 149,900   | 10     | July 1                   | 5                                   | Do. 5 p.c. Dbs. Red.                       | 100-103            | ..                              | 4 17 1                            |
| 200,750        | "      | June 10                  | 4½                                  | Do. 4½ p.c. Db. do.        | 148-153            | ..                              | 2 18 10                           |           |        |                          |                                     |                                            |                    |                                 |                                   |
| 800,000        | Stk.   | June 10                  | 12                                  | Continental Union, Ltd.    | 207-212            | ..                              | 5 13 2                            |           |        |                          |                                     |                                            |                    |                                 |                                   |
| 200,000        | "      | "                        | 9                                   | Do. 7 p.c. Prf.            | 197-202            | ..                              | 4 9 1                             |           |        |                          |                                     |                                            |                    |                                 |                                   |
| 61,600         | Stk.   | Aug. 31                  | 14                                  | Croydon A 10 p.c.          | 305-310*           | +2                              | 4 10 4                            | 746,164   | Stk.   | June 29                  | 10½                                 | WATER COMPANIES.                           |                    |                                 |                                   |
| 108,400        | "      | "                        | 11                                  | Do. B 7 p.c.               | 255-265*           | +5½                             | 4 3 0                             | 150,000   | "      | "                        | 5                                   | Chelsea, Ord.                              | 813-818            | ..                              | 3 6 0                             |
| 555,000        | Stk.   | Aug. 12                  | 5½                                  | Crystal Palace Ord. 5 p.c. | 125-130            | ..                              | 4 0 9                             | 160,000   | "      | "                        | 4½                                  | Do. 5 p.c. Prf.                            | 170-175            | ..                              | 2 17 2                            |
| 60,000         | "      | "                        | 5                                   | Do. 5 p.c. Prf.            | 140-145            | ..                              | 3 9 0                             | 175,785   | "      | Mar. 30                  | 4½                                  | Do. 4½ p.c. Prf. Stk., 1875                | 148-152            | ..                              | 2 19 3                            |
| 496,090        | 10     | July 28                  | 11                                  | European, Ltd.             | 23-24              | ..                              | 4 11 8                            | 1,720,560 | Stk.   | Apl. 15                  | 8                                   | Do. 4½ p.c. Db. Stk.                       | 157-162            | ..                              | 2 15 7                            |
| 364,060        | 10     | "                        | 11                                  | Do. 27 10s. paid.          | 16½-17½            | ..                              | 4 14 4                            | 654,740   | "      | June 29                  | 4½                                  | East London, Ord.                          | 220-225            | -2                              | 8 11 1                            |
| 5,922,290      | Stk.   | Aug. 12                  | 12½                                 | Gaslight & Coke, A, Ord    | 290-295            | -2                              | 4 3 0                             | 390,000   | "      | "                        | 3                                   | Do. 4½ p.c. Db. Stk.                       | 167-160            | ..                              | 2 16 3                            |
| 100,000        | "      | "                        | 4                                   | Do. B, 4 p.c. max.         | 120-125            | ..                              | 3 4 0                             | 700,000   | 50     | June 29                  | 7½                                  | Do. 3 p.c. Db. Stk.                        | 103-105            | ..                              | 2 17 2                            |
| 665,000        | "      | "                        | 10                                  | Do. C, D, E, 10 p.c. Prf.  | 305-310            | ..                              | 3 4 6                             | 810,000   | Stk.   | Mar. 30                  | 4                                   | G'd Junction, 10 p.c. max.                 | 115-118            | ..                              | 3 3 7                             |
| 80,000         | "      | "                        | 5                                   | Do. F, 5 p.c. Prf.         | 152-157            | ..                              | 3 3 8                             | 708,000   | Stk.   | Aug. 12                  | 14                                  | Do. 4 p.c. Db. Stk.                        | 142-147            | ..                              | 2 14 5                            |
| 60,000         | "      | "                        | 7½                                  | Do. G, 7½ p.c. do.         | 230-240            | ..                              | 3 2 6                             | 160,000   | "      | "                        | 7                                   | Kent                                       | 364-369            | ..                              | 8 15 11                           |
| 1,300,000      | "      | "                        | 7                                   | Do. H, 7 p.c. max.         | 195-200            | +2                              | 3 10 0                            | 1,043,800 | 100    | June 29                  | 10                                  | Do. New, 7 p.c. max.                       | 212-217            | ..                              | 3 4 6                             |
| 463,000        | "      | "                        | 10                                  | Do. J, 10 p.c. Prf.        | 305-310            | ..                              | 3 4 6                             | 406,200   | 100    | "                        | 7½                                  | Lambeth, 10 p.c. max.                      | 298-303            | ..                              | 3 6 0                             |
| 476,000        | "      | "                        | 6                                   | Do. K, 6 p.c. Prf.         | 182-187            | ..                              | 3 4 2                             | 350,000   | Stk.   | Mar. 30                  | 4                                   | Do. 7½ p.c. max.                           | 227-232            | ..                              | 3 4 8                             |
| 1,061,150      | "      | June 10                  | 4                                   | Do. 4 p.c. Db. Stk.        | 131-133            | ..                              | 3 0 2                             | 500,000   | 100    | Aug. 12                  | 13½                                 | Do. 4 p.c. Db. Stk.                        | 140-145            | ..                              | 2 15 2                            |
| 294,850        | "      | "                        | 4½                                  | Do. 4½ p.c. do.            | 148-153            | ..                              | 2 18 10                           | 1,000,000 | Stk.   | July 28                  | 4                                   | New River, New Shares                      | 427-432            | +2                              | 3 1 4                             |
| 958,000        | "      | "                        | 6                                   | Do. 6 p.c. do.             | 199-203            | ..                              | 2 19 1                            | 902,300   | Stk.   | June 29                  | 6                                   | Do. 4 p.c. Db. Stk.                        | 140-145            | ..                              | 2 15 2                            |
| 70,000         | 10     | May 12                   | 8                                   | Hongkong & China, Ltd.     | 13½-14½            | ..                              | 5 10 4                            | 126,500   | 100    | "                        | 6                                   | Southw'k & V'xhall, Ord.                   | 166-171            | ..                              | 3 10 2                            |
| 3,800,000      | Stk.   | "                        | 10                                  | Imperial Continental       | 212-217            | +2                              | 4 12 2                            | 489,200   | Stk.   | "                        | 5                                   | Do. do. 7½ p.c. max.                       | 157-162            | ..                              | 3 14 1                            |
| 376,400        | 100    | Aug. 2                   | 4                                   | Do. 4 p.c. Dbs. Red.       | 98-101             | ..                              | 3 19 8                            | 1,019,585 | "      | Apl. 15                  | 4                                   | Do. do. 5 p.c. Prf.                        | 168-172            | ..                              | 2 18 2                            |
| 473,000        | Stk.   | Aug. 12                  | 3½                                  | Do. 3½ p.c. Db. Stk.       | 101-104            | ..                              | 3 7 4                             | 1,155,066 | Stk.   | June 10                  | 10                                  | Do. 4 p.c. A Db. Stk.                      | 141-144            | ..                              | 2 15 7                            |
| 560,000        | 100    | Apl. 1                   | 5                                   | Met. of Mel- 5 p.c. Db.    | 111-113            | ..                              | 4 8 10                            | 200,000   | "      | "                        | 4½                                  | West Middlesex                             | 300-305            | ..                              | 8 5 7                             |
| 260,000        | 100    | "                        | 4½                                  | bourne 4½ p.c. Db.         | 107-109            | ..                              | 4 2 7                             | 200,000   | "      | Mar. 11                  | 8                                   | Do. 4½ p.c. Db. Stk.                       | 162-165            | ..                              | 2 14 7                            |
|                |        |                          |                                     |                            | * Ex div.          |                                 |                                   |           |        |                          |                                     |                                            |                    |                                 | * Ex div.                         |



advantage of them during the hours of their usefulness strikes one as altogether out of proportion to the eager crush of a people stricken by famine. When the water is first turned on, there is a knot of women and children placidly waiting their turn; but after the first few minutes, it melts away almost as soon as the turncock has hurried round the corner. Between three and four o'clock, I stood by a stand-pipe for nearly a quarter of an hour. The only person who paid it a visit was a small child, who filled a miniature jug, and spilled most of its contents before she had reached her destination. This, it is true, was during the quiet hours of the afternoon, when most of the population are at work away from home. But, even so, it did not look like famine. Nor could any one of the several people of whom I inquired with respectful sympathy give me a single instance of genuine distress directly due to lack of water that had come within their own experience. They grumbled, of course, and very naturally. When you pay water-rates for a constant supply, and do not get it, and yet have to pay, you naturally feel aggrieved. East and West are at one on this point. But as for a single instance of distress occasioned by lack of water not due to negligence, it was not to be had for the most sympathetic pumping. Indeed, one or two people hinted, in the course of confidential gossip, that a good deal of water was still being wasted. Aggrieved householders, who meant to 'take it out of the Company' turned their taps on the first thing in the morning, and neglected to turn them off for the rest of the day. How many gallons of water a single tap can waste in the course of six hours let experts work out. Certainly more than people who felt the pinch of need would care to fritter away." The writer concluded by saying: "Whatever the faults and failings of the East London Water Company may be, there seems to be little doubt that the public exasperation against it is stimulated artificially. There are plenty of ward politicians and parochial mugwumps in the East-end who have any quantity of promissory notes, issued at election time, out against them. They have promised the municipalization of everything, from tramways to water-works; and a Water Company's calamity is the mugwumps' opportunity." The following observations were made in the editorial columns on the following day: "By this time, we should think, most people will be convinced of the shallowness of the agitation against the East London Water Company. We hold no brief for that Company or any other, but we prefer the facts of our impartial Commissioner, which we published yesterday, to any number of flabby speeches from street-corner agitators; and these facts show that the outcry against the Company is quite unjustifiable. The supply of water has been—very prudently, we think—kept within the resources of the Company. The agitation against the East London Company is only sincere in its insincerity."

**The Public Lighting Question at Downham Market.**—Reference has already been made in the "JOURNAL" to the dispute between the Downham Market Gas Company and the District Council in regard to the charge for the public lamps. It seems that something like a crisis has been reached—negotiations between the parties having been broken off. Steps are being taken by the Council to light the town by oil.

## THE DEVONPORT CORPORATION AND THE WATER-WORKS.

After considering the matter for several months, the Water Committee of the Devonport Town Council have come to the conclusion that authority should be sought for the compulsory purchase of the undertaking of the Devonport Water Company. In the first place, the Committee entered into negotiations with the Company, and, on the advice of Mr. J. Diggle, invited them to transfer the works to the Corporation on the following terms: (1) The purchase to be completed and possession of the undertaking to be given to the Corporation on the 30th of September, 1899. (2) The consideration for the purchase to be the payment by the Corporation to the shareholders in the Company of annuities commencing from Sept. 30, 1899, such annuities to be equivalent to the dividends now paid on various classes of shares, *plus* one-half per cent. on the paid-up capital for each of the first two years, and a further half per cent. for each of the second and subsequent two years until such annuities shall be equal to the maximum dividends payable on the various classes of shares, but so that no annuity in any particular class of shares shall at any time exceed the maximum dividends payable in respect of that class of shares. (3) The said annuities to be redeemable by the Corporation on the expiration of 60 years at 33½ years' purchase. (4) Officers of the Company to be compensated. (5) Costs to be paid by the Corporation. (6) The sale to be subject to the approval of the Town Council, and of the Local Government Board or Parliament, as the case may be. (7) Pending completion of the sale, no capital to be expended by the Company without the consent of the Corporation. The answer of the Company was that they were not willing to sell; and the Committee consequently advised the Corporation to promote a Bill in Parliament next session for the compulsory purchase of the works. Their recommendation will be considered by the Town Council at a special meeting this week.

## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The last of the series of deputations which the Edinburgh and Leith Gas Commissioners have sent out this year to inspect gas-works, in view of the erection of their new works at Granton, left Edinburgh on Monday morning. It consisted of Bailie Kinloch Anderson, who is Convener of the Works Committee, Sir Andrew McDonald, Bailie Manclark, of Leith, Councillor Mallinson, of Edinburgh, and Mr. W. R. Herring, the Gas Engineer. The three former deputations perambulated England, and had a look in at a London works before returning home. This last one has gone farther afield. On Monday night, they crossed from Harwich to the Continent. The towns on their list are Copenhagen, Berlin, Vienna, Paris, and Brussels. This method of educating Commissioners is a somewhat costly one at first; but it is the one which is best calculated to lead to saving in the end. It is therefore the best. Hitherto no

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objection has been taken to it; but I should not be surprised if some of the Commissioners who court notoriety should lift up their voices—for speaking's sake—when the accounts of expenses come up for sanction. It will be a pleasing feature of the arrangements for these new works if no such exception be taken. Hitherto there has been unanimity within the Commission. It will be a pity if a jarring note should be now introduced, upon a matter of detail. The Commissioners have a very large undertaking before them. They are at present forming the die upon which their policy for many a day will be moulded. A few hundred pounds spent now will be as nothing compared with the advantage to be gained by making a correct start. Parsimony at this stage of the proceedings might lead to a false step, with resultant yearly loss. This would be false economy. As will be observed from the advertisement columns of the "JOURNAL," the Commissioners are inviting tenders for the construction of a large gasholder tank at Granton. This will be the first part of the work to be settled; but most probably it will not be the first to be completed, for a section of the works will be put in hand as soon as possible. On the return of the deputation, therefore, the Commissioners will have before them the important work of finally fixing the systems or processes to be adopted in the new works.

The Gas Committee of the Aberdeen Corporation on Tuesday considered the estimates prepared by Mr. A. Smith, their Engineer, for the working of the gas undertaking during the current year. These show an expected revenue of £69,066 from the sale of 448 million cubic feet of gas; £5000 from the sale of coke; £5100 from the sale of tar and ammoniacal liquor; and £400 from the sale of cyanogen—a total of £79,566. To this has to be added £5864 of surplus from former years, making a total revenue of £85,430. The expenditure is estimated as follows: Coal £38,500; purifying material, £900; salaries, wages, &c., £10,223; distribution of gas, £2630; maintenance of works and plant, £3800; rents, feu-duties, and taxes, £4086; management (municipal), £2060; discounts and bad debts, £2900; sinking and contingent funds, £8357; annuities, £4770; interest, £3100; reserve and fire insurance funds, £300—a total of £81,625. There will thus be a surplus, it is estimated, of £3805. The finances of the department are in such a satisfactory position that the Committee considered they would have been justified in recommending a reduction in the price of gas of 3d. per 1000 cubic feet; but they have, for this year, contented themselves with recommending a reduction of 1d., making the price 3s. 1d. per 1000 cubic feet. When Mr. Johnston became the Convener of the Gas Committee, in 1894, the price of gas was 3s. 11d. per 1000 cubic feet. In the course of four years, therefore, a reduction of 10d. has been effected, which is highly creditable to all concerned. The Aberdeen Corporation Gas Department is on as satisfactory a basis as any that I know of.

The Perth Gas Commission on Monday discussed at length the report of their Sub-Committee upon the account of Mr. Young, architect, which was given in the "JOURNAL" a fortnight ago. In opposition to the motion for adopting the report, it was moved that the last paragraph—that which proposed to censure Bailie Wright, the Convener, and Mr. A. Wilson, the Engineer—should be omitted. In the vote, fifteen supported the adoption of the report, four the amendment, and four declined to take part in the

division. In Mr. Wilson's case there was the further caution that, "in the event of his being guilty of any similar laxity, or showing any want of proper attention and zeal in the discharge of his duties as Manager in future, he will be requested to tender his resignation."

At a meeting of the Directors of the Cupar (Fifeshire) Gas Company on Tuesday, a letter was submitted from Bailie Watson, on behalf of the Corporation, asking if the Directors would name a price at which the shareholders would sell their undertaking to the Corporation. The Directors were of opinion that the Company were not anxious to sell, but that in any event they would require to consult the shareholders before they would name a price. They also thought the Town Council should come forward and make the offer. It was eventually resolved to decline to state a figure.

On Thursday of last week a deputation of the Directors of the Motherwell Gas Company visited Arbroath, for the purpose of inspecting the residual plant which Mr. Carlow erected there three years ago; the Contractors being Messrs. Pettigrew and Co., of Middlesbrough. The whole plant was in operation at the time, and was fully explained to the visitors by Mr. Carlow. A sample of the naphtha produced was tested in their presence, showing the percentage of benzol in it. The deputation expressed themselves thoroughly satisfied with the whole condition and arrangements of the Arbroath Gas-Works.

During the past year, the Airdrie and Coatbridge Water Company had, from their existing works, a surplus revenue of £8783, and paid dividends at the rate of 10, 6, and 5 per cent. upon the respective stocks. In their annual report, the Directors stated that the construction of the reservoir and relative works in connection with the augmentation of the water supply, at Cowgill, near Biggar, was being pushed on. The main-pipes had been laid as far as Symington; and between that place and Roughrigg the pipes and the laying of them had been contracted for. These contracts amounted to about £50,000; and it was expected that between £10,000 and £20,000 would be required to complete the storage reservoir and other works at Cowgill. The Directors hoped that the whole of the new works, with the exception of the compensation reservoir, would be completed by the end of 1899. In the existing works, serving 106,205 households, there was a supply for 102 days, which was 40 days less than last summer. The Airdrie and Coatbridge Company's is the largest and most important water supply undertaking in Scotland not connected with one of the big cities.

Heavy rains have fallen in Scotland this week; and consequently any fears of a scarcity of water have, for this season, been dispelled. The record of a register kept in Edinburgh has been published, which shows that during the 24 hours ending at 9 o'clock on Wednesday morning, the rainfall amounted to 1.58 inches. Most of it fell in the four hours ending at 10.30 on Tuesday night. The total for the 24 hours was equal to 36,000 gallons, or 160 tons, per acre. The rainfall for the whole year is still below the average. On Aug. 30, as measured at Glencorse, Edinburgh, it amounted to 17.15 inches, as compared with 23.10 inches in 1897, and 19.33 inches in 1896. At the Edinburgh Water Trusts' reservoir at Gladhouse, it has amounted this year to 16.22 inches, as compared with 21.92 inches in 1897, and 15.55 inches in 1896.

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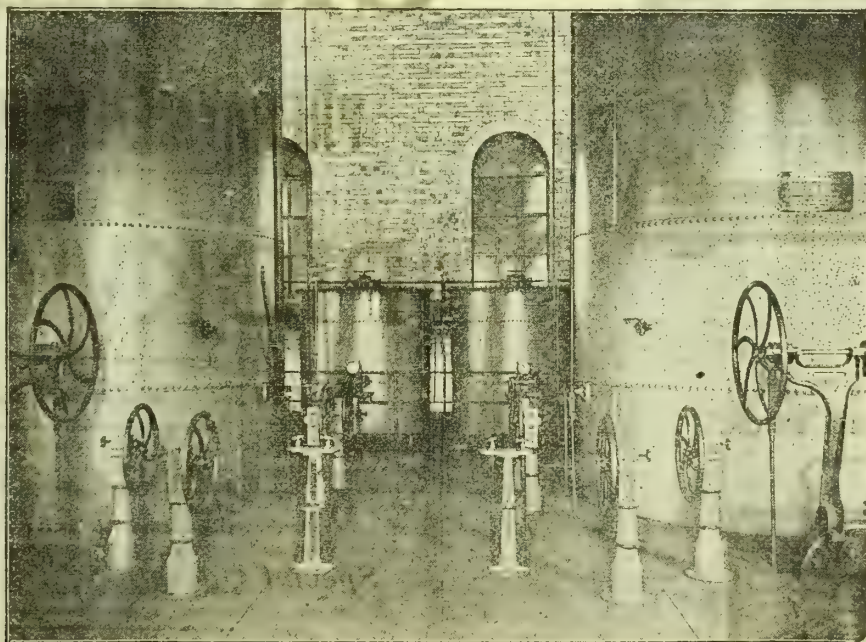
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## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Sept. 3.

**Sulphate of Ammonia.**—August requirements being covered, dealers have ceased buying; and there has been some decline in values from the highest points touched. There has, however, been a satisfactory amount of direct demand; and all parcels continue to be picked up as they are put on the market. The closing quotations are £10 per ton f.o.b. Hull, and £10 2s. 6d. per ton f.o.b. Leith and Liverpool. In the forward position, no business of importance has transpired. The quotations are £9 17s. 6d. per ton f.o.b. Leith, ordinary terms, October-March delivery; and London, Beckton terms, £9 15s. per ton, October-December delivery.

**Nitrate of Soda** is firm in the forward position; but, owing to arrivals, spot price has declined to 7s. 6d. per cwt. for fine quality.

LONDON, Sept. 3.

**Tar Products.**—The continued low price of benzol attracts a good deal of attention, not only in this country, but on the Continent also. It is felt that gas manufacturers are not sufficiently alive to the economic value of benzol for enrichment purposes. The complaint that this enricher is condensed out of the gas in the mains shows that its application has been unwisely made. Benzol should not be added to gas already rich in it, as ordinary gas is supersaturated at ordinary temperatures with 3 per cent. To get the best results from benzol, it should be applied to poor gas; and at to-day's price, its cost will not be much more than one-third of a penny per candle power. There is still a fair demand for creosote and common tar oils; and stocks in makers' hands are somewhat lower than usual. For naphthalene there is good inquiry; and its use is said to be extending. Carbofic acid is firm. Cresylic or disinfecting acid is disappointing, having regard to the time of the year. Anthracene continues in a decidedly flat and unsaleable condition. On the other hand, a little more interest is shown in respect to pitch; and as the shipping season is now pretty near, this product may see some improvement, especially as the demand for German consumption is said to be enlarging considerably.

The average values for the week are: Tar, 13s. to 17s. Pitch, east coast, 24s.; west coast, 20s. Benzols, 90's and 50's, nominal, 9½d. Toluol, 1s. 2d. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 1½d. Crude, 30 per cent., naphtha, 4½d. Creosote, 2½d. Heavy oils, 42s. 6d. Carbofic acid, 60's, 2s. Naphthalene, pressed, 55s.; drained salts, 30s. Anthracene, nominal, "A," 4d.; "B," 3d.

**Sulphate of Ammonia.**—Business is being done at prices ranging between £10 and £10 5s., less 3¼ per cent.; the difference in price depending on port of shipment—Hull at the moment being the cheapest. For forward, buyers will not pay an advance; but with the present position of stocks, it looks as if sulphate must be dearer, especially as there is a firm tone in the nitrate trade.

## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—The upward move in prices to which reference was made last week has now come into general operation throughout Lancashire. For the present, it is rather too early to ascertain at all precisely what effect the advanced prices may have upon business, as very much will depend upon the action of Yorkshire, and also whether some of the South-West Lancashire collieries will hold firmly to the full advance of which they have given notice. The position in isolated cases is perhaps not considered altogether strong, as may be judged from the fact that where it had previously been announced that round coals would be advanced 1s. per ton, the colliery owners at the last moment resolved not to advance more than 6d. So far as the Manchester district is concerned, the movement is general and definite, to the extent of 5d. per ton on best house-fire coals, 10d. per ton on lower house-fire qualities and other descriptions of round coal, and 5d. per ton on burgie and slack—the advance applying to pit, wharf, and delivered rates. In the South-West Lancashire districts, the upward move is somewhat irregular; many of the collieries not advancing round coals more than 6d., while others have sent out circulars raising their list rates 1s. per ton. With regard to engine fuel, there has been no general move in the above district, owing to prices having in most cases been put up a month or so back; and any advance at present is not more than a general levelling up of prices where they are below full current rates. The general pit quotations may be given at 11s. to 11s. 6d. per ton for best Wigan Arley; 10s. to 10s. 6d., for seconds Arley; 9s. up to 10s., for Pemberton four-feet; 7s. 6d. to 8s. 6d., for common round coal; with engine fuel ranging from 3s. 9d. and 4s. 3d. for the lower descriptions, to 4s. 9d. and 5s. 3d. for the best qualities. An extraordinary feature of the market is that, while prices for inland business have been very generally advanced on round coals with the commencement of the month, shipping rates have become easier owing to the termination of the South Wales dispute. Some of the collieries are well sold over the present month, at prices as high as 10s. 6d. per ton for good qualities of steam coal, delivered at the ports on the Mersey; but on any business now being put through, it would be difficult to get more than 9s. 6d. to 9s. 9d. for ordinary steam coal, delivered at the Garston Docks or the High Level, Liverpool.

**Northern Coal Trade.**—The coal trade has been weakened by the settlement of the Welsh difficulty, and the consequential increase of the output; so that the prices in this district are drooping towards a lower level. Steam coal is, of course, the most affected. Best North-umbrian steam has dropped to about 13s. per ton f.o.b.; second-class steam, to 12s.; and steam smalls, to about 7s. There is still a good demand for fuel, which must be expected to continue during the Baltic season; but it is possible that, for the winter deliveries, steam coals may be much lower in price. There is not the same change in the gas coal trade yet, because the demand is increasing, and because there is a considerable amount of coal to be delivered on old contracts. The price may be put as from 9s. 6d. to 9s. 9d. per ton f.o.b. Regarding the large gas coal contracts now under negotiation, counter offers have been made by

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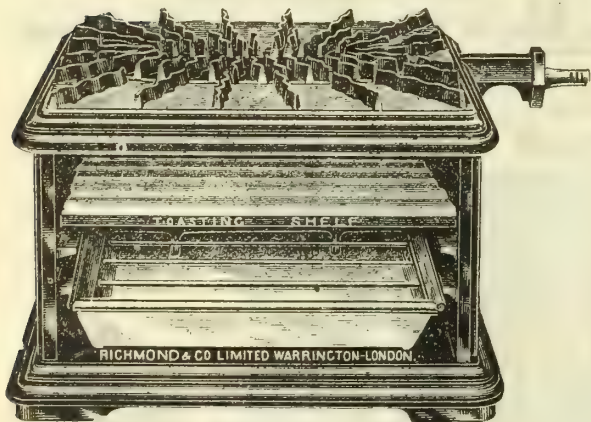
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the companies; and it is possible that the tenders may be finally decided upon in the course of a few days. Gas coke is fairly steady at the prices that have been ruling of late.

**Scotch Coal Trade.**—Now that a settlement has been effected in South Wales, it is matter of certainty that there will not be, by-and-bye, so large an outflow of coal from Scotland. A drop in prices may therefore be expected, sooner or later. It is given out that there has been so much contracting forward month by month, that it will be several weeks before prices will be perceptibly affected. It would seem as if the settlement of the Welsh dispute had not been foreseen; otherwise the masters in the West of Scotland and in the Lothians would not have conceded the advance they did within the past two weeks. In Fifeshire, the masters have declined the advance; and the miners have, on the instruction of their leaders, lodged notices to cease work a fortnight hence. The men are being urged not to let the Welsh settlement influence them; but it is likely that it will, whether they care or not. The probability is that no strike will occur. The prices quoted are: Main, 10s. per ton f.o.b. Glasgow; ell, 11s. to 11s. 3d.; and splint, 10s. 9d. to 11s. The shipments for the week amounted to 253,972 tons—an increase of 11,070 tons upon the preceding week, and of 57,208 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,327,502 tons—an increase upon the same period of last year of 1,145,937 tons.

**Protection of the Maidstone Water Supply.**—In view of the outbreak of typhoid fever which occurred at Maidstone last September, and the Commissioners' report upon the matter, noticed in the "JOURNAL" last week and again to-day, the Directors of the Water Company have directed their Manager (Mr. W. J. Ware) to examine the springs daily. During the time the hop pickers are about, the springs will be under observation night and day, and all the sources of supply will be rigidly protected.

**Dorking Water-Works Purchase.**—Negotiations are proceeding between the Dorking District Council and the Water Company regarding the transfer of the undertaking of the latter to the former. Before calling a meeting of the shareholders to consider the expediency or otherwise of selling their property, the Directors determined to come to a definite understanding with the Council as to the basis on which they should conduct the negotiations; and, to that end, they submitted to them the following conditions: "First, that the transfer and price were to be made and determined in all respects as though an Act for compulsory transfer had been obtained. Second, that inasmuch as the sanction of the Local Government Board was requisite to the purchase the Council should either obtain that sanction before the arbitration, or would in the event of their not obtaining it repay to the Company the whole of the expenses incurred in connection with the agreement and the transfer proceedings." The Directors intimated that they were in favour of, and would recommend the sale, providing these terms were assented to; and last Thursday the Council unanimously agreed to them.

**Reductions in Price.**—The Directors of the Farnworth and Kearsley Gas Company have reduced the charge for gas 2d. per 1000 cubic feet; making the net price for public lighting and to consumers of more than 400,000 cubic feet per quarter, 2s. 6d., and for less than this quantity 2s. 10d. per 1000 cubic feet; the reduction to come into operation in the current quarter. The Stretford Gas Company will reduce the price of gas 3d. per 1000 cubic feet after the current quarter. The Westerham Gas Company have reduced the price of gas to 4s. 6d. per 1000 cubic feet.

**The Falmouth Corporation and the Gas and Water Works.**—The Falmouth Town Council have decided to employ Mr. A. Silverthorne to advise them in reference to the purchase of the gas and water undertakings. Mr. Silverthorne was consulted on a previous occasion when a similar proposal was under the consideration of the Corporation; and he then presented a long report upon the value of the works. In the course of the discussion upon his present appointment, it was said that further advice was now required, and that the ratepayers needed educating upon the subject. On the last occasion, it was explained, the Water Company refused to give Mr. Silverthorne facilities for obtaining information, and the report did not contain all that was necessary upon this branch of the subject.

**Abercarn Water Supply.**—Colonel J. T. Marsh, R.E., one of the Inspectors of the Local Government Board, recently held an inquiry at the Council Room of the Abercarn Urban District Council in regard to an application by them to borrow £8150 for increasing the water supply. Mr. T. S. Edwards, Clerk to the Council, represented that body; and among those present were the Surveyor (Mr. G. Stevens) and the Medical Officer of Health (Dr. Walter E. James). The Clerk stated that the population of the district was 13,500, and the assessable value £45,111; while there were outstanding loans at present amounting to £4674. Dr. James said the whole of the springs it was proposed to tap were practically deep seated, supplied very pure water, and were free from surface contamination. Mr. Stevens gave details of the proposed work, and the inquiry terminated. Subsequently the Inspector visited the springs.

**Commemoration of the Passing of the New Act of the Gloucester Gas Company.**—The passing of their new Act of Parliament was considered by the Directors of the Gloucester Gas Company an event of sufficient importance to justify a celebration; and it was carried out last Tuesday in a very generous manner—all connected with the Company, from the highest to the lowest, being invited to take part. The annual meeting of the shareholders was first held; and at its close those present were entertained to luncheon. The workmen, having been given a holiday, were later served, in a marquee at the works, with a substantial dinner, to which about 80 sat down—the Assistant Engineer (Mr. W. S. Morland) being in the chair. The families of the workmen were also included in the festivities—a capital meat tea being provided for them in the afternoon; and later on, to the strains of music, they indulged in various amusements. During the afternoon, several of the Directors and shareholders visited the works; and the hearty manner in which they were received showed that the utmost goodwill prevails between them and their workpeople.

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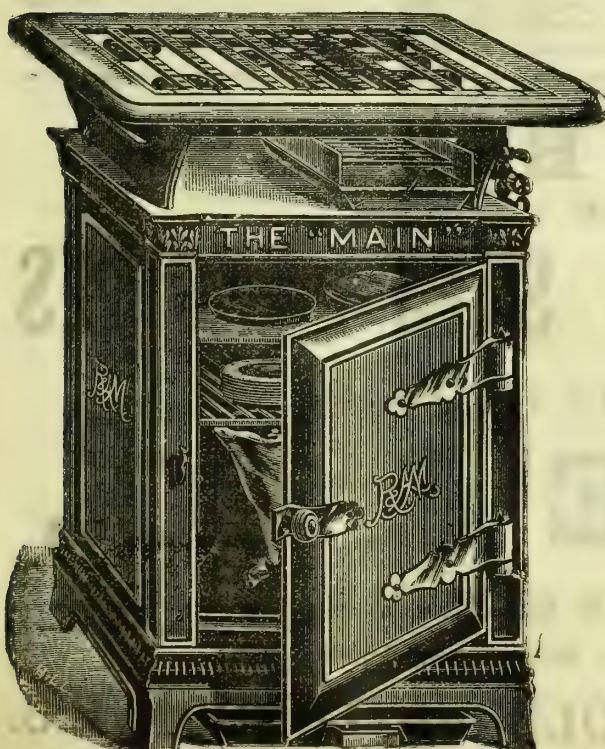
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**A Possible Source of Pollution for Liverpool Water.**—The recent decision of the Chorlton and Manchester Joint Asylums Committee to utilize the Anderton Hall Estate (situate on the banks of the Lower Rivington Reservoir), caused the Liverpool Corporation to take fright at the prospect of the sewage from the projected asylum for 1000 patients percolating into the Liverpool water-works reservoir. A deputation from the Municipality has, in consequence, attended at the offices of the Local Government Board, and submitted their objections to the Board's Parliamentary Secretary; and seven local M.P.'s sent a joint letter to Mr. Chaplin. They pointed out that, however stringent the precautions might be to preserve the reservoir from contamination, there must always be danger. The selection of a site for a large asylum of pauper imbeciles in immediate contact with the water supply of a vast population was described as unfortunate. The President of the Board has already directed a public inquiry into the matter.

**The Upper Derwent Water Scheme.**—A conference recently took place between the Belper Rural District Council and members of both the North and South Darley Urban District Councils, at the Whitworth Institute, Darley Dale, on the subject of the great water scheme which is being promoted by the Corporations of Derby, Leicester, Nottingham, and Sheffield, to take the waters of the Upper Derwent for domestic supplies. Alderman Waite, of Duffield, attended from the Belper Rural District Council, who had written drawing attention to the scheme, and asking for the co-operation of the Darley Councils. There was a large attendance of the members of the Local Authorities. Alderman Waite pointed out that the boroughs had thoroughly determined to secure the Derwent waters for themselves. The object the Belper Council had in view was to consolidate the Rural and District Councils, so as to secure the water for the places in the county, before it was allowed to cross the boundary. There would be 14 million gallons per diem taken from Ashopton Valley, and this would be brought through the Darley Dale district. It would be easy to arrange to take water in bulk for the districts *en route*, at a very cheap rate. Moreover, it would be much better to secure this arrangement before the Bill was drafted, so as to save the expense of having to fight it in the Houses of Parliament. The proposal of the deputation was thoroughly supported by the Councils in conference; and it was arranged for them to join the movement to secure co-operation throughout the county. Committees from the two Councils will be elected later.

**Repairing the Maes Gwyn (Shropshire) Reservoir.**—The Bishop's Castle Corporation having applied to the Local Government Board for a loan of £1600 to defray the expenses of lining a reservoir at Maes Gwyn, in Shropshire, which developed such numerous leaks as to be useless for its purpose, Mr. Herbert H. Law, Assoc.M.Inst.C.E., one of the Board's Inspectors, attended at the Town Hall on Tuesday last to hold a public inquiry. The Mayor (Alderman Garnet-Botfield), the Chairman of the Water Committee (Alderman H. Greenhouse), and several of the councillors, were present. The Town Clerk (Mr. E. Griffith), in answer to the Inspector, stated that the loan was required to complete the reservoir at Maes Gwyn, which had a capacity of 2½ million gallons. The population of the borough at the last census was 1586, which was a slight decrease from the previous census. The assessment was £4310 gross; and the loans outstanding were £4013. It was desired that the loan applied for should be spread over a period of not less than thirty years. The Borough Surveyor (Mr. J. Hamar) gave evidence as to the construction of the dam and the probable cause of the defects. Mr. E. S. Cobbold, Consulting Engineer to the Corporation, said the method he proposed to adopt in lining the reservoir was to use a layer of cement concrete 6 inches thick with a core of Callender's pure bitumen sheeting. He considered it hopeless to expect in such fissured strata a water-tight reservoir, unless it was lined throughout; and, after careful consideration, he had decided to adopt concrete with a bitumen core as being the most simple, economical, and efficient method of carrying out the work. Mr. W. T. Curry, the Engineer for the Contractors (Messrs. Callender), in reply to the Inspector, cited a number of cases in which their sheeting had been used with entire success. The method proposed for lining the Maes Gwyn reservoir—viz., by two thin layers of concrete with a core of bitumen sheeting—was the usual means of applying the material in open reservoirs of this class. There being no opposition, the Inspector closed the inquiry, and subsequently accompanied the Engineers, and some of the members of the Council, to view the reservoir.

There was recently held at Halifax an exhibition of "Electroid" acetylene gas, produced by Messrs. Marsh and Thorp's system. The gas is at present in use on one of the piers at Morecambe.

Messrs. Falk, Stadelmann, and Co., Limited, have issued a supplement to their general catalogue (Ed. 59) of lamps and fittings, incandescent gas lighting, electric accessories, acetylene lamps and burners, &c.

Messrs. Richmond and Co.'s very latest production in the way of advertising is a neat little card which puts a question relating to the culinary department of the household and gives the answer by pulling a string.

The Lamp Manufacturing Company, Limited, have brought out a new and effective illustrated catalogue of their several varieties of petroleum lamps; railway, street, and shop lamps for gas and oil; Coligny, Coligny-Welch, and Fullford regenerative gas-lamps; petroleum heating and cooking stoves, &c.

Messrs. C. Joyner and Co., Limited, of Birmingham, have decided to light with acetylene gas the large addition which they have recently made to their gas-fittings manufactory; and, after much experiment, they have placed the order for a "Thor-Scar" apparatus for the purpose with the Thornton-Scarath Automatic Lighting Syndicate, Limited.

Probably one of the largest orders ever placed in this country for conveyors, elevators, and appliances for the general transmission of power, has been given by the Directors of the United Alkali Company, Limited, to the New Conveyor Company, Limited, of Smethwick, for the new chemical works on the Manchester Ship Canal, to handle coal, coke, and phosphate rock. About 1000 feet of Mr. Gilbert Little's latest design of hot coke conveyor is to be supplied.

Messrs. Jenkins and Co., Limited, of Retford, have received further instructions from the South Metropolitan Gas Company to instal the duplicate plant of coal breaking, elevating, and conveying machinery for their Bankside works; this being a repeat order for this class of machinery as supplied last March for the same retort-house. The firm have also just received an order from the Portsea Island Gas Company for the erection of a mechanics' shop at their works.

The Altrincham Gas Company, as mentioned in the "JOURNAL" last week, have found it necessary to extend their carbonizing plant, and have decided to erect a new retort-house 64 feet span and 78 feet long, to contain six 20 feet through arches with settings of eight retorts on Chester's regenerative system. The contract for the whole of the work, including retort-house and coal-stores, chimney, retort-bench, and all fittings, &c., has been placed in the hands of Messrs. R. Dempster and Sons, Limited, of Elland.

The Airdrie Iron Company, the Managing Director of which is Mr. J. C. Adamson, one of the few remaining original members of the North British Association of Gas Managers, have just completed, at the Dawsholm station of the Glasgow Corporation, a set of condensers capable of dealing with 5 million cubic feet of gas per day. The completion of this contract makes a total condensing power of upwards of 26 million cubic feet per day, which the Airdrie Company have erected for the Corporation.

Messrs. Graham, Morton, and Co., Limited, gas engineers and contractors, of Leeds and London, have purchased the freehold premises, goodwill, &c., as a going concern, of the Hydraulic Seamless Pressing Company, Limited, Leeds, including the whole of the land, four large workshops, 100 feet long and 45 feet wide, fitted with overhead travelling cranes, &c., and the entire plant and machinery, which comprises the most modern system of electric welding. The works are fitted up with the electric light; and there are spacious erecting-shops and yards convenient to the plating-shop. We learn from the Managing-Director (Mr. Maurice Graham) that the Company will run this stamping and pressing business in conjunction with their own manufacture of elevating and conveying machinery for handling all classes of material, and their improved system of inclined retorts, as personally erected by Mr. Graham in many gas and chemical works at home and abroad. The Company have also acquired the whole of the valuable patent rights in connection with this improved system of flanging and pressing. They have now, therefore, an extended sphere of operations; and the present management should be a guarantee that the business will be efficiently conducted.

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## TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

Telegraphic Address: "GASKING LONDON."

Telephone Number: Holborn 121.

## EDITORIAL NOTES.

## Sir W. Crookes on the Need of the Age.

As though to demonstrate the omniscience of a modern learned man, the President of the British Association, Sir William Crookes, took as the first subject of his Inaugural Address the problem of the future food supply of the world—a question that does not fall naturally within the limits of those departments of science in which he has made his world-wide reputation. Before opening up his address, the President offered a remark concerning the character of these compositions, which bears out what we have repeatedly advanced in this regard. He said that "formerly the President unrolled to the meeting a panorama " of the year's progress in physical and biological sciences. " To-day the President usually restricts himself to specialities connected with his own work, or deals with questions which for the time are uppermost." Sir W. Crookes allowed it to be understood that he did not intend to follow the old fashion in this respect; and then he forthwith plunged into discussion of the question which, as we have already observed, was no speciality of his, and as to which public interest can hardly be said to have been keenly aroused—the question of the bread supply of the population of these islands. It is these charming little bits of illogicality manifested by learned pundits that show the rest of mankind (who, we know from a very high authority, are "mostly fools") that these eminent ones are human after all. They are also human in another respect, when they happen to occupy the proud position of President of the British Association—they dearly like to make a "sensation." Sir W. Crookes is not the man to misunderstand or lose the benefit of his opportunity. Accordingly he first set himself to make the flesh of his hearers creep, by announcing that within a measurable period the world will not have enough to eat; and then he sought to allay the fear that he had created, by exhibiting Science as a beneficent fairy who is to stand between humanity and the Demon of Hunger.

There was just a little touch of exaggeration in Sir W. Crookes's picture of a world providing itself with more mouths than with food to fill them. The "red fire" of the opening scenes of pantomime was fully in evidence. The year 1931 is the critical period at which, according to Sir W. Crookes, the world of consumers will get beforehand with the world of producers of wheat, unless the latter can effect much more than the traditional service of making two ears of corn grow where one grew before. This can be done only through the application of science to the case of the agriculturist. Wheat needs nitrogen; and this can be given to the crop in various forms. The gas manufacturer may prick up his ears at this announcement, and look for some recommendation of the nitrogenous manure—sulphate of ammonia—in which he is more particularly interested. But he will be disappointed. Sir W. Crookes is well aware that "the distillation of coal " in the process of gas making yields a certain amount of "its nitrogen in the form of ammonia; and this product, " as sulphate of ammonia, is a substance of considerable "commercial value to gas companies." But there is not enough of it to go round. All Europe does not produce more than 400,000 tons of sulphate a year; and "in view " of the unlimited nitrogen required to substantially "increase the world's wheat crop, this slight amount of "coal ammonia is not of much significance." He calls it a "slight amount!" The thanks of manufacturers are due to Sir W. Crookes for relieving them of the last lingering fear of over-production of sulphate. The supply can never be more than insignificant. Then there is the alternative, nitrate of soda. Of this manure, Sir W. Crookes thinks the world will need 12 million tons a year; the present export being 1½ million tons. It is hardly necessary to remark that, at this rate, the existing deposits will soon be exhausted. Afterwards, if the world is to feed itself, the nitrogen of the atmosphere must be fixed for manurial use at a much cheaper and quicker rate than Hellriegel's microbes can do it.

This fixation of the gas is to be done electrically. As far back as 1892, Sir W. Crookes exhibited to the Royal Society the flame of burning atmospheric nitrogen; thus showing that nitrogen is a combustible gas, under certain conditions. It can be burnt to nitrous and nitric acids, which can be easily recovered. Here we have our fixed nitrogen. But at what price? A Board of Trade unit of



electricity, applied to the burning by induction current of atmospheric nitrogen, will make 74 grammes of nitrate of soda; and therefore 14,000 units would be required to produce a ton of the salt. Even under known conditions, the cost of manufacture need not exceed £5 per ton. And as for the supply of power necessary to make the conversion, there need be no fear. Niagara alone could make all the electricity required without appreciably lessening its value as a spectacle. *Gaudeamus igitur!* Let us eat, drink, and be merry; for when more nitrate of soda is wanted, it will be forthcoming. The world did not know before last Thursday that nitrate of soda was the one thing of which it stood in need. Yet, according to Sir W. Crookes, this is the chief bulwark between the Caucasian race and other races of meaner fibre who can get through life upon a diet of bananas, or millet, or rice. With plenty of nitrate of soda, all that western civilization stands for will continue to progress; without it, all will perish. There is, as we have remarked, a grotesque tinge about this reduction of the way of progressive Humanity, ever toiling towards the stars, to a question of saltpetre; but such is the penalty paid for his "sensation" by the man of science.

The point has not been overlooked. The newspapers have already been poking fun at Sir W. Crookes for trying to frighten people without sufficient cause. If all the earth wants is more fertilizers, and these are to be had, so to speak, by turning a handle at Niagara or somewhere else as soon as the market price offers sufficient inducement, why all this pother? Of a truth, the world has been treated to so many of these scientific vaticinations of what is to happen when such-and-such a geometrical progression has realized itself, that it has become more than a little sceptical of all such exercises. They may be correct, if nothing has been overlooked, and the conclusion has been properly drawn from sufficient and pertinent premises. But this is precisely where the invalidating factor, or the suspicion of it, creeps in. It is quite true that, if a few cod's roes were to hatch completely, the ocean would not have room for any other fish; but they never do. With regard to the infinitely delicate and highly developed ramifications of economic interests, adjustments of supply and demand are made with an exactitude which justifies some forecasts and makes nonsense of others. Sir W. Crookes has enrolled himself in the band of prophets which includes Malthus and Jevons. It is a worthy eminence.

#### The Waverley Association Meeting.

THE meeting of the Waverley Gas Managers' Association at Duns last Thursday was as successful a gathering as could be expected in a body of managers of small works such as are the bulk of the members of the Association. Of course, much that was said at it was of the nature of "small beer" to those who are accustomed to deal with retorts by the hundred, and with cubic feet by hundreds of millions; but no one seeks to despise the day of small things. On the principle of every soldier carrying the Marshal's bâton in his knapsack, it is feasible to imagine that some of the managers who are to-day struggling with elementary problems in small and isolated works, may rise to be leaders in their walk of life. There is a special reason, however, why the gas managers in the Waverley district should be encouraged to uphold their organization—that is, the antiquity of the body. There may not yet be altogether unanimity as to the claim of the Waverley to be the parent of all Gas Associations; but admittedly it was one of the very first. Like many other questions, time, and a little research, may solve this one. A valuable contribution towards this end was made by Mr. Adamson, of Airdrie, at the dinner after the meeting. Mr. Adamson was at the formation of the Waverley Association; and his testimony is unimpeachable. But, apart from this subject, it will be somewhat of a revelation to many to learn that the idea of gas managers associating themselves together was not suggested for the purpose of mutual help in matters technical, as is now the principal object of such bodies, but by the necessity which was then felt by managers, of protecting themselves against the devastating sweep of the notorious Flintoff. In this view Associations of Gas Managers present another example, of which there are many, of a body being created for one object and developing into something higher and better.

#### The Cause of the Weakness of Trade Unions.

AMONG the qualifications of success as a Trades Union representative, the power of unlimited make-believe, and

unspoil by any touch of humour or sense of the ridiculous, must take a high place. Otherwise it would be impossible for these grown men to go on playing at the game of passing portentous resolutions which they know to be futile. A favourite resolution at Trade Union Congresses, such as that which recently met at Bristol, is one approving of the federation of Trade Unions as a means of enabling society men to "dictate their own terms as to wages, hours, and "conditions of labour." These are the words with which the President of the congress commended the cause of federation to his audience. It never seems to have struck him or anybody else that there is no bargain when one side has all its own way and the other is helpless. The gentlemen assembled at Bristol in the name of Labour would have raised a fine "howl of deprecation" if Sir W. Lewis, or any other representative employer, had publicly announced his intention of doing by the men what they calmly proposed to effect by realizing their fond dream of federation of all the Unions. The truth is that in all bargains, whatever the subject, each party gets what it can, not what it would; and that all bargains in trade and industry are made under the pressure of outside influences not within the control of either party. Not all the organization or federation of employers or employed that could possibly be engineered by any known or unknown leaders would serve to neutralize the most powerful of the causes of profit and loss in trade. There are professional trade unionists who know this and a good many other things apparently ignored by the majority of their colleagues. Prominent among these is Mr. Knight, the able Secretary of the Boiler Makers, who was put up to speak at Bristol respecting the work of the Special Committee appointed by last year's congress to collect information with a view to framing a federation scheme. Mr. Knight candidly confessed that the labour of this Committee had so far been without fruit. He hinted that the true reason for the failure is the weakness of the individual Trade Unions. What is the good of talking about the federation of Trade Unions, so long as these only embrace in their membership a minority of the workpeople engaged in these particular occupations? This is the question. Trade unionism will never be made strong in the land, says this terribly outspoken Boilermaker, by holding congresses and talking about Socialism and Collectivism and all the rest of it as being the natural and the necessary outcome of any such "movement." Get your men into line first, so that the total number of possible "blacklegs" becomes a negligible quantity; and then you will have a strong Union. Then get a number of such Unions to act in common; and they will be a force for employers and the public to reckon with. It is not the power of the masters that the cause of Unionism has to fear; but the folly of the leaders and spokesmen, who play ducks and drakes with the funds entrusted to them, and otherwise act so that it is an open question whether it is worth a good man's while to be in the Society or not. It is hardly to be wondered at that the platform performers who represent political trade unionism before the world do not like Mr. Knight; he is too old-fashioned for them. But the members of his own Society know what they owe to the man who, almost alone of Trade Union officials, was never known to be "spoiling for a fight" as soon as a few pounds had accumulated in the Society money-box.

#### Belfast Corporation Finance.

SOME members of the Belfast Corporation are exercised in mind because the Gas Committee proposed to pay for their last year's extensions out of revenue. The matter was discussed at the last monthly meeting of the Corporation, when Alderman Dempsey challenged the policy of the Committee in this regard, declaring that it would have been better to have reduced the price of gas instead. Another speaker objected that no member of the Corporation would have done the same thing in his own private business. There is an answer to this argument; but it was not needed. The Town Clerk showed himself a worthy successor to the long line of legal authorities who have demonstrated, not only in Ireland, that, when there is no statutory authority for the doing of a necessary thing, the Act can be dispensed with and the thing done very satisfactorily without it—at any rate, for the time being. On this occasion the Town Clerk intimated that, the borrowing powers of the Corporation for gas-works purposes being virtually exhausted, the Gas Committee had



no money beside what was in the till. To the observation that an Act might be obtained, the reply was that this would be for the future, whereas the Committee wanted the cash to spend. Of course, if it were a Gas Company that did this thing, the local authority would want to know the reason why, and make all manner of most unpleasant remarks about it. Being a Corporation, Belfast is in matters financial a law unto itself—always, of course, for the time being.

#### The Decadence of the Small Electric Lighting Industry.

IT has been argued, and not without reason, that the only way for municipal electric lighting to beat gas is to sell current at a cheaper rate than the equivalent gas light. It is, of course, easy to formulate a grand generality of this character; but it is another matter to present it acceptably in pounds, shillings, and pence. When it comes to stating the equivalent of gas in the price of the unit, the most surprising discrepancies appear in the rating of the different light sources. To take the fancy performance of the most improved incandescent electric lamp and compare it with the duty, or the neglect of it, exhibited by the commonest of flat-flame gas-burners, is an old trick that continues to work as satisfactorily for one side as the somewhat older "confidence trick" of police-court renown. Indications are not lacking, however, that the heavy, continuous pressure of the competition of the incandescent gas-burner is telling surely upon many a central station electric lighting speculation. It is pretty well understood, although not generally expressed, that when the new incandescent gas-burners get established in the market, more than one electric lighting company will discontinue business. Of course, this statement will be hotly denied by the electrical press; but it is true, nevertheless. All the efforts of the "Free Wiring" companies to stem the tide will then be unavailing; because the amount of the annual bills cannot be disguised—if indeed it is not really increased by the deferred payment system. And the same may be said of various eccentric systems of charging for current. Local authorities will not feel the pinch for a time; and there will always be a certain amount of electric lighting in demand in large centres of population. But the "small fry"—the little electric lighting companies that carry on business by the aid of a big mortgage and the touching allegiance of the local news sheet—are doomed. Some of them feel it already; but others will succumb after more or less protracted agonies. It is their common experience that when the first period of expansion has come to an end—when customers no longer clamour to be connected to the mains, and loudly abuse the electric lighting people for their dilatoriness in doing this work—the stage of decadence appears. The high-water mark once reached, the tide recedes with alarming precipitancy. One big consumer after another grows tired of the costly little lamps with filaments that glow like newly burnt-out matches, the while his neighbour and rival makes a blaze with incandescent gas-burners; and so the "rot" sets in. There is no stopping it. If the local authority can be prevailed upon to buy up the concern, well and good. The ratepayers will stand almost anything. But yet there are limits even to this process; and these are already in sight in several districts.

### WATER AND SANITARY AFFAIRS.

PUBLICATION has been given, very opportunely, to the general conclusions contained in the report addressed to the London County Council by Sir B. Baker and Mr. G. F. Deacon, who were instructed to advise the Council upon the whole scheme for a supply of water from Wales. These two eminent Engineers repeat what has been stated before, that for the next ten or fifteen years the Thames must necessarily remain the chief source of supply for London. Beyond that period it is intimated that, together with the wells and probably the Lea, the Thames will always be maintained as an alternative or contributory source of supply, if for no other reason than the danger of making the Metropolis dependent upon a single source which might be liable to accidental interruption. Coming to a more immediate period, it is remarked that the practical question for decision within the next year or two is whether 12 to 15 years hence the additional supply shall come from the Thames or from Wales. Somewhat

in a spirit of self-abnegation it is argued that the personal prejudices and sentiments of the public, rather than the opinions of "engineers, chemists, and accountants," are the most powerful factors in deciding questions of this description, and that therefore it is not necessarily a wise course to "accept the lowest tender and take an inferior article where water supply is concerned." This curious passage, in a wobbling kind of way, leads up to the conclusion that it would be wise to go to Wales.

It will occur, at least to some people, that if "the personal prejudices and sentiments of the public" are the most powerful factors in settling this question, the report by Sir B. Baker and Mr. Deacon is somewhat superfluous. Every three years the members of the Council have to catch votes, and on such occasions they will naturally have regard for "the most powerful factors," the exact nature of which they will anxiously seek to ascertain. We may suggest whether sufficient consideration has been given to the principle of "the lowest tender." It will be observed that "accountants" are brushed aside along with engineers and chemists; yet the ratepayers may be expected to have some regard for estimates, if they can be relied upon. A calculation is given on the basis of the figures set forth in the report, that in respect to the Welsh scheme the first 200 million gallons per day would involve an additional expenditure of less than a penny per week for an average household, while for the second instalment of 200 million gallons the Welsh water "would be the cheaper of the two." But the second instalment is a long way off, unless London is prepared to adopt Wales as the entire source of its supply, against which there is the strongest possible objection, as involving the risk of "accidental interruption." In the meantime there is an "additional expenditure" which is made to look very small, but which on closer acquaintance may prove by no means insignificant. There are rival estimates; and it is difficult to perceive the economy of departing from a source of supply close at hand, in order to seek for a substitute 200 miles away. However, the Water Committee have got the report of the advising Engineers, and it is understood that they have postponed the consideration of it "pending the sittings of the present Royal Commission on Water Supply." But the Progressives of the Council still look wistfully towards Wales; and plans and sections of the Wye portion of the famous scheme are in course of preparation. It is left to the Companies, not only to devise, but to carry out plans which will prove of immediate service. While the Council are preparing diagrams, the Companies are constructing works.

A letter from Mr. Beachcroft appearing in the columns of "The Times" has brought out a rejoinder from Mr. Stuart, "the eminent member both of Parliament and of the London County Council." The point of variance arises out of the censure pronounced by Mr. Stuart at a public meeting; blame being cast on the East London Company for not having made provision for getting water from other Companies in case of need. Mr. Stuart's own quotations from evidence given by Mr. Bryan on the Company's Bill of last year, abundantly prove that the Company were alive to the necessity of being prepared to supplement their own supply. The contention arises as to the time and manner of carrying out this idea. It is acknowledged that the Company "urged upon Parliament" the adoption of a clause by which they should be enabled to obtain water from other Companies. Mr. Beachcroft says the County Council opposed the introduction of this clause. Mr. Stuart declares that "this is quite a mistake." But he fails to prove that there is not some foundation for Mr. Beachcroft's assertion, contenting himself with saying that the clause was passed. And so it was, but with a proviso added at the instance of the Council, whereby it was rendered obligatory on the Company to obtain the consent of the Local Government Board before taking a supply "in cases of emergency" from any other Company. It is fair to infer, as stated by Mr. Beachcroft, that the interchange of water was looked upon with disfavour by the County Council "from the purchase point of view." But now the power of getting water to aid the East London supply being obtained, Mr. Stuart complains that the Company have allowed more than a year to pass by without acting upon it. That they are making a *bonâ fide* effort to exercise such power cannot be denied; but Mr. Stuart considers it "a belated" affair, and asks why the Company did not set to work much sooner. It must be



remembered that at an early period of the drought the Company drew a supplemental supply, amounting recently to as much as six million gallons a day, from the New River Company. They are now constantly drawing a moderate quantity from the Kent Company, and very soon they will obtain important aid from the Southwark and Vauxhall. Who could have foreseen the necessity for taking such steps at an earlier period? Does Mr. Stuart even now believe in the drought? There are many who do not, even though the whole country is becoming parched, so that cattle are suffering, and the milk supply is running short. "London" and the "Daily Chronicle" have both derided the idea of a drought; and yet we find the East London Company blamed for not having foreseen all that has come to pass, and provided against it "long ago."

Though disappointed in the effect produced upon their resources by restricting the supply to four hours per day in place of six, the East London Directors were able to pass through last week without any further reduction in the service. This was better than could be expected; and it looks as if the present supply would be continued until the crisis is altogether tided over by the completion of the junction which will bring in five million gallons per day from the Southwark and Vauxhall system. If this can be speedily accomplished, the relief to the strained apprehensions of the public will indeed be great. The Hackney Vestry, which for some occult reason or other maintains an attitude of violent opposition to the East London Company, has also had its little quarrel with the Local Government Board, that department having presumed to ask the Vestry to use its best endeavours to diminish the waste of water going on in the district. The Vestry denies that there is "a shred of evidence" to show there is any waste of water. Yet there is the personal testimony of the special correspondent of "The Times," as an eye witness of the proceedings, that when a deputation from the Hackney Vestry challenged Mr. Bryan to prove the accusation of waste, and a bundle of letters was produced from which that gentleman proceeded to read in support of the allegation, the chief spokesman of the deputation and several of his followers rose abruptly and left the room. Yesterday the leading journal gave a few copies of the letters, clearly establishing the charge of excessive waste. As affecting a body of higher status than the Hackney Vestry, it is rather amusing to find that the County Council, which has been appealed to as the one beneficent power to end all the water troubles, has now excited "some indignation" in Limehouse by its sluggish response to a request that it would lend a couple of fire-engines to pump water from the Thames for watering the roads and flushing the drains. The great water authority that is to be, has evidently failed to recognize the duties which appertain to such a responsible position.

**Gas, Water, and Electric Lighting Statistics.**—Messrs. Hazell, Watson, and Viney, Limited, send (somewhat later than usual this year) their two annuals—"Gas and Electric Lighting Works Directory and Statistics, 1898," and "Water-Works Directory and Statistics, 1898." Both books are said to have been revised to July 1 last; and as these are the twenty-second issues in each case, there should not be much room for error. The electric lighting section of the first-named publication has this year been largely added to. Particulars are given of "the whole of the works now running, and a record of the principal Provisional Orders granted by the Board of Trade to Municipal Authorities and Public Companies, with the position in which they now stand."

**Water Softening by the Archbutt-Deeley Process.**—At the last monthly meeting of the Institution of Mechanical Engineers, a paper describing water softening and purification by the Archbutt-Deeley process was read by Mr. Leonard Archbutt, Chemist to the Midland Railway Company. It is unnecessary to discuss the desirability of softening and purifying the water required for various purposes, when the natural supply unsatisfactory in these respects. The Archbutt-Deeley arrangement is an intermittent, not a continuous-flow, system. The reagents employed are lime and anhydrous carbonate of soda; and the operations comprise agitating the contents of the mixing-tank by steam, and carbonating the water by means of the combustion gases of a coke-stove. The plant is described as being cheap, simple, and easily worked. The process has been at work since January, 1892, in the Derby works of the Midland Railway Company, clarifying as well as softening the sewage-polluted water of the River Derwent, and reducing the hardness from 15° to 4½°—effecting considerable organic purification, at an inclusive cost of chemicals, labour, and interest on outlay of about 1d. per 1000 gallons.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 600.)

THE course of business in the Stock Exchange last week was eventful and interesting. The opening was most cheerful and buoyant on the strength of the decisive operations in the Soudan; and the tendency was well confirmed by other favourable influences. Prices rose freely; and as the attendance became more numerous, business grew brisk. But just when the upward movement was in full swing, like a bolt from the blue came the news of the Candia affair; and it sustained a rude check. Other disagreeable influences also cropped up. The result was that prices were all huddled down again; and at the close the losses more than counterbalanced the gains. Even the Money Market had its phases; for considerable ease characterized the earlier part of the week, while in the latter portion rates hardened appreciably. In the Gas Market, there was certainly more activity than in the preceding week; but still business even then did not amount to much. In fact, for a considerable time past, there has been a very decided falling off in the volume of business transacted. Speculation has run more in electric lines. Variations in the value of Gas securities have not been numerous, or considerable in size; and they were irregular in direction. In Gaslights, the "A" maintained about middle figures until Friday, when it dropped as low as 288; and although it changed hands on Saturday at better prices, the quotation did not recover. Even the "H," which was stronger in the preceding week, was inclined to droop. South Metropolitan was quiet, and offered no feature. Commercial were steady and unchanged. Among Suburban and Provincial Companies, the only incident was a fall in British, in view of a considerable reduction in the rate of dividend. Among the Continental undertakings, Union and European were dead-quiet; but Imperial showed out with another advance in value. Of the rest, Oriental had a further rise, and Hong-Kong and River Plate improved; but Monte Video was lower. Hardly anything was done in the Water Companies. East London was lower; and what it lost New River gained.

The daily operations were: Business in Gas was quiet and unimportant on Monday; and quotations did not move. Things continued very inactive on Tuesday; but Hong-Kong rose ½, and Oriental ¼. British, however, fell ½. Wednesday produced only moderate business; and movements were adverse. British receded 1; and Monte Video, ½. On Thursday, the only noticeable feature was an advance of 1 in Imperial Continental. Transactions on Friday were about at their quietest; and prices were only poor. Gaslight "A" receded 2. In Water, East London was 3 lower, and New River 3 higher. Saturday was very quiet; but the tendency was more favourable. Imperial Continental rose 2; and River Plate, ¼.

### DR. BUNTE'S COMMENTS ON WATER GAS.

THE paper by Dr. Strache, of Vienna, on "Improvements in Lighting by Water Gas," of which we last week completed an abstract translation (see p. 532), and a paper by Dr. Leybold on "Carburetted Water Gas," to which reference has also been made (*ante*, p. 201), have called forth from Dr. H. Bunte some interesting comments.

Non-carburetted water gas, he says, is one of the "children of sorrow" of gas manufacture. Since Donovan, nearly 70 years ago, sought to make practical application of the conversion of steam into water gas by incandescent carbon, there have always been enthusiasts who have had great hopes of the process. But almost all their attempts to utilize it have ended in failure; and it is difficult to credit favourable reports. Recently, however, tremendous strides have been made, both in the production and in the application of water gas; and the altered aspect must not be overlooked. One of the first water-gas plants on modern lines was erected at Frankfurt-on-the-Main in 1880-81, and was thoroughly investigated. The result of the investigation was not very favourable to the system, as only 45 per cent. of the heating value of the fuel which was put into the generator was preserved in the water gas. Analyses and readings of the temperatures showed that the loss of 55 per cent. of the heating value of the fuel in the course of its transformation into water gas, arose chiefly from incomplete combustion and imperfect utilization of heat during the blowing process. Until quite recently, little improvement has taken place in the direction of securing a higher duty from the fuel. In 1886, a well-known German plant showed an efficiency of barely 50 per cent.; and this agrees with the results obtained with American plant.

Recently, however, Dellwik has devised a process in which, by means of a strong blast and a shallow bed of fuel in the generator, the formation of carbonic oxide is avoided, and complete combustion to carbonic acid is secured. One important source of loss of heat is thereby removed, and a much larger yield of water gas is obtained. The author was dubious of the advantages claimed for this process, so long as he had merely the



patent specification on which to base an opinion; but his doubts have been completely dispelled by a personal investigation of the plant at the Warstein mines. The results of his researches were perfectly concordant, though the investigation was not—nor did it need to be—a very prolonged one; and a computation of efficiency made in precisely the same manner as that in which the efficiency of the Frankfort plant was computed seventeen years earlier, led to the following conclusions: Of the heating value of the coke, 72 per cent. was preserved in the water gas; 16 per cent. was lost in the hot gases which escaped during the “blow” at a temperature of about 1650° Fahr.; 8 per cent. was lost in the hot water gas; and the remaining 4 per cent. was lost by radiation and conduction from the plant. An efficiency of over 70 per cent. of the heating value of the fuel is an extremely good result for an apparatus which works at so high a temperature as a water-gas plant, and is in consequence of its high temperature subject to great losses.

Another apparatus inspected by the author during last winter was that of Dr. Strache at the Pathological Institute of the General Hospital at Vienna. In addition to economy arising from the superheating of the blast and steam, an important advance achieved in this apparatus is that it is adapted to consume coal in place of coke. When water gas is made at a coal-gas works, no gain results from the use of coal, because coke is usually obtained at a cheap rate; but when water gas is produced independently of a gas-works, coal is often the cheapest fuel available. Moreover in places remote from bituminous coal fields, descriptions of coal unsuitable for gas or coke production can be used in the water-gas plant. Dr. Strache has proved that water gas can be successfully applied to the lighting and heating of buildings. At the Vienna Pathological Institute, about 500 burners are used for lighting, and about the same number for heating purposes. The lights are steady, and of a fine colour; and for microscopical or other delicate work, they are far superior to the electric light. The dissecting tables are flooded with light in a manner which other means could not readily equal. The heat evolved is comparatively little. Water gas yields only about half the heat given off by an equal volume of coal gas; and as Dr. Strache's water-gas burners consume per candle-hour about as much gas as the ordinary Welsbach coal-gas burners, it is clear that the heat evolved is relatively very low. With regard to the hygienic aspects of water gas, on account of the large proportion of carbonic oxide which it contains it would be unwise to speak very confidently until the Vienna installation has been in use for a greater length of time. It may, however, be observed that the surgeons, chemists, and pathologists of the Institute are using the water gas in their own rooms, and are undoubtedly quite satisfied that the method of illumination is a hygienic one.

Dr. Strache has stated quite correctly that water gas is at least as favourably placed with regard to risk of explosion as coal gas. The powerful odour which carbylamine imparts to the gas is an immense safeguard. In order to compare the risks of explosion with mixtures of various gases and air, Dr. Eitner and Herr Trautwein made a number of experiments in the author's laboratory. The results are embodied in the following table:—

Explosive Limits of Combustible Gases and Air, expressed in Volumes per Cent. of the Combustible Gas in the Mixture.

| Combustible Gas.         | LIMIT AT WHICH EXPLOSION ENSUED. |        |
|--------------------------|----------------------------------|--------|
|                          | Lower.                           | Upper. |
| Benzoline . . . . .      | 2.6                              | 4.8    |
| Pentane . . . . .        | 2.5                              | 4.8    |
| Benzene . . . . .        | 3.1                              | 6.3    |
| Acetylene . . . . .      | 3.8                              | (40.0) |
| Ethylene . . . . .       | 4.2                              | 11.5   |
| Methane . . . . .        | 6.4                              | 12.8   |
| Coal gas . . . . .       | 8.0                              | 19.0   |
| Hydrogen . . . . .       | 9.5                              | 66.3   |
| Carbonic oxide . . . . . | 17.3                             | 74.8   |
| Water gas . . . . .      | 12.5                             | 66.5   |

Very small quantities of the readily boiling hydrocarbons, benzoline and benzene, and slightly greater quantities of acetylene and ethylene suffice to produce an explosive mixture. From 7 to 8 per cent. of coal gas gives an explosive mixture with air; but about 12.5 per cent. of water gas of ideal composition (equal volumes of hydrogen and carbonic oxide) is needed to give the same result. There is another aspect of the limits of the proportions in which the gases form explosive mixtures, which must not be overlooked. There is no doubt that the explosive mixture which is formed by water gas permits of very thorough utilization of the heat of combustion of the gas in gas-engines. So far as the author is aware, water gas has hitherto only been tried for motor use with successful results in England; but this application of the gas will no doubt extend itself shortly.

The fact that water gas affords a smokeless flame without a primary air supply as in atmospheric burners gives it an immense advantage, as the risk of the flame striking back is avoided. The Welsbach burner made disilluminated coal gas an agent for the dissemination of light; and now it is known that non-luminous water gas is capable of giving the same effects, it behoves us to watch the advances in the economy of the water-gas process, and to regard water gas not as an undesirable competitor with coal gas, but as an ally which will enable the gas industry to retain for many years its pre-eminent position as a dispenser of light, heat, and power. If we put to ourselves

the questions whether coal gas is now employed—as it was ten years ago—exclusively, or even to the largest extent, as an illuminating agent, and whether the illuminants which are assessed by the photometer now have the same value as they had before the introduction of the Welsbach burner, we are compelled to answer them in the negative. Wherever the bunsen burner is used, whether for lighting by incandescence or for cooking and heating, the illuminants of coal gas are intentionally destroyed, and the flame is made into a non-luminous heating flame. The more incandescent lighting, and the use of gas for cooking and heating spread, so much the more are the illuminants of the gas depreciated in value; and the employment of disilluminated or non-luminous gas increases at the consumers' burners. The question, which was at one time much discussed, whether it is advantageous to supply rich or poor illuminating gas, now admits of no argument. To-day the question which arises is, To what extent is it advantageous to make coal gas or water gas from the coal? The answer is controlled in a large degree by the value of bye-products; for they play an important part in determining the net cost of coal gas, and water gas affords an advantageous means of disposing of coke, which is the chief bye-product of coal-gas manufacture. Bye-products are not formed in water-gas manufacture; and with depression in the value of bye-products, the conditions become more and more unfavourable to the illuminating coal gas, and more and more favourable to non-luminous water gas. Gas engineers have to choose the methods of manufacture which are fitted to supply towns with light and heat in the cheapest and best manner.

If the recent advances in water-gas manufacture enable one to prophesy a brighter future for that gas, it would nevertheless be a mistake to omit an earnest admonition. Water gas has already been described as one of the “children of sorrow” of the gas industry, for its past has been by no means untarnished. Wild speculation has repeatedly retarded a sound progress of the water-gas industry. Companies have risen and fallen; and a year ago the London Law Courts witnessed the final act of the wreck of the English Syndicate which, under the guidance of Samson Fox, led to the loss of millions. The reputation and usefulness of the gas industry will be best maintained by honest scientific work, rigorous introspection, and a creditable spirit of enterprise.

BIRMINGHAM AND ITS WATER SUPPLY.

AN interesting work dealing with the future water supply of the capital of the Midlands—written by a former member of the Birmingham Corporation Water Committee—the third edition of which has just been received,\* calls for some extended notice at the present time, seeing that the author claims to have so far “revised and enlarged” his book as to constitute it “a contribution to the question of the water supply of large towns.” Mr. Barclay dedicates his work to Mr. E. Lawley Parker, J.P., during whose mayoralty the Corporation Bill was promoted, and who (in the words of the author) “rendered conspicuous service during the parliamentary campaign which resulted in the Bill being carried into law, and upon the death of Sir Thomas Martineau was unanimously chosen to occupy the onerous and honourable position of Chairman of the Water Committee.”

The former edition of the book contended that the future needs of Birmingham could only be supplied by bringing water from a distant source; and, after reviewing the available gathering grounds (local and distant), it showed that the watershed of the Elan and Claerwen was the most suitable for the requirements of the increasing population of Birmingham. The scheme adopted by the Birmingham City Council on the recommendation of Mr. James Mansergh, M.Inst.C.E., with its estimated cost, was then fully set forth; and the method for raising the necessary capital, with provision of a sinking fund without augmenting the rates, was explained. In the present edition, a new financial table has been introduced, and is that which was used in evidence before the Parliamentary Committee. The text dealing with this table has been amplified and re-written. There are also five additional chapters, which show how the Act of Parliament was obtained, with particulars of the evidence given before the Committees of both Houses by the scientific witnesses both for and against the Bill. The nature of the local opposition—also that of London, Hereford, the Welsh land-owners, and others—is next dealt with. The clauses agreed to by the Corporation, and inserted in the Bill to meet these various opponents, are given in detail; and the discussions on the Bill as it passed through both houses are epitomized. In another chapter the steps taken by the Water Committee of the City Council, both in regard to finance and for providing an increased supply of water during the construction of the Welsh works, are explained; and it is shown how the actual expenditure comes out as compared with the original estimate.

The main portion of the new edition is, however, devoted to showing the progress of the works in the Elan Valley, and on the line of route. These works (said to be the largest of the

\* “The Future Water Supply of Birmingham; With References to Liverpool, Manchester, London, &c.; being a Contribution to the Question of the Water Supply of Large Towns.” By Thomas Barclay. Third Edition. Birmingham: Cornish Bros.; 1898.



kind attempted in the country) possess several special engineering features. The works are, as we have had occasion to report from time to time, in full progress; and the construction of the compensation reservoir, the submerged dam, and the other reservoirs which are in hand is explained. The description of the plant used, including the compressed-air apparatus, the crushing plant, and the automatic weighing cranes for handling enormous masses of material, is particularized. The laying down of railways, the making of roads, and the skilful organization by which the work is being carried out, are all described; as are also the operations on the line of aqueduct, including the tunnelling of mountains, the crossing of rivers, the method adopted to prevent disaster by the bursting of pipes, and other devices such as the wash-out and air-escape valves. The way by which the water is brought through the aqueduct to Birmingham, with its gradual fall of only 170 feet in 73 miles (although during its progress frequent descents have to be made into the river valleys, and subsequent ascents made to the level of the hydraulic gradient) is fully explained. A description is also given of the filter beds and reservoir at Frankley, and also of the service reservoirs at Warley and Northfield.

An interesting feature of the book is an account of the provision made by the Corporation for the workmen and their families in the Elan Valley; and the regulations controlling the supply of intoxicating drink in the canteen. The social results of this experiment are detailed; and it is stated that the canteen profits are devoted to the social and intellectual welfare of the inhabitants. The whole cost of the day school, beyond the Government grant, has been met from the canteen profits; and the expenses of the public rooms (including the library, the gymnasium, &c.), together with the salary of the missionary, comes out of the fund, while the bath house and hospital have been handsomely subsidized from it.

In the final chapter there is an account of the Liverpool and Manchester new water undertakings, both of which have been completed since the issue of the former edition. The cost of these schemes, and many other particulars, are given for the guidance of those who are interested in the carrying out of such enterprises. In the same chapter the present condition of London, in relation to its water supply, is touched upon by the author.

The book is copiously illustrated, showing the present stage of the works both in the Elan Valley and on the line of aqueduct. There are also numerous maps and charts. The most important of these is the coloured map giving the geological formation of the line of aqueduct, with many other engineering particulars. A sectional chart of the reservoirs is also included, and the model of the watershed which was used before the Parliamentary Committee is reproduced.

**Gas-Lighted Buoys.**—An article on "Illuminated Buoys" appeared in "The Times" last Tuesday; and the greater part of it was devoted to a description of the use of oil gas for lighting these useful guiding marks to mariners. The article did not do much in the way of advancing knowledge on the subject from a technical point of view; but it did show that this form of lighting buoys was rapidly growing in estimation. Recognizing the great value to navigation of lighted buoys, the Elder Brethren of the Trinity House have done much to encourage the development of the system in this country by placing gas-lighted buoys at many important points in the channels at the entrance of the Thames, in the Solent, and elsewhere. This example has been quickly followed by the Scottish Lighthouse Board, the local authorities for the Mersey, the Clyde, the Tees, the Ribble, King's Lynn, and sundry other seaports; and now on the coasts of the United Kingdom, there are close upon 100 gas-lighted buoys in position. In the Suez Canal, in Canadian and Australian waters, these buoys are already in use. In America also a considerable number are employed; but the United States Lighthouse Board have also some electrically-lighted buoys in Gedney's Channel approach to New York, which system, as now worked, is said to be very expensive, and liable to frequent interruptions of current. In France, too, the lighting of buoys by means of gas has been largely adopted of late years; and in Germany, Denmark, Russia, Holland, and Italy numerous gas-lighted buoys have replaced unlighted ones. It may truly be said that the development of this system is the most important improvement in our coast-marking arrangements that has taken place in the last twenty-five years. An "Ex-Member of the Clyde Lighthouses Trust" has subsequently written to claim that to the Northern Board is due the credit of introducing a complete system of illuminating gas buoys. He says: "After testing the matter thoroughly, the system was adopted; and a gas-works and special steamer were constructed at Port Glasgow for carrying out the service, which now consists of gas buoys and beacons at various points on the Firth of Clyde, besides foghorn installations at Toward and Cumbrae lighthouses. The example thus set was followed at a respectful distance by other Boards, including the Trinity House, whose dealings with the invention in its initial stages appear to have been on all-fours with its treatment of the Doty oil and Wigham gas burners (the latter of Tyndall resignation fame), which reflected anything but credit upon what claims to be the premier lighting board in the kingdom."

## COMMUNICATED ARTICLE.

### WAYSIDE NOTES.

By T. S. CLEMINSHAW, Assoc.M.Inst.C.E., of Colombo.

The various branches of gas engineering admit of so much difference of opinion, that to many it is the greatest bewilderment to attempt to arrive at a conclusion as to what is the best course to pursue in some of the leading departments of it. If, for instance, the student, or searcher for knowledge, takes up a paper on a popular subject, he is certain to find opinions so immediately opposed to one another that he is apt to give it up in despair, and fall back on his own resources. Happy indeed is the man who, in his time, has had the great advantage of travelling round works and jotting down his observations in his note-book. In some of the places visited, he will have seen things which he thinks are wrong; and he is apt to depart with a less exalted opinion of the man in charge. Put yourself in his place, and think how you would act—perhaps after taking the place of a man who was content to let things drift, or who, from the keen eye of his cheeseparing superiors, could not escape and put the works in order, and whose only criterion of a good works was the dividend-paying power, irrespective of its condition as a fully-equipped gas-works. Such works go on, necessitating an enhanced price of gas, through the mistaken employment of inefficient plant, when they should, by a judicious expenditure of capital, or a dip into a carefully nursed-up reserve fund, have been working on modern lines and selling gas at a cheaper rate. The old stack of retorts goes on and on steadily wearing out, till at last the goose that lays so many golden eggs is judged fit to die. A new bench must be built, on a modern system; and no provision has been made for its construction from a reserve fund, as, in their anxiety to get the utmost farthing of dividend, there was no chance of building one up. But when the change is effected, it means eventually a 20 per cent. increase of gas per ton of coal carbonized—perhaps more—and a large saving in coal and labour, which in the aggregate will wipe out the cost of these extensions in, may be, a couple of years, to say nothing of the saving in wear and tear of retorts. Who does not know of such works in his experience? The writer well remembers a case where, by an improved system of retort-setting, a considerable increase of gas could have ensued; but it was decided to build a new arch on to the old ones, with the intention, it is presumed, of "putting up wi' the deil ye ken."

But let us pay closer attention to the root of the matter. In laying out a new works, many are the methods of achieving the end in view. First and foremost comes the good old adage of "Keep down your capital expenditure." Certainly; but how? The designer knows a place where some discarded plant is rotting away, ready for melting down at its proper place, the foundry. So he goes round and makes a bargain for some old mouthpieces, ascension-pipes, a length or two of hydraulic main, a set of purifiers, and perhaps an old governor, for his new venture. Picture such a works. Ascension-pipes, 6 inches; foul main and condensers, 6 inches; purifiers, 4 inches; station meter, 3 inches; gasholder, 8 inches; and governor, 8 inches. The venerable articles compel him probably to put in settings of a different size and even shape in each oven. But this is anticipation.

Then the question of foundations no doubt is an important one, and meets with varied treatment. Let your readers watch a warm discussion of a paper in which concrete takes a leading position. Take note of the proportions one man says are sufficient to ensure success in this, to some people, simple mixture. The writer once rashly argued with a fellow engineer on this subject, and the debate became warm; but it cooled down on the gude-wife's exclaiming, "Eh, mon, but ye shouldna argy wi' him about concrete!" In this question of concrete, one man declares that it is absolutely necessary, on good ground, to use a 3, 2, 1 mixture, respectively of stones (2½-inch ring), sand, and cement. Another says 5, 3, 1. Yet others want 6 to 1, 8 to 1, 12 to 1. And so the battle wages. But now comes another element into line as the discussion goes on. Skirmishing changes to a general engagement when wet and dry concrete is considered. The "wet" man declares the "dry" man does not consolidate the aggregates thoroughly; and the other says the wet man washes the cement away. Both these men are correct, if judged by extremes—as they often are. In some places, the aggregates, in the shape of a clean shingle or ballast, containing the necessary small stones and good clean sharp sand, form an ideal concrete when mixed in the proportion of one cubic yard to a 400 lb. barrel of cement. In some instances the shingle may be of even larger proportion, and an efficient foundation or tank may be built out of the resultant mixture. But for the foundations of new benches in a works already installed, or for any concrete work, what can be superior to old fire-bricks, retorts, clinkers, and such like? Yet cases have been known of such being rejected, and expensive hand-broken stone put in their place—and that, too, by folks who considered themselves not wanting in business acumen.

For some retort-bench foundations a 3 to 1 sand and cement, among 9 parts of such old materials, has produced a concrete so



tenacious, after a few years' standing, that when generator firing was installed, and the centre of the arch required its concrete removed, gads of great endurance from heavy sledge hammers became necessary to effect the work. The concrete was then taken out in large and thoroughly incorporated lumps, which required two men to handle them into a barrow. Nor need the free interspersing of handy blocks of stone be neglected, taking care that they are well bedded and then amply incorporated in the mass of concrete. This concrete—9 to 1—placed *in situ* so that the water has been brought to the surface under the trampling of a navy's boots, was harder to remove than the 3, 2, 1 mixture first mentioned. In the above remarks portland cement is understood. But lime, when it can be had of good quality, will serve the purpose as well; the proportion of lime being, of course, increased to achieve the same result.

When once the foundations are laid, then the mystery often commences. What sized settings shall be put in? Shall the exit-flue of an open-fire setting be at the bottom of the back of the arch, or by a hole in the crown? In a 60 million cubic feet works could be seen a system (!) which included twos, threes, fours, fives, sixes, and sevens. Again, in a works boasting 16 retorts, three in a bench at the most, no two settings were alike; and the chance of obtaining decent heats was remote, for the stack was built of limestone, and an overventuresome man in charge saw it melting at the inside of the oven when he increased the temperature. Here was made 25-candle gas, 9500 cubic feet to the ton, out of a coal from which others procured 12,000 cubic feet of 17-candle gas to the ton. In one instance a house was erected 24 feet wide, and 40 feet long, for a rising town. The retorts were 15-inch, rounds, 7 feet long. While the demand was small, not much inconvenience was experienced; but later on there was no room for the men to move round when drawing and charging, as they had to scramble over the coke and coal. Subsequently, the works were extended; and then came in vogue 15-inch rounds, 18-inch rounds, and 21 in. by 15 in. ovals—a somewhat confusing variety, and apt to be awkward if a bench gave out before its time, and no retorts of the special size were in stock. The latter system was due to the uncertainty as to the best shape to be used; but the newcomer promptly adopted the ovals, and confusion vanished.

Nor should a rather peculiar plan pass into oblivion. In a house capable of manufacturing 120 million cubic feet of gas per annum, the outer walls being still in excellent condition, the retort-bench was condemned when the make only reached 60 millions. A new house, costing several thousand pounds, was erected containing another retort-bench. Now had the old house been remodelled piece by piece, on a well-considered plan, much money could have been saved. The retorts in the old house were 16-inch circular, 20 feet long; and through a deep seal being employed, they became so much obstructed that a 6-inch sphere could not pass along a line stretched from centre to centre of the mouthpieces. The mode of charging these retorts was peculiar. First one side was filled, and then, in face of a flaming mouthpiece, the opposite side was manipulated.

The want of proper system in many small retort-houses is often painfully evident. In one house, eleven beds of threes, all iron, were put in, and had worked for some time, even when the retort-house was producing 17 million cubic feet, no exhauster being employed. This cannot be said to have been a reasonably modern system; and the continuance of such a building cannot be called common, even during the last two decades. By degrees it is becoming recognized that retort-arches should be built so as to be capable of easy working when the works expand; and the employment of fives and sixes is a real step in this direction—omitting the bottom retorts in the earlier stages, and making use of the space for regenerative flues on a small scale. In medium-sized works, of 60 or 80 million cubic feet capacity per annum, the employment of sixes leaves room for an easy step-up, month by month, in some places. But this should form a question of much importance as to the local conditions. Given plenty of gasholder room, and a reasonable rise in the demand, a bench of sixes each month "fills the bill" well, and for evenness of heating will take a foremost place for the medium works. It should be borne in mind that there are manufacturers of retorts who have a standard set of sizes for mouthpieces; and the bolt-holes then require no alteration. The manufacturers naturally complain about the multiplicity of templates; and, indeed, they are a formidable array in the manufacturers' hands. If some standard were adopted, they would be able to stock retorts ready for prompt delivery. The retorts are ordered in the spring of the year; and there is a rush to get them finished in time for the winter. But if standard sizes came in, a steady employment could be given to workmen in the winter. Anyone acquainted with "overtime" knows that speed, quality, and expense do not always receive equal consideration. And while considering the question of simplicity, may not a word or two be written on the shapes of tiles, blocks, and quarries of such and such patent regenerative or other furnaces; one man yielding to no one his preference or his absolute faith in a rebated joint, while another declares he gets just as good results from a plain squared tile? Some fire-clays, it is well known, have the property of shrinking after they leave the kiln, and get burnt afresh in the setting; but others remain true. Surely, then, economy points to the use of simple joints, which do not suffer in transit, and permit of great simplicity both of design and cost of labour.

Experience proves that square joints can be used with good results. Witnessing an extension of retorts not many months ago, this multiplicity of blocks and tiles, with tender parts, many of them broken in transit, impressed the writer greatly.

We come to a somewhat delicate part of the retort-setting, when we survey the various schemes that have been laid before the gas world, in the shape of regenerative, recuperative, generator, full-depth, half-depth, and shallow-depth generators, a generator in the same position as the ordinary fire, and lastly the old style of open firing. But pausing to consider the best system, the searcher among technical records is struck with wonder, not far off profanity. He will, perhaps, take advice of a friend, who says to him, "Why, my dear fellow, nothing is simpler; try the regenerative full-depth furnace." May be he is not convinced, so asks a second friend, who says, "Try a deep generator, and heat the secondary air under the floor of the setting." Yet another advises him "to go in for none of those systems—frightful expense and risk. Why I get as good results as any of them," &c., &c. A large installation of gas-fired retorts recently formed the topic of information and good discussion in your columns, as well as among engineers. This setting was a simple kind of generator, with flues for secondary air under the floor of the setting; and a friend of the writer's pooh-poohed the system. He declared that no good would result unless a full and complete system of regeneration was installed; and that the idea of feeding with gaseous fuel a large number of retorts from one furnace, admitted of no regulation of the heats. The presence of dampers on the outlet-flues was pointed out, but all of no avail; it was non-regenerative, and that was enough. And yet success has elsewhere been found among simple settings such as these.

It is recognized among those who have tried it, that in these gas-fired furnaces the chief difficulty for a beginner is the proper regulation of air; and strange sights await the searcher after truth. One uses a proportion of primary and secondary airs as 1 to 2, another 1 to  $4\frac{1}{2}$ , another 6 to 1, yet another 2 to 1; and so the proportions vary. Nor can this proportion be found out but by experiment, as two benches in one stack contain elements which demand a varied proportion of opening of the two shutters. Who is not familiar with this in the open-fire setting, though the bricks in a setting may be within a few dozen alike in size and quantity? A ready means to achieve the result is by watching the combustion chamber to see that combustion is good; and then, having weighed the coal in, weighing during three or four days the coke that is left after fuel has been taken for the furnace. If weighing is impracticable, measured bags may be used. The alteration of each proportion of openings in the shutters will then tell its own tale; always allowing sufficient time for the altered condition of air supply to take effect—say, three or four days in the week. It is well, in regulating the supply of air, to trust to shutters alone. In two cases observed, there were respectively a  $1\frac{1}{2}$ -inch and a 2-inch pipe entering the ashpans outwardly. Being horizontal, of course, they contributed their quantity of primary air; this being allowed for. Anyone who has watched the ordinary open-fired bench knows that hot lumps of coke detach themselves from the glowing body of fuel, and, falling below, swirl round and round on the top of the water, before some of them sink, but not all. Some eventually find their way to the overflow-pipe in the gas-fired oven, and obstruct the admission of air to the furnace. Only a detail one may say; but quite sufficient to upset the balance of air supply. Were the pipe sealed, there would be no such trouble. The overflowing water, in a blocked pipe, would rise till it reached the furnace frame, and then escape; for the doors, though planed, are exceedingly difficult to keep tight—demanding attention such as no ordinary stoker or furnaceman will give, and rendering the calculation of the air a matter that need not be carried to the extent it is when results are published, showing the amount to the decimal of a foot.

The writer has been fortunate in examining furnaces where the depth of cellar-floor, below the stage-floor, for the installing of gas-fired producers, has varied from 3 to 14 feet. One producer was set in a bed of sixes—neatly worked out, it is true, but doomed to failure, as the cold air and brickwork (the result of water trickling on the bars) rendered it impossible that the two bottom retorts should receive sufficient heat from a furnace whose fire-bars were almost in a line with the underside of the bottom retorts.

Let us examine the essentials of gaseous firing in an atmosphere free from too much technicality (for there are abler pens than the writer's), as a means of giving some of the less fortunate brethren a helping hand. The real object is to eliminate from the coke the gaseous elements, mix a proper proportion of air with the gas in the combustion chamber, and a fierce, clean heat is the result; while the mineral matter gradually descends to the ashpans for removal. The gas may be extracted in two ways—fast or slow, in shallow or deep producers, giving clinker or otherwise. Shallow producers are more apt to give clinker than the deep ones; but it is not always advisable or possible to make depth the sole consideration, as expense comes too largely into such a scheme.

In a shallow furnace, the time taken for the coke to reach the bottom is perhaps 4 or 6 hours; while in a deeper furnace it takes 30 to 35 hours to effect the same end. Consequently the evolution of gas from the coke is a much more gradual process, although the volume may be nearly identical. The zone of



combustion in the furnace is a very little above the bars, and below the top in the shallow furnace; but in the deeper one it is far enough from the bars not to cause clinker, which results from too great a heat being present when the mineral matter and gas from the coke are parting company. This brings on a very important consideration, which is no less than the desirability of using water or steam, under the bars of the producer, with the primary air. Passing through several works where gaseous firing was employed, the use of the two elements became the object of keen observation. The very general use of a supply of water on the bars caused reflection, especially when large lumps of fairly solid clinker could be seen in the heaps of pan breeze outside. It is admitted that the reason why water is placed on the coke at the bottom of the producer, is to raise steam. This is granted; but the constant passing of water on the coke, which rests on steeply inclined bars, cools it and the bars to such an extent that, shortly after the producer has been cleaned out and the coke cooled, there is not sufficient heat to raise the necessary amount of steam to avoid clinker—or, at least, to allow of its removal in a loose friable state. On the other hand, with the use of steam, so arranged that the volume issues to the middle of the ashpans, meeting in its upward course the primary air which comes through the doors, the freedom of clinker is indeed marked, and is a matter of much gratification to the men working the furnaces, by running three months at a time without requiring the use of clinker-bars heavy enough to be a load for a man to put in the furnace, but only a light rod of  $\frac{3}{4}$ -inch round steel flattened at the end. In this case, of course, the clinker was taken out in a "loose friable state."

Surely such a desideratum is answer enough to those who declaim the use of steam in these furnaces in lieu of water; and yet, during a recent discussion in your esteemed columns, one correspondent declared it was matter in a wrong place, and had no business there. It was presumed to be harmful, as it lowered the heats, and so spoiled the efficiency of the furnace. Too much steam will undoubtedly do this; but if a handy indicator is put on the wheel of an ordinary  $\frac{1}{2}$ -inch steam-valve, and intelligently used, the workman soon finds out, for his own sake, the amount of steam needed to keep down the clinker, without sacrificing the heats. The indicator consisted of a circular plate  $\frac{3}{8}$ -inch thick, provided with a hole large enough to pass the wheel of the valve, and a pair of clips to fasten it to the  $\frac{1}{2}$ -inch steam pipe; while a pointed bent brass indicator allowed of an easy method of calculation. Before this was done, much waste was likely to occur as to the volume of steam; but afterwards the men expressed themselves satisfied, and on settings of six in a bed—the retorts being 22 in. by 14 in. by 9 ft. long—8000 cubic feet per mouthpiece was accomplished without any inconvenience in the ascension-pipes. In some of the large works, between 6000 and 7000 cubic feet per mouthpiece seems to be high enough to satisfy those in charge.

In the choice of retorts there is room for much diversity of opinion; and it often happens that retorts of one district are set among bricks from a different source altogether. Consequently trouble arises owing to the difference of shrinkage of the various materials. The same may be said of bricks. The employment of bricks bought at fancy prices, because on analysis they claim to possess certain percentages of silica and alumina, &c., is not always justifiable. An experience may not, it is hoped, be considered out of place. Some bricks possessing a high percentage of silica were purchased at 105s. per thousand, packed up in casks containing fire-clay to protect the fragile bricks. Later on a harder brick was bought at 47s. 6d. per thousand, which gave results equally good, and had the advantage of being of the same composition as the bricks inside the setting.

Then the question as to staying the retorts inside the setting is one of much importance, and has been known to range between spaces of 14 inches between the walls, with the old system of open-fired retorts, to alternate  $4\frac{1}{2}$  inches space and wall in gaseous firing. A spacing found to answer well was 12 inches with open-fired and 7 inches with gaseous-fired retorts; and the retorts were in better condition in the latter than in the former—even though the period under much hotter fire was more than double.

The spacing between the retorts vertically is a matter worthy of much thought and consideration—more than it is usually accorded, especially in medium gas-works. Some declare that 5 inches is the least that should be allowed, even with gaseous firing; but good results have ensued from  $3\frac{1}{2}$  inches space. Nor should the height of the retort be neglected; and as 13 inches is about the lowest that is practicable with scoop charging, so 18 inches is too great a height, and with many 14 and 15 inches has proved ample. When kept free from carbon, 14 inches will be found to work well; and every extra inch makes it harder for the men, in medium works, to raise the scoop to the top retorts, in benches of six, seven, eight, or nine in a bed. Starting with a 12-inch space under the bottom retorts, a 20-inch retort (14 in. by 3 in. by 3 in.), then  $3\frac{1}{2}$  inches space, a 20-inch retort, then  $3\frac{1}{2}$  inches space, and 3 inches as the thickness of a top retort, will give 5 ft. 2 in. as the height of the floor of the retort. Practical experience will soon convince a doubter of the truth of this statement. The employment of extra tall men as stokers is by this plan rendered unnecessary, thus permitting of a wider selection. It is understood that this applies only to medium and small sized works, which have not advanced sufficiently to make the installation of machinery advisable or profitable.

Let us pass on to the matter of stays for the bench, and we find a selection of styles to suit even the most fastidious. Bars of various shape, Tees, I section, I section with a plate at back to cover more surface, old rails of various shapes and sizes (sometimes four grouped together to form one buckstay), flat bars on edge (the worst of the lot), flat bars with angles riveted on them, and many more. True, it is a stay that is required to keep the bricks from creeping, especially at the division-walls. Consequently the surface of the brickwork should receive as much support as possible; and this cannot be done by the flat bars on edge. A pair of flange rails, Vignoles section, an I joist with a wide plate, riveted on to the joist at the back—say, 12 inches wide for a 14-inch wall, or 15 or 16 inches wide for an 18-inch wall—will be found a real preventive of creeping walls, if properly erected, and a strong enough transverse bolt used. The top end being left long enough affords means of supporting each single length of hydraulic main—a practice that has been condemned by some, but which, for convenience and safety, is finding increasing favour. This plan is slightly more expensive at first than the old style of continuous long lengths of hydraulic main; but the conveniences and ultimate saving outweigh the first cost. In the continuous system, there is practically no chance of keeping the seal of the hydraulic main, satisfactorily and automatically, at a constant level, and having a circulation of the tar at the bottom of the main.

Round the hydraulic main many skirmishes and battles royal have been waged; some of them traceable to simple causes for their solution and pacification, and others only solved by means of much labour and high language. The hydraulic main seems to carry a false name in many places, and would have been better denominated, according to some, as the "slough of despond." Its chief object being to seal the dip-pipes in water, care should be taken to remove any other element as fast as can be. Granted; but if the gas comes forward with all the water dried out of it, how then? Feeding water into the main is one practice indulged in, causing expense to raise the water; and another plan is not to dry up the incoming gas till it gets to the hydraulic main. In the case of some coals, they block up the ascension-pipes easily—especially when the bench of retorts has the flues so disposed that the hottest part of the retort is at the front, and a block occurs from the mouthpiece right to the bottom of the hydraulic main, necessitating the removal of the pipes and arch pipes amid the heat, smoke, and dust. Many have been the contrivances on, in, and about the hydraulic main—anti-dips, bye-pass pipes, removable seals, and cups that have the water blown out of them, and so unseal the pipes when the make is heavy, and fill up as the charge gets exhausted. An experience of some years has led the writer to believe that good results may be had with anti-dips, which, owing to peculiar circumstances, were adopted; but the hydraulic main, worked in a proper manner with a water-seal of even depth on the pipes—an easy matter when single lengths of main are employed—does its work well.

The subject has already run to such length, on account of the great interest of it, that a conclusion must be made. If, however, the writer's notes have been the means of interesting and assisting any of the members of the profession, the compilation of them will indeed have fulfilled the main object with which they were written.

**The Gas Supply of Vienna.**—Under the title of "An Anglo-phobists' Defeat: How Dr. Lueger had to give in to a British Company," the Vienna Correspondent of the "Daily Mail," writing last Friday, said: "Two years ago Dr. Lueger, the anti-Semitic Buergermeister of Vienna, boasted that after the smashing of the Jews he would smash the English in Vienna, and drive all of them out of Austria by the end of the century. One chief act of his administration has been his refusal to renew the contract with the Imperial Continental Gas Association for the lighting of Vienna. After involving the town in the expenditure of vast sums to build a new gas-works, and lay new pipes, Dr. Lueger has come to the conclusion that the English are indispensable, and has renewed negotiations with the Gas Company. I learn from the 'Neues Wiener Journal' that the negotiations resulted in the renewal of the English Company's contract for the greater part of Vienna. This surrender to the English Company is the most serious defeat the anti-Semites have suffered." Commenting on this news, the "Pall Mall Gazette" says: "British enterprise has found an open door at last. What is more, the said door had been shut and padlocked for two years. The Vienna correspondent of the 'Daily Mail' reminds us that Dr. Lueger, the Anti-Semite burgomaster, had boasted that, after smashing the Jews, he would smash the English, and drive them out of Austria by the end of the century. He began, in a very small way, by boycotting the Imperial Continental Gas Association, which was under contract to light Vienna. He went on, in a much larger way, to build new gas-works, pull up the Semitic-British pipes, and lay down fresh and patriotic ones. But, alas! the business was a failure, and an expensive one, too. Dr. Lueger has renewed negotiations with the Company, and they have forgiven and forgotten. 'This surrender,' adds the correspondent, 'is the most serious defeat the Anti-Semites have suffered.' It is also a most damaging confession for Dr. Lueger himself. If there was one thing in which he might have been expected not to fail, it is the production of gas."



## TECHNICAL RECORD.

### WAVERLEY ASSOCIATION OF GAS MANAGERS.

#### Half-Yearly Meeting at Duns.

The Seventy-fifth Half-Yearly Meeting of this Association was held at the White Swan Hotel, Duns, on Thursday last—Mr. J. M'LAREN, of Duns, the President, in the chair. There was a good attendance of members and their friends.

The HON. SECRETARY (Mr. W. B. M'Lusky, of Selkirk) stated that he had not thought it necessary to prepare any report for the Committee who were appointed at the preceding meeting with reference to the efforts of the North British Association for the standardizing of meter-unions. They were all aware of what had been done in the interval. The matter was now in the hands of the Council of The Gas Institute; and they had not thought it needful to take any action upon it.

The decision of the Committee was approved; and they were continued in office.

#### THE PRESIDENT'S ADDRESS.

The PRESIDENT then delivered the following address:—

Before commencing my address, I must thank you for the high honour which you have bestowed upon me in electing me President of the Waverley Association of Gas Managers for the present year. When I was proposed for this office, at a meeting last year, I could not but appreciate the great compliment. But I felt considerable doubt as to my ability to fill the post satisfactorily; and it was only with the firm conviction that I could, if selected, rely upon the help, not only of the Association, but also upon the help of all of you, that I agreed to my name being put before you for the post. I have already felt some of its numerous responsibilities and worries; and not least among these is the preparation of an address. If I could put before you something entirely new in gas undertakings, I might feel justified in asking your attention for some short time. But as I have nothing new, I must throw myself upon your mercy, and ask you to excuse and overlook all my manifold defects. The few remarks I am about to make are simply intended to show some of the difficulties the manager of a small gas-works has to contend with.

In speaking on this subject, let us imagine a works making (say) from 5 to 10 million cubic feet of gas per annum, and that the works are old and out of date—too small to meet the demand put upon them in midwinter—and also that the company cannot afford to, or will not, reconstruct the works, or that they think reconstruction will not repay the outlay. Not a very bright outlook, you will say. Well, no, I grant that. But how many managers of small works have much better? Let us first of all examine the duties of the manager of such a works. He has to be on the works early in the morning, to act as his own time-keeper, and to see that all his plant is working properly. He is, naturally, responsible for the correct working of the concern, has to keep all books, and sometimes, when called upon, to be his own stoker, main-layer, fitter, and, if pressed, his own labourer. He has also to inspect meters, look after the public lamps, and, when necessary, do all testing and drawing. He is liable to be, and frequently is, aroused in the night to attend to some accident on the works. Of course, his chief object is to make as much profit as possible. This is no easy matter with the plant he has to work with; added to which he will have to pay heavy carriage on coal and residuals, as small works are usually out of the way of collieries, and often far from a good railway line. If you inspect his retort-house, you will see that he has three single benches of three retorts—nine retorts in all. His furnaces are direct-fired—burned beyond repair, as likely as not—and his retorts are patched and cracked. These he has to make work by some means or another.

In small works as in large, the retort-house is the most vital part, more especially as regards money-making; and upon the efficiency of the carbonizing plant proper depends the financial results of the business. If money is lost there, or the working is not economical, no amount of care and attention afterwards will be of much benefit. He cannot work as cheaply as in the case of a large works. Even though his plant is good, he cannot compete with works using stoking machinery, inclined retorts, and other labour-saving appliances. Besides, these would not pay in so small a place. The works will be too small to allow of storing coal in any quantity. This places him to a great extent in the hands of the colliery proprietor who holds his contract for coal, as regards the running of waggons, which will run fast enough in summer when neither he nor anyone else wants them; but in winter, when the demand for coal is high, he has a great deal of bother to get any coal at all. And when he does get it, it is wet through, or may be covered with snow; and it has to go into the retorts just as it is, much to the detriment of the heat of the setting.

In midwinter it will suddenly spring upon him that the beds cannot be got hot, and no one knows the reason; or else he finds out that there is no draught up the chimney, nor can he obtain any. Then, after almost superhuman efforts, he discovers that the main-flue is blocked with dirt, ash, or dust. This he manages to clear temporarily. Then either his exhauster will stop or some of his connections will get blocked up with accumulated

tar and liquor, &c.; thus causing a big back-pressure, and not infrequently blowing the liquid from his hydraulic main into the retorts. If in midwinter, when the whole of his retorts are working, a fog should come on suddenly, and the consumption owing to this become greater than the make, he has to get up furious heats in as short a time as practicable, to obtain the greatest possible amount of gas in the least possible time. This is often the source of trouble with the ascension-pipes, as a thicker tar is produced, which forms pitch sooner than lighter tar would. Or, if the benches are not in the best condition, an arch may drop in; and perhaps a retort or two may then get burned through.

From the retort-house, the gas is led through the foul main to the condensers. This main may be a 6-inch one, which is far too small; and the condensers may be totally inadequate to cope with the full make from all the retorts. Then, again, the 6-inch main may have filled up badly in the years it has been down, and the condensers and inlet and outlet of the scrubbers may be in the same state; and it would be nothing new for the pipes to choke up and put the works in a mess with back-pressure. The exhauster may suddenly break down, causing such a pressure that it would be easier for the gas to find its way through the porous sides of the retorts than against the pressure thrown by all the different pieces of apparatus. The manager will then have to set to and repair the exhauster; for he has no other to put on in cases of this sort, and this one may have been working for years, and not have been touched in the way of repairs.

The purifiers will be too small for the maximum make—in fact, they will hardly last for three days in the busiest season; and if one is taken off to put fresh oxide or lime in, the remainder go dirty sooner, as they have more work to do. The purifier centre-valve may be old, and the faces not true, in which case the gas will leak from one purifier to another. There may also be a water-valve or two about the place; and these have a nasty way of freezing, or going wrong just when wanted. The station meter may be too small, or out of order—useless, perhaps—in which case the manager does not know what amount of gas he is making or delivering. If his gasholder is far from the boiler (supposing he has a boiler), so that he cannot get steam into the cups, it is quite usual for the water to freeze in winter and bind the holder. Should this happen in the morning, when the consumption of gas is less than the make, a pressure is thrown which will blow the water out of the purifier lutes. If it should happen at night, when the consumption is greater than the make, the holder becomes fixed, and the pressure becomes less and less, until at last the town is put into darkness.

The manager of a small works is quite as much troubled with naphthalene deposits as the manager of a much larger works. Besides the troubles known only in small works, he has to contend with the same as his better-off brother in the large works. He has, like the manager of large works, to attend to the complaints of the consumers; keep the gas free from impurities, and above, or at least equal to, the candle power prescribed by his Act; to keep order; and, above all, to "make money."

And now I will not detain you any longer. I have tried to keep as near my title as possible; and in so doing I am afraid it may appear to you that I have been relating a chapter of accidents. But, at the same time, I think I have shown some of the difficulties the managers of small works have to contend with. If I should have succeeded in interesting you for a short while, I shall have attained my chief object.

#### Discussion.

Mr. H. RUTHERFORD (Aberlady) said he thought they ought to thank Mr. M'Laren for his address. He had shown them many difficulties which a small gas manager had to encounter.

Mr. D. VASS (Edinburgh) said he could quite bear out what the President had said—that many of the difficulties which he had pointed out faced them all on entering upon duties in a works which were strange to them. The first winter in a new works was a very trying time to any gas manager. Even in the smallest works, a new manager should, during the first summer he was in charge of them, make a thorough inspection of the whole plant. This would enable him to overcome many of the difficulties which had been mentioned. By such inspection, they would find out, for instance, if the main flue was clear, or could have the condensers steamed, supposing there was steam on the works. The washer and the exhauster could be looked at; and he thought it was always advisable to employ a mechanic in the summer to overlook the exhauster. His experience was that, if they tried themselves to patch up the exhauster, it might go wrong just at the time it was wanted. Even if it were overhauled by a mechanic, an accident might take place; but then they would have the satisfaction of being able to say that they had done the best they could to prevent any such difficulty. The President had confined his remarks to works of from 5 to 10 million cubic feet; but the same difficulties were to be found in works as large as from 20 to 40 million cubic feet. Of course, in the larger works there was a bigger staff to deal with difficulties; and they might be got over sooner. One little trouble which he had to overcome, and which could not be foreseen, was with what was called a self-acting trap. He believed they were not unusual in distributing-mains. In this particular case, it had been put on when a new 10-inch main had been laid from the holder; and it gave no



trouble for years. But one evening the pressure suddenly fell; and had it not been for a small district holder, it might have gone down to 2-10ths or 3-10ths. As soon as the decrease was noticed, the holders were reversed, and arrangements were made to fill one which was nearly grounded. It took them about three days to find out the defect. A lead pipe had been laid, to work by a syphon arrangement; and there having been a flood in the district, the water, instead of having been drained off by the syphon, had been drained in, and had filled the main to a few inches from the top.

Mr. W. BLAIR (Haddington) said they all knew very well that small gas-works were a training field for managers for larger works. He had had experience in both small and large works. As the manager of a small works, he had always made it a point, about this time of the year, to thoroughly overhaul the whole of his plant—to take particular notice of the condition of the pressure-gauges and such things, and of how the gas was going right up to the holder. And he might say that he had never experienced a complete choke-up; he had never had anything which could not be remedied in a few minutes. He had had his trials and difficulties, like others; but he had always found that attention to the matters he had mentioned enabled him to get on very well. In Haddington, he had not had a cap or pipe open for the last seven years, except for these inspections. He had a small steam-boiler; and he found that by it he could clear away, in five minutes, any obstruction which was likely to occur between the gas outlet and the purifiers. He had an exhauster and washer, and almost all the recent appliances which could be introduced into gas making. He had found the re-modelling of the works to be of the greatest advantage. They had reduced the price of gas from 5s. 10d. to 4s. 7d. per 1000 cubic feet. He thought that even in works down to a million cubic feet, it was worth while considering whether they should not introduce the latest appliances. He had no doubt it would be found to be of advantage in the long run—at least, that had been his experience. With reference to pitching, he might say that, in cases where retorts had been lying off, it was advisable, before they were re-started, to examine the dip-pipes, because there might be found, at the bottom of them, an incrustation, which could be easily cleared away, but which if left would obstruct the passage of gas.

Mr. A. C. YOUNG (Kelso) said he had always found that the bane of the gas manager's life, in the winter, was the thing which happened suddenly. This trouble all his life had been with the hydraulic main pitching up. It was a difficulty he had never been able to overcome. He had found that high heats were always the cause of it. He would be very pleased to know how it was to be got over, because some managers held it was the coom, or gum, of the coal, especially in the case of small or drossy coal; while others said that it was the rich cannels, such as Newbattle. He had found it to take place even with common cannels, when the heats were high. Condensers were very apt to choke; but as Mr. Blair had pointed out, if they were cleaned out regularly, this might be avoided. It was a very good thing to have steam ready to be turned on at any moment; but he had never found steam to cure the pitching. He had heard that running water was effectual in preventing it; but had not found it so. He had had to take off the mains and remove the pitch by means of hammers and chisels, which was sometimes a dangerous operation.

Mr. BLAIR said he employed as high heats as anybody. He produced close upon 11,000 cubic feet of gas per ton of coal; and this, he thought, was a sign that he used fairly high heats. He might sometimes have tough tar in the hydraulic main; but he would not call it pitch. In his main, he had a baffle-plate fitted in front of the hydraulic valve, dipping  $2\frac{1}{2}$  inches into the liquid, and rising the same distance above it, so that all condensable matter had to go beneath; and he was not bothered with any pitching whatever in his main. He used the best cannon which was to be found in Scotland. He thought that pitching was, to a great extent, caused by the dips in the hydraulic main being really below what they should be. As to stopped ascension-pipes, if they were properly cleaned out each charge, there should be no trouble in this way. It was only when they were neglected, or the carbon or sooty matter was allowed to gather on the first 18 inches of the retort, that there was any trouble.

Mr. W. SMITH (Melrose) said he had listened with great attention to what had been said. With reference to the stopping of ascension-pipes, it occurred to him that the cause of this might be that they were too small. He had often been troubled in this way, when working with high heats; but when using low heats, he had never had any such difficulty. He thought that Mr. Blair did well in getting up to 11,000 cubic feet of gas per ton of coal; if he (the speaker) could do this, he would have a more favourable balance-sheet at the end of the year.

Mr. G. TAYLOR (Jedburgh) remarked that, like Mr. Blair, he had a baffle-plate in his hydraulic main; and he was never troubled with pitching. He found that, if the pipes were slanting in a certain direction, there might be thick tar, not pitch; but that, if they were put right, this went away. He thought that if the hydraulic main were too close to the bench, it might cause pitching. He found steam to be of very great benefit. One winter he had to pump a trap regularly. He put a steam-pipe down, and it cleared it at once, though it was pitched up very much.

The PRESIDENT said he quite agreed with one or two of the remarks Mr. Blair had made. He recollected once, in Ireland, he had three retorts working and three lying off; he started these three, and his gauge went up dreadfully. There was a sort of tarry matter gathered at the bottom of the dip-pipes, but no pitch; and he must say that, through all his experience, he had never had any difficulty with pitch in his hydraulic main. But he could not agree with Mr. Blair in regard to ascension-pipes. Ever since he had been at Duns, he had had great trouble with them in the dead of winter. When he had to use a high heat, to force matters, he was badly troubled—not with pitch, but with a thick sort of tar. It occurred at the very top of the cap, just before entering the hydraulic main. The pipes were always clear at the bottom.

Mr. BLAIR said he would recommend that there should be a cross current of ventilation at the level of the top of the retort-bench.

The HON. SECRETARY thought they might get a little nearer to the point. Mr. Young's difficulty, if he understood it aright, was not so much with the quantity of gas which was being taken off per ton of coal. It was rather the quantity the coal was capable of producing; and that immediately they began to distil the condensable hydrocarbons they had a choke. They were bound to have. At Selkirk, where they had fairly good settings, they could, with Newbattle cannon, for example, obtain 11,500 cubic feet of gas per ton. This was quite an ordinary make. But if they attempted to obtain 11,000 cubic feet from (say) Meiklehill, or any of the common coals, they had chokes immediately. Now, in Mr. Young's case, he had excellent heats, and the coals were all new to him; and his (the speaker's) opinion was that the trouble was due to coom. The reason he took such an interest in this matter was that he had chokes from the very same reason as Mr. Young had. He had drawn out ropes of pitch about 18 inches long, when using English coal at high heats; but whenever he used Scotch coal mixtures, getting the same satisfactory results from the coal carbonized, he had no stoppages. He believed that in every case, provided the plant was of the proper size, stoppages were due to over-distillation of the coal. They could not expect to take so much gas from an ordinary coal as from a rich cannon.

Mr. VASS supposed that Mr. Young did not mean them to understand that he was troubled with pitch in the proper sense of the word, but with thick tar. He himself was troubled with tar accumulating to such an extent that it would not blow by the ordinary valve. The valve was arranged so that the tarry matter should be drawn from the main first, and should leave only liquor in the main. In this particular case, the gas outlet was at the top of the main. The tarry matter got so thick that it would not flow; and they were troubled with back-pressure. He considered that the trouble was due to heat radiated from the bench. There would be about 18 inches between the top of the bench and the bottom of the hydraulic main; and the arches of the ovens had been made particularly light, as it was thought that they would rise and fall much easier, and would thereby have greater durability. The crowns of the arches would be about a brick and a half thick. They had to bore the end of the main, and steam the tar, in order to run it off. Now, if they found that there was the least tendency to pitch, they put steam through for about five minutes; and to get rid of the radiated heat, they placed a course of loose bricks along the edges of the bench, and filled in sand, leaving about a foot of space between the top of the sand and the hydraulic main. With this, and occasional steaming, they had been able to keep the main practically clear. He agreed with Mr. Blair in the matter of ventilating the retort-house. During the first winter he was in Portobello, they had a very close retort-house; and every night they had choked pipes. That winter he had enough to do to keep his men working, as they threatened to leave on account of the choking of the pipes. He had since changed the position of the bench. There was now much better ventilation in the retort-house; and there were not so many choked pipes.

Mr. J. C. ADAMSON thought that, somehow or other, the conversations at their meetings were perhaps more productive of good to the younger gas managers than what took place in the larger Gas Associations, where subjects which, to those in large works, seemed trifling did not engage full attention. As a manufacturer of plant for gas making, he might say that they had the advantage of coming into contact with all varieties of apparatus—for each gas manager sought to devise something to carry out his own ideas—and in this way they gathered a more universal knowledge of what was best adapted for the purpose. His experience was that the baffle-plate in hydraulic mains was almost universally used now; and so far as he knew, it had never failed in its object. He would suggest to their minds something which had not been referred to. He did not know if it had been observed by any of them that the manner in which the ascension-pipe was placed had sometimes to do with the choking of it. Supposing the ascension-pipe were inclined, as it went up, towards the retort-bench, the radiated heat from the bench would strike the side of the pipe down which the condensable matter was running, and there would be, more or less, a re-distillation of these products, leaving solid matter behind, adhering to the pipe, and tending to choke it up. If, on the other hand, the ascension-pipe lay away from the bench as it went up, the condensable matter would run down the cold side



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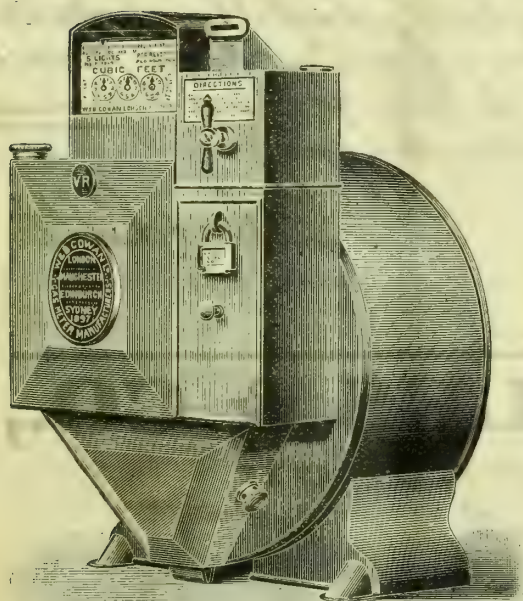


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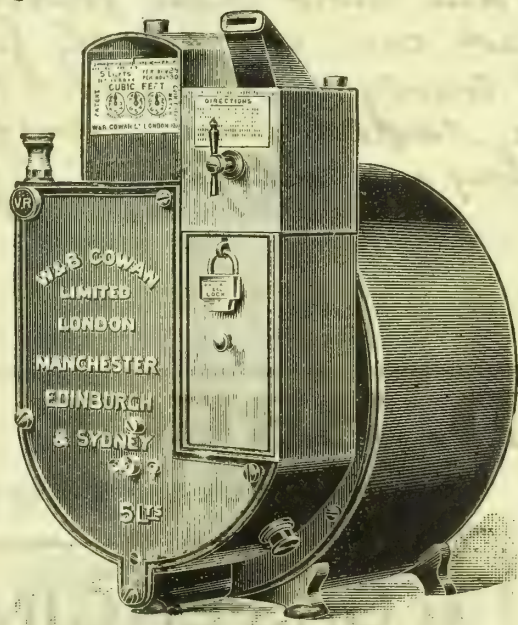
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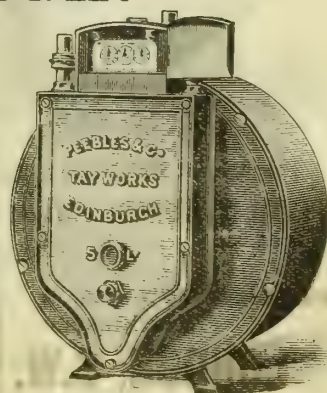
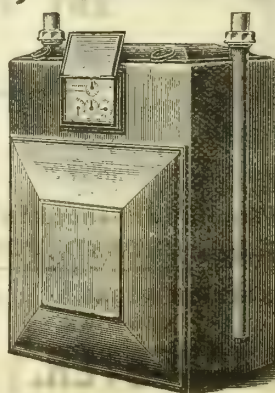
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of the pipe, and would not be affected by the radiated heat. He did not say that this would take place in every retort-house, because, where they had the cross currents Mr. Blair had spoken of, they would help to a great extent to neutralize the effect of the radiated heat.

Mr. TAYLOR said he could corroborate Mr. Adamson's statement. In his place, the ascension-pipes all hung out at the top. They had been in position for seventeen years; and there had never been a choke in an up-pipe, though there had been in a cross-pipe.

The PRESIDENT expressed his pride that his address had led to such a good discussion, and thanked them all for the way in which it had been received. While Mr. Adamson was speaking about the lie of the ascension-pipes, he was thinking of his own retort-house; and he recollected that the pipe which had troubled him most lay inwards to the bench at the top. The cross-pipe had been cut too short; and the ascension-pipe had been given an inward slant to suit it.

#### CONCLUDING BUSINESS.

The question of the next place of meeting was then considered; and it was resolved that, while no hard-and-fast rule should be adopted as to the holding of the spring meetings in Edinburgh, the meeting in April of next year should be held there, and that the meeting in September of next year should be held in Melrose—the date in each case to be, as usual, the second Thursday of the month.

The PRESIDENT asked for information regarding the insurance of gas-works against fire or accident; and several members informed him as to the rates which they were charged. The rates vary according to the class of risks, and average from 4s. to 4s. 6d. per £100.

This concluded the business of the meeting.

The dinner was afterwards held in the same hotel—Mr. M'Laren presiding.

#### THE ORIGIN OF GAS ASSOCIATIONS.

Mr. J. C. ADAMSON (Airdrie), in proposing the toast of "The Waverley Association of Gas Managers," said that the Waverley Association was the parent of all the Gas Associations or Gas Institutes in the country, and so far as he knew in the world. He congratulated the gas managers of to-day on living in such peaceful times. It was not always so. There was once a man named George Flintoff (whose death was noticed some two or three years ago in the "JOURNAL OF GAS LIGHTING"), who was possessed of a voluble tongue, and having agitated the gas consumers and others in several towns in England, with more or less success, he thereafter turned his attention to Scotland, where he arrived about the year 1860, and commenced a crusade similar to that which he had been carrying on in England. Not long ago he came across a printed bill which he held in his hand. It had been published by a Committee which Flintoff had succeeded in forming in Denny in July 1860. In the bill the Committee announced "the engagement of George Flintoff, Esq., the Gas Engineer from London, who has exposed gas abuses and saved more than £250,000 [not of capital but] a year to the gas consumers of a number of towns," and who was to "deliver a lecture on the Sale of Gas Bill and the various meter frauds practised upon the public." He succeeded in Denny as he also did in some other towns in Scotland in inducing a number of people to back him in the formation of a Consumers' Company and in the planting of a gas-works. From the West of Scotland he was working his way eastwards; and he arrived, if he (Mr. Adamson) remembered aright, in Dalkeith, where the late Mr. John Young was Gas Manager and already a veteran in the gas world—the father of Mr. William Young, of Peebles. Mr. Young tackled Flintoff in debate on the public platform in Dalkeith and elsewhere; and by an exposure of many of his misstatements he sought to hold the fort for the gas profession, to whom Flintoff was by his agitation causing injury. At that time coal was dear, and gas plant and gas knowledge not in such an advanced stage of perfection as it was to-day, and there might be some defects, from which a person who was seeking to raise an agitation might possibly find some help. At that time the late Mr. Robson, the Gas Manager of Selkirk, and himself—then Gas Manager at Galashiels—were in the practice of meeting at each other's houses on alternate Saturday evenings over a social cup of tea. In talking over the burning gas question of the hour, either Mr. Robson or himself, he forgot which, put forward the question, could nothing be done to stem the tide of this agitator who was causing such trouble and annoyance to gas managers. The suggestion then arose between them, that a Gas Managers' Association should be formed for mutual advice and help. Mr. Robson sent out invitations to the gas managers in the Waverley District, convening a meeting in Kelso. Some eight managers were present; and the Waverley Association of Gas Managers was duly formed, with Mr. Clazy, of Kelso, as the first President, and himself as the first Secretary. Mr. Mackenzie, then Manager of the Cupar-Fife Gas-Works, and afterwards of Dunfermline, was a gentleman to whom he (the speaker) had been indebted; having been his apprentice-master when he was qualifying himself for a gas managership. When writing to him, as he did regularly at that time, he told him of the Association the gas managers of the

South of Scotland had formed. Mr. Mackenzie at once adopted the idea as a good one for his district; and he and his nearest neighbour Gas Manager, Mr. John Loudon, of Ceres, took the necessary steps which resulted in the formation of the Fife and Kinross Association. This afterwards merged into the Scottish Association; and from this afterwards arose the West of Scotland Association. And now all these were merged in the North British Association. He was glad that the Waverley Association maintained intact the individuality of their Association which was the parent of all other Associations; and he hoped that they would long live and flourish. He was glad to meet that day as he had done, when living in Galashiels in the early sixties, so many kind hearts among the gas managers of the Border towns; and he trusted they would go on meeting for many years to come, and find both profit and pleasure in each other's company. He had been asked to couple the toast with the name of their present respected Secretary, Mr. M'Lusk; and he thought that nothing could be more appropriate than that he—the Secretary of about 40 years ago—in proposing the Waverley Association, should couple it with the enterprising Secretary of the present time.

The members and their friends afterwards drove to Manderston House, the seat of Sir James Miller, Master of the Berwickshire Foxhounds, which they had received permission to visit, and where they were privileged to witness the garden and the hunting arrangements. The weather was favourable for the outing, which was much enjoyed.

#### THE MEETING OF THE BRITISH ASSOCIATION.

Sir W. Crookes on Nitrate of Soda as a Fertilizer, and the Fixation of Atmospheric Nitrogen.

For the third time in its history, the British Association has met in Bristol. The destruction of the Colston Hall by fire almost on the eve of the meeting might have occasioned serious inconvenience in a town less richly equipped than Bristol with spacious scholastic and other establishments, suitable for gatherings of the immensity of that which assembled last week. Happily the city was lavish in its generous hospitality; and there was no deficiency in the requisite accommodation. The Council of the Association fitly recognized this liberality of the authorities by making a grant of £120 from their funds in order to assist in alleviating the great misfortune which has befallen the town.

The formal inauguration of the meeting took place on Wednesday in the People's Palace—the retiring President, Sir JOHN EVANS, occupying the chair at the commencement of the proceedings. In resigning his position, Sir John said it was hardly necessary for him to introduce his successor, Sir William Crookes; for his name was known throughout the civilized world. At an early age, he attained great eminence in chemistry. But he had not confined himself to chemical research, for he had experimented largely on various materials *in vacuo*; and the Crookes tube was known throughout the world. These experiments led to more important results than the radiometer. From them had risen the Röntgen rays; and they might look to Sir W. Crookes as the real originator of the rays, which were now so extensively employed.

Sir WILLIAM CROOKES then proceeded to read his address; and the first and chief subject dealt with was that of food supply. By means of numerous figures and arguments, he sought to show that our wheat-producing soil is totally unequal to the strain put upon it, and that the way out of the colossal dilemma which would ultimately present itself would be through the chemist. The address then proceeded: Before we are in the grip of actual dearth, the chemist will step in and postpone the day of famine to so distant a period that we, and our sons and grandsons, may legitimately live without undue solicitude for the future. It is now recognized that all crops require what is called a "dominant" manure. Some need nitrogen, some potash, others phosphates. Wheat pre-eminently demands nitrogen, fixed in the form of ammonia or nitric acid. All other necessary constituents exist in the soil; but nitrogen is mainly of atmospheric origin, and is rendered "fixed" by a slow and precarious process which requires a combination of rare meteorological and geographical conditions to enable it to advance at a sufficiently rapid rate to become of commercial importance.

There are several sources of available nitrogen. The distillation of coal in the process of gas-making yields a certain amount of its nitrogen in the form of ammonia; and this product, as sulphate of ammonia, is a substance of considerable commercial value to gas companies. But the quantity produced is comparatively small. All Europe does not yield more than 400,000 annual tons; and, in view of the unlimited nitrogen required to substantially increase the world's wheat crop, this slight amount of coal ammonia is not of much significance. For a long time guano has been one of the most important sources of nitrogenous manures; but guano deposits are so near exhaustion that they may be dismissed from consideration. Much has been said of late years, and many hopes raised by the discovery of Hellriegel



and Wilfarth, that leguminous plants bear on their roots nodosities abounding in bacteria endowed with the property of fixing atmospheric nitrogen; and it is proposed that the necessary amount of nitrogen demanded by grain crops should be supplied to the soil by cropping it with clover and ploughing in the plant when its nitrogen assimilation is complete. But our present knowledge leads to the conclusion that the much more frequent growth of clover on the same land, even with successful microbe-seeding and proper mineral supplies, would be attended with uncertainty and difficulties. The land soon becomes what is called "clover sick," and turns barren. There is still another and invaluable source of fixed nitrogen. I mean the treasure locked up in the sewage and drains of our towns. Individually the amount so lost is trifling; but multiply the loss by the number of inhabitants, and we have the startling fact that in the United Kingdom we are content to hurry down our drains and watercourses, into the sea, fixed nitrogen to the value of no less than £16,000,000 per annum. This unspeakable waste continues; and no effective and universal method is yet contrived of converting sewage into corn. Of this barbaric waste of manurial constituents Liebig, nearly half a century ago, wrote in these prophetic words: "Nothing will more certainly consummate the ruin of England than a scarcity of fertilizers—it means a scarcity of food. It is impossible that such a sinful violation of the divine laws of Nature should for ever remain unpunished; and the time will probably come for England sooner than for any other country, when, with all her wealth in gold, iron, and coal, she will be unable to buy one-thousandth part of the food which she has, during hundreds of years, thrown recklessly away." The more widely this wasteful system is extended, recklessly returning to the sea what we have taken from the land, the more surely and quickly will the finite stocks of nitrogen locked up in the soils of the world become exhausted. The store of nitrogen in the atmosphere is practically unlimited; but it is fixed and rendered assimilable by plants only by cosmic processes of extreme slowness. The nitrogen which with a light heart we liberate in a battleship broadside has taken millions of minute organisms patiently working for centuries to win from the atmosphere.

The only available compound containing sufficient fixed nitrogen to be used on a world-wide scale as a nitrogenous manure is nitrate of soda, or Chili saltpetre. This substance occurs native over a narrow band of the plain of Tumarugal, in the northern provinces of Chili, between the Andes and the coast hills. In this rainless district for countless ages, the continuous fixation of atmospheric nitrogen by the soil, its conversion into nitrate by the slow transformation of billions of nitrifying organisms, its combination with soda, and the crystallization of the nitrate have been steadily proceeding, until the nitrate fields of Chili have become of vast commercial importance, and promise to be of inestimably greater value in the future. The growing exports of nitrate from Chili at present amount to about 1,200,000 tons. The present acreage devoted to the world's growth of wheat is about 163 million acres. At the average of 12·7 bushels per acre, this gives 2070 million bushels. But thirty years hence, the demand will be 3260 million bushels; and there will be difficulty in finding the necessary acreage on which to grow the additional amount required. By increasing the present yield per acre from 12·7 to 20 bushels, we should with our present acreage secure a crop of the requisite amount. Now from 12·7 to 20 bushels per acre is a moderate increase of productiveness; and there is no doubt that a dressing with nitrate of soda will give this increase and more.

The action of nitrate of soda in improving the yield of wheat has been studied practically by Sir John Lawes and Sir Henry Gilbert on their experimental field at Rothamstead. This field was sown with wheat for thirteen consecutive years without manure, and yielded an average of 11·9 bushels to the acre. For the next thirteen years it was sown with wheat, and dressed with 5 cwt. of nitrate of soda per acre, other mineral constituents also being present. The average yield for these years was 36·4 bushels per acre—an increase of 24·5 bushels. In other words, 22·86 lbs. of nitrate of soda produced an increase of one bushel of wheat. At this rate, to increase the world's crop of wheat by 7·3 bushels, about 1½ cwt. of nitrate of soda must annually be applied to each acre. The amount required to raise the world's crop on 163 million acres from the present supply of 2070 million bushels to the required 3260 million bushels will be 12 million tons distributed in varying amounts over the wheat-growing countries of the world. It is difficult to get trustworthy estimates of the amount of nitrate surviving in the nitre-beds. Common rumour declares the supply to be inexhaustible; but cautious local authorities state that at the present rate of export, of over one million tons per annum, the raw material "caliche," containing from 25 to 50 per cent. nitrate, will be exhausted in from twenty to thirty years. Dr. Newton, who has spent years on the nitrate-fields, tells me there is a lower class material, containing a small proportion of nitrate, which cannot at present be used, but which may ultimately be manufactured at a profit. Apart from a few of the more scientific manufacturers, no one is sanguine enough to think this debateable material will ever be worth working. If we assume a liberal estimate for nitrate obtained from the lower grade deposit, and say that it will equal in quantity that from the richer quality, the supply may last, possibly, fifty years, at the rate of a million tons a year; but at the rate required to

augment the world's supply of wheat to the point demanded thirty years hence, it will not last more than four years.

For years past we have been spending fixed nitrogen at a culpably extravagant rate, heedless of the fact that it is fixed with extreme slowness and difficulty, while its liberation in the free state takes place always with rapidity and sometimes with explosive violence. There is a gleam of light amid this darkness of despondency. In its free state nitrogen is one of the most abundant and pervading bodies on the face of the earth. Every square yard of the earth's surface has nitrogen gas pressing down on it to the extent of about 7 tons. But this is in the free state; and wheat demands it fixed. To convey this idea in an object lesson, I may tell you that, previous to its destruction by fire, Colston Hall, measuring 146 ft. by 80 ft. by 70 ft., contained 27 tons weight of nitrogen in its atmosphere; it also contained one-third of a ton of argon. In the free gaseous state, this nitrogen is worthless; combined in the form of nitrate of soda, it would be worth about £2000. For years past attempts have been made to effect the fixation of atmospheric nitrogen; and some of the processes have met with sufficient partial success to warrant experimentalists in pushing their trials still further. But I think I am right in saying that no process has yet been brought to the notice of scientific or commercial men which can be considered successful either as regards cost or yield of product.

The fixation of atmospheric nitrogen, therefore, is one of the great discoveries awaiting the ingenuity of chemists. The fixation of nitrogen is vital to the progress of civilized humanity; and it is a question of the not far distant future. Let me see if it is not possible even now to solve the momentous problem. As far back as 1892 I exhibited, at one of the *soirées* of the Royal Society, an experiment on the flame of burning nitrogen. I showed that nitrogen is a combustible gas; and the reason why, when once ignited, the flame does not spread through the atmosphere and deluge the world in a sea of nitric acid, is that its igniting point is higher than the temperature of its flame—not, therefore, hot enough to set fire to the adjacent mixture. But by passing a strong induction current between terminals, the air takes fire, and continues to burn with a powerful flame, producing nitrous and nitric acids. This inconsiderable experiment may not unlikely lead to the development of a mighty industry, destined to solve the great food problem. With the object of burning out nitrogen from air so as to leave argon behind, Lord Rayleigh fitted up apparatus for performing the operation on a larger scale, and succeeded in effecting the union of 29·4 grammes of mixed nitrogen and oxygen at an expenditure of 1-horse power. Following these figures, it would require one Board of Trade unit to form 74 grammes of nitrate of soda; and therefore 14,000 units to form one ton. To generate electricity in the ordinary way with steam-engines and dynamos, it is now possible, with a steady load night and day, and engines working at maximum efficiency, to produce current at a cost of ½d. per Board of Trade unit. At this rate, one ton of nitrate of soda would cost £26. But electricity from coal and steam-engines is too costly for large industrial purposes. At Niagara, where water power is used, electricity can be sold at a profit for 1½d. per unit. At this rate, nitrate of soda would cost not more than £5 per ton. But nitrate of soda is limited in quantity, and will soon be exhausted. Human ingenuity can contend even with these apparently hopeless difficulties. Nitrate can be produced artificially by the combustion of the atmosphere. Here we come to finality in one direction; our stores are inexhaustible. But how about electricity? Can we generate enough energy to produce 12 million tons of nitrate of soda annually? A preliminary calculation shows that there need be no fear on that score; Niagara alone is capable of supplying the required electric energy without much lessening its mighty flow. The future can take care of itself. The artificial production of nitrate is clearly within view, and by its aid the land devoted to wheat can be brought up to the 30 bushels per acre standard. In days to come, when the demand may again overtake supply, we may safely leave our successors to grapple with the stupendous food problem. And in the next generation, instead of trusting mainly to foodstuffs which flourish in temperate climates, we probably shall trust more and more to the exuberant foodstuffs of the tropics, where, instead of one yearly sober harvest, jeopardized by any shrinkage of the scanty days of summer weather, or of the few steady inches of rainfall, Nature annually supplies heat and water enough to ripen two or three successive crops of foodstuffs in extraordinary abundance.

Several other subjects which are engaging the attention of the scientific world were treated upon in the address; but they are beyond the scope of the "JOURNAL."

At the close of his eloquent discourse, the President was heartily thanked by the ladies and gentlemen, numbering about 2000, who had had the privilege of hearing its delivery.

A Convention of Acetylene Gas Manufacturers was recently held in the Great Northern Hotel, Chicago, at which fifteen firms were represented. A number of officials were elected; and it was decided to send to all acetylene gas manufacturers in the United States a copy of the minutes of the Convention, with an invitation to apply for membership.



### THE ACTION OF LIGHT ON ACETYLENE.

Some time ago Messrs. William A. Bone and John Wilson noticed that acetylene undergoes a well marked change on exposure to bright sunlight; and in view of the fact that the use of this gas as an illuminant is being advocated, says the "Electrical Review," they determined to investigate the change. At a meeting of the Chemical Society held on June 16, they described the results which they had so far obtained; and we commend them to those who are endeavouring to exploit this new illuminant, especially since some of the lamps in which it is used are made of glass, which is, of course, transparent. We know perfectly well, our contemporary observes, that under the ordinary conditions in which an acetylene lamp would be employed, sunlight is not available; but we have never heard that these lamp reservoirs are kept in the dark until the moment they are required for use. The subject is of sufficient importance to warrant a somewhat fuller abstract than usual of the chemical methods employed in determining the change which acetylene undergoes.

Tubes of about 100 cc. capacity, drawn out at each end and terminated by capillary glass taps, were filled at atmospheric pressure with pure acetylene prepared from copper acetylide, and dried by passing through a concentrated solution of potassium hydroxide. Some of these tubes were exposed on the roof of the laboratory throughout June and July of last year, when the weather was particularly fine. After two or three days' exposure, a faint brown deposit was observable on the inside of the bulbs. This gradually increased in extent and thickness until, at the end of a fortnight, the tubes were entirely covered with a dark brown, greasy deposit. The change was evidently due to the action of sunlight; for if a portion of the tube were screened from the light, no deposit was formed over the area so protected, and, further, after the tube had become coated with the opaque deposit, no further action was noticeable even after prolonged exposure. Acetylene was decomposed to a less extent when exposed in tubes during August and September, 1897, than during the previous two months. The decomposition is independent of the presence of air, because acetylene mixed with its own volume of oxygen or nitrogen was exposed to sunlight for a very long period without any appreciable change occurring. A slight contraction in volume was observed when tubes exposed during last summer were opened over mercury. A measured quantity of the gas sent into a Hempel pipette containing a freshly prepared ammoniacal solution of cuprous chloride was quickly reduced to about 2 per cent. of its original volume. The residual gas, after treatment with dilute sulphuric acid, appeared to contain a fairly dense hydrocarbon absorbed by fuming sulphuric acid, mixed possibly with a small quantity of hydrogen. No saturated hydrocarbon could be detected. The solid deposit on the side of the tube was removed by treatment with fuming nitric acid, in which it does not dissolve to any appreciable extent. On removal of the acid filtration, irregular yellow plates remained. The acid filtrate was carefully tested for the presence of nitro-derivatives of benzene and naphthalene, but without success. The yellow plates were insoluble in hot benzene, and could be heated at 270° without melting or undergoing any change. They apparently consisted of a very dense hydrocarbon or hydrocarbons.

Messrs. Bone and Wilson are working this summer on larger volumes of acetylene; and they hope eventually to determine the nature of the products obtained during its decomposition under the influence of sunlight. It is conceivable that they may discover that these products are capable of exercising a dangerous influence; and we are quite sure that even the most ardent advocates of acetylene will welcome fuller information on this subject.

### WIND PRESSURE ON EXPOSED STRUCTURES.

Sir J. Wolfe Barry was the President of the Mechanical Science Section at the meeting of the British Association last week; and on Thursday he delivered his Inaugural Address. In one part of it, he instanced how hasty generalizations were sometimes responsible for unnecessarily increasing the anxieties of engineers and arousing public alarm. Following this up, he spoke of the danger of "hasty generalization" in connection with the important question of wind pressure; and his remarks on this point will be of much interest to constructing engineers generally. He said:

Tredgold, who undoubtedly was one of the soundest of engineers, laid down in 1840 that a pressure of 40 lbs. per square foot should be provided for—reasoning, no doubt, from the fact that such a pressure had in this country been registered on a wind-gauge of a square foot or less in area. As a consequence, he assumed that the same force could be exerted by the wind on areas of any dimensions. Thus roofs and bridges, wherever any calculations of wind pressure were made, were designed for a pressure of 40 lbs. per square foot of the whole exposed surface. Under the alarm caused by the fall of the Tay Bridge in 1879, the piers of which were not probably strong enough to resist a

horizontal pressure of one-fifth of such an amount, a further general assumption was made, and railway bridges throughout the kingdom were ordered by the Board of Trade in 1880 (acting no doubt on expert advice) to be in future designed, and are designed to this day, to resist 56 lbs. of horizontal wind pressure on the whole exposed area, with the ordinary factors of safety for the materials employed, as if such horizontal strain were a working load.

It had, for a long time previously to this order of Government being issued, been suspected that these small gauge experiments were untrustworthy; and subsequent experiments at the Forth Bridge on two wind-gauges of 300 square feet and of 1½ square feet respectively indicated that with an increase of area, the unit of pressure fell off in a very marked degree. Under the same conditions of wind and exposure, the larger gauge registered a pressure 38·7 per cent. less per square foot than the smaller gauge. I have been able to carry experiments further at the Tower Bridge, by observing the pressure on the surface of the bascules of the bridge as evidenced by the power exerted by the actuating engines. In this case, we have a wind-gauge of some 5000 feet in area; and it has been shown that, while small anemometers placed on the fixed parts of the bridge adjoining the bascules register from 6 lbs. to 9 lbs. per square foot, the wind pressure on the bascules is only from about 1 lb. to 1½ lbs. per square foot. It is difficult to imagine the amount of money which has been wasted in unnecessary provision against wind strains of 56 lbs. per square foot on large areas, in consequence of this hurried generalization from insufficient data. I know something of what the provision for 56 lbs. on the square foot for wind cost at the Tower Bridge; and I do not wish to mention it. But if the public had been told that the dictum of experts, arrived at however hastily in 1880, was to be set aside in the construction of that bridge, all confidence would have been beforehand destroyed in it; and I suppose no Committee of Parliament would have passed the Act.

I have mentioned these matters, which could be added to by many similar instances in other branches of applied science, not for the sake of reviving old controversies or of throwing a stone at highly-distinguished men, honoured in their lifetime, and honoured in their memory, nor for the sake of criticizing more modern scientists or a Government department. Still less do I wish to question the necessity and value of mathematical calculations as applied to the daily work of engineering science; but I recall the circumstances for the purpose of bespeaking the utmost caution against our being tempted to lay down laws based on unascertained data. We know the tendency there has been at all times to generalize and to seek refuge in formulæ; and we cannot but know that it is not at an end now. We ought to recognize and remember how few physical questions had been exhaustively examined sixty years ago, and, may I say, how comparatively few have even now been fundamentally dealt with by experiment under true scientific conditions? The investigation of physical facts under all the various conditions which confront an engineer requires much care, intelligence, time, and last, not least, not a little money. In urging the vital necessity of investigations, I am sure that I shall not be understood as decrying the value of the exact analysis of mathematics; but we must be quite sure that the premises are right before we set to work to reason upon them. We should, then, exert all our influence against rules or calculations based merely on hypothesis, and not be content with assumptions when facts can be ascertained, even if such ascertainment be laborious and costly.

**New Loan Sanctioned for the Heywood Gas Undertaking.**—The Chairman of the Gas Committee (Mr. A. C. Maden) reported to the Heywood Town Council last Thursday that the Local Government Board had sanctioned the borrowing of £8000 for gas-works purposes. The Committee asked for permission to borrow £10,000; and the Board had granted them power to borrow £8000, to be repaid in 25 years. The Committee thought that this was very satisfactory. Of the amount named, £1500 was required for land, £2000 for prospective new mains, £3000 for stoves and prepayment meters; a new coke-breaking machine would take a large part of £600; and £900 was being spent in buildings for stores, &c.

**Burnley Corporation Gas Supply.**—The annual report of the Burnley Corporation Gas Engineer (Mr. J. P. Leather) has just been published, together with those from officials in the other departments. He states that the increased gas consumption for the year was 6,118,000 cubic feet; or 1·36 per cent. In the previous twelve months, the increase was 3·6 per cent.; and he attributed the falling off to depression in trade, which was very pronounced in the cotton industry last winter. The largest consumption in one day was 2,700,000 cubic feet, as compared with 2,704,000 cubic feet in the preceding twelve months. There were 1898 public lamps in use, an increase of 80 on the year; and they consumed 38,008,000 cubic feet of gas, having been lighted 3583 hours. The quantity of coal and cannel carbonized was 46,259 tons; and the gas made and sold per ton, compared with the three previous years, was: 9818 cubic feet made and 9303 feet sold in 1898; 9766 feet made and 9307 feet sold in 1897; 9812 feet made and 9220 feet sold in 1896; and 9425 feet made and 9012 feet sold in 1895. The Engineer adds that the Committee decided recently to fix free of charge small breakfast cookers with prepayment meters; and a considerable demand was now being made for them—about 400 being in use. The business in gas-stoves was 66 cookers and 68 gas-fires sold direct, and 226 cookers and 16 gas-fires on the hire-purchase system. The cookers on simple hire had decreased by 19; gas-fires had increased by 11.



## REGISTER OF PATENTS.

**Gas-Main Stoppers.**—Goodman, P., of New York. No. 22,864; Oct. 5, 1897.

This invention relates to a device intended to temporarily stop a gas-main. It is constructed (as shown) of two flat steel springs, which have eyes at their ends adapted to receive a pivot pin. The springs are pivoted at each end to two rods; the one being a tube receiving the other, and thus telescoping. The springs are slightly bent or curved throughout their length, but capable of compression so that they may be forced closely to the centre against the rods. Outside the springs is provided some form of elastic packing—such as a rubber tube. Outside of the tube, and enclosing within it the springs, is a casing to which is attached a flexible diaphragm of cloth, leather, or any similar material, treated, if necessary, in such a manner as to make it, for all practical purposes, impervious to gas. The diaphragm is made in the direction of the sliding rods larger than the diameter of the pipe to which the device is to be applied. In the other direction it is made so that it will be drawn tight when the sides are separated, so as to fit against the interior surface of the pipe. The sliding rods have handle-bars jointed thereto just inside of their outer ends, and bent near their points of attachment so that they will pass rearward and clear of the spring bars and their packing.

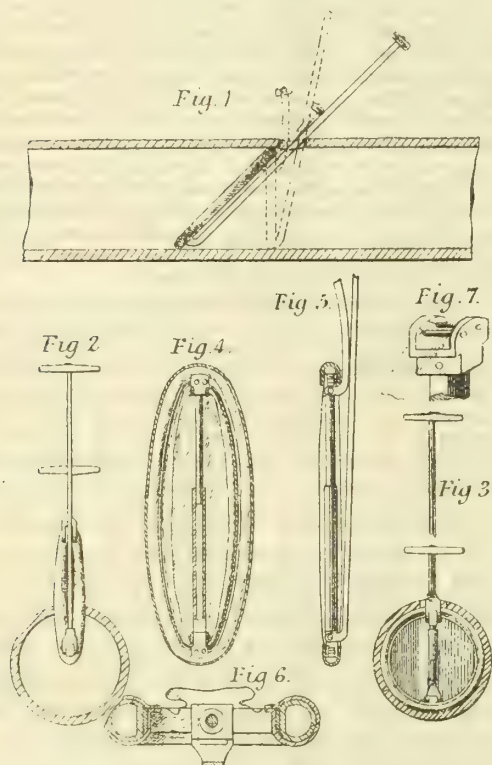


Fig. 1 shows the device being applied to a pipe; fig. 2 is a cross section of the pipe, showing the device inserted through a hole in the side; fig. 3, is a similar view, with the device in position; fig. 4 is an enlarged detail of the ring or stopper proper, showing the casing surrounding the tube or packing; fig. 5 is a longitudinal section taken through the ring at one side of the sliding bars; fig. 6 is a cross section; and fig. 7, a perspective detail, showing the end of one of the sliding bars and the pivotal connection of the springs thereto.

When the device is to be used, a hole is made in the gas-pipe or main; and the sides of the device are brought close together and inserted through the hole. The device will, when first inserted, occupy an angular position; and it is so inserted that the ring will be next to the source of gas supply. This leaves the ring to fit against the interior surface of the pipe entirely at one side of the entrance hole. While in this position, one handle is held firmly, while the ring is compressed by drawing upon the other handle, at the same time that the handle-bars are brought to an upright position. In this way, the springs are forced outward until the ring assumes a circular form pressing closely against the interior surface of the pipe.

**Self-Igniting Mantles for Incandescent Gas-Burners.**—Stoecklin, L., of Mulhausen, Germany. No. 6860; March 21, 1898.

The patentee proposes to treat the mantle, before it is burned in the well-known manner, with a platinum salt solution, in an alkaline bath (ammonia, soda, or potash-lye), whereby the material of the mantle is "acted upon chemically in such manner that the mantle is rendered capable of taking up the necessary quantity of platinum salt in order to produce self-ignition, without its solidity being thereby deteriorated."

The detailed procedure is as follows: The mantle, ready prepared with thorium nitrate, cerium nitrate, and the like incandescent salts and dried, as found on the market—that is, before being burned—is saturated with an alkaline solution of ammonia, potash, or soda-lye, preferably with an alcohol ammoniacal or alcohol alkaline solution. This preliminary treatment has the effect of depositing the incandescence oxides in a form insoluble in water, upon and in the fibres of the mantle; and without this treatment it would be impossible to produce upon the mantle a platinum-black deposit which would not chip off at once after the burning process. The mantle is next well washed for some time in running water, in order to completely remove the superfluous alkali and the alkaline salts which have formed, and then thoroughly dried. The mantle is now ready to receive the platinum salt. For this purpose, it is dipped with its head into a concentrated solution of platinum or iridium, but only so far that the solution is absorbed up to the seam. The mantle is then introduced

into an ammoniacal solution, in order to convert the platinum again into an insoluble platinum compound.

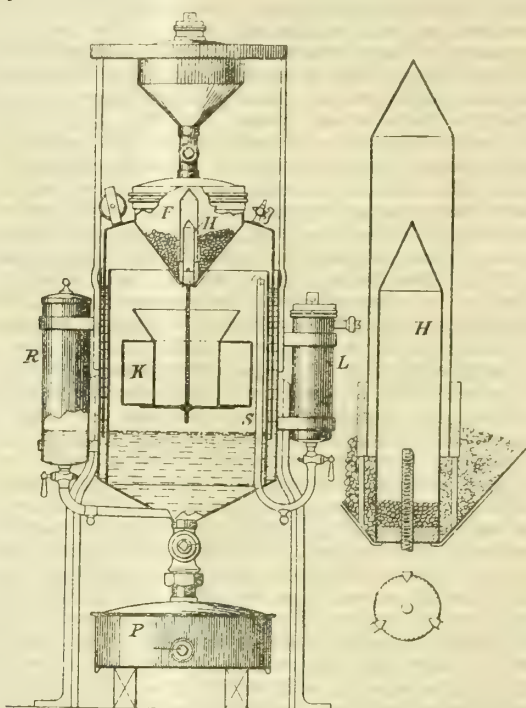
By this latter treatment, a double purpose is attained: First, the platinum salt is prevented from being soaked up too far, so that it may be taken up exactly to the desired height; the platinum salt being at once converted by the ammonia into an insoluble platinum compound. Second, the ammonia carries the acid of the salt with it, and thus effects afterwards a more homogeneous division and burning of the platinum. After this treatment with ammonia, the mantle is again washed in running water and dried.

**Manufacture of Gas.**—Wise, W. L.; a communication from A. Piatti and Co., of Rome. No. 8813; April 15, 1898.

This is a modification of the "invention" described in patent No. 2129 of 1897 [See "JOURNAL," Vol. LXX., p. 1400]; and it consists in the substitution for colophony, of bitumen or bituminous substances, which give the same results as colophony, and cost much less. The procedure is the same as that described, except that bitumen or bituminous substances are employed in the same proportions in lieu of colophony.

**Acetylene Gas-Generators.**—Kieffer, F. A., of Paris. No. 11,261; May 17, 1898. Date claimed under International Convention, Dec. 11, 1897.

This invention relates to acetylene gas-generators, consisting essentially of a combination with a container for the carbide (carried by a bell or holder in which the gas is generated) of "a cylindro-conical valve, which is caused to be alternately opened and closed so as to admit and cut off the supply of carbide."



The illustration shows a vertical section of the whole apparatus, a vertical section of the valve connected with the float, and an underside plan of the carbide container in which the valve is mounted.

The bell or hollow cylinder shown is open at the bottom and closed at the top, and is inverted in an annular water seal between double walls of the tank. The bell is formed in one with the carbide container F, which communicates with a second supply-vessel from which carbide may be transferred to the container while the apparatus is in operation. Around the outlet of the container, are projections which support the tubular "cylindro-conical" valve H, which (weighted with shot) is capable of sliding vertically within a hood or tubular casing rising within the container. The valve is connected by a screw-threaded rod to an annular float K, having a funnel-shaped mouth leading to its central aperture. The tank, with its hopper-shaped bottom, communicates with a receptacle P provided with a discharge-cock R. Water is supplied to the tank from a reservoir; and the gas as generated passes away through a pipe S into a purifier L, whence it is supplied for consumption.

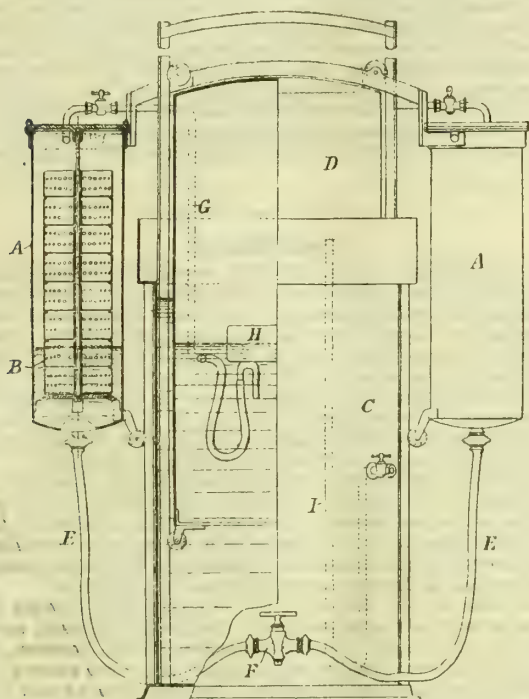
The following is the action of the apparatus: The containers having been filled with carbide, water is admitted to the receptacle R, and to the tank, until the desired level is reached, whereupon the cock is closed and the apparatus commences to act. At this moment the holder bell is in its lowest position, and the float K in contact with the water, so that the valve H is raised sufficiently to uncover the orifice of the container F, and allow a small quantity of carbide to drop into the water through the funnel-shaped mouth of the annular float. Upon the carbide coming in contact with the water, acetylene gas is generated, the pressure of which raises the holder bell together with the carbide container, which causes the valve H to close the outlet and cut off the supply of carbide. As the gas evolved passes away for consumption, the pressure in the bell is reduced, and it consequently falls together with the container F. During this downward movement of the bell, the valve H again rises under the action of the float K, so as to allow more carbide to drop into the water, when a fresh evolution of gas takes place. The bell then again rises and closes the outlet, and so on—thus automatically furnishing a supply of carbide proportionate to the consumption of gas.

**Producing Acetylene.**—Thompson, W. P.; a communication from H. Sez, of St. Denis, France. No. 14,197; June 27, 1898.

This apparatus for producing acetylene gas entails the use of two generators A, independent of one another, but both connected to one and the



same bell of the gasholder, from which they are externally suspended, and which carries them along with it in all its movements. Angular brackets serve to maintain a plate at a certain distance apart from the bottom; and upon this plate carbide boxes B are placed on top of one another. The boxes, which are formed with a solid base and a perforated periphery, are held in position by a rod secured to the plate. The holder consists (as usual) of a reservoir C, and a sliding bell D guided by friction-rollers, adapted to roll upon T-irons. The bell has a cross bar fixed upon its upper end, which terminates at each of its extremities in a hook so constructed as to embrace and support each of the gas-generators. Each generator is moreover guided at its lower part by a friction-roller adapted to roll upon a T-iron fixed upon the outer wall of the reservoir C. By this arrangement the generators are carried along by the moveable or sliding bell, and follow all its movements. The water for the reaction arrives at the lower part of the generator through flexible pipes E, connected to a single three-way cock F, arranged at the bottom of the reservoir. This cock, according to the position given to its plug, permits of it either feeding one single gas-generator or both of them, or of completely isolating the one and the other from the reservoir. The gas formed in each generator is carried off by the pipe G, which has its other end immersed in the reservoir. This end traverses the wall of the bell D, to which it is soldered, and terminates internally in a nozzle on which a flexible pipe is mounted connected to a bent tube directed towards the bottom, and carried by a float H. An identical arrangement is provided for the discharge of the gas from each generator; the bent tubes being either carried by a single float or by separate floats. A pipe I, terminating in a cock arranged upon the outside of the reservoir, serves to convey the gas from the interior of the bell, in order to pass it into the feed-conduits from which it is drawn.



When in operation, after the reservoir C has been filled with water up to a suitable level, while the bell occupies its low position, the cock F is operated so as to place one of the generators in communication with the reservoir. Instantly the water-level existing in the reservoir has the tendency to be established in the gas-generator through the intermediary of the pipe E; but as soon as the water in its rising motion arrives in contact with the carbide contained in the lowest box C, acetylene is produced and discharged into the water of the reservoir, where it forms bubbles and subsequently arrives under the bell D, which latter it lifts. As the bell ascends, it carries the generator along with it; thus withdrawing the carbide from the action of the water. From this moment the water-level remains stationary under the bell; and the level in the generator is kept about at the same height. If, therefore, the consumption exceeds the production, the bell D, as well as the gas-generator, descends; and as the level remains constant, a fresh layer of carbide is attacked, and fresh gas produced. If this production exceeds the consumption, the bell rises together with the gas-generator, thus withdrawing the carbide contained in the latter from the action of the water. The operation thus proceeds in a regular manner, until the carbide contained in one of the generators is completely exhausted. All that is then necessary is to so operate the cock F as to place the reservoir in communication with the other generator which has been previously charged—isolating, of course, the gas-generator which has been working in order to re-charge the same. The production of gas can be thus continued indefinitely without interruption.

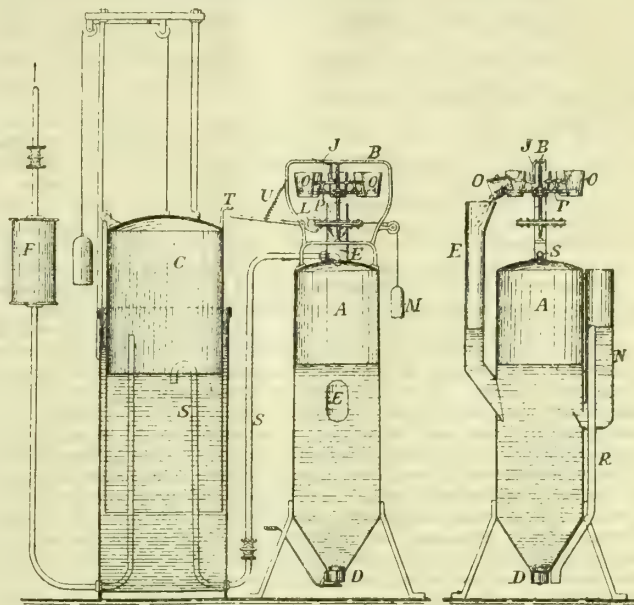
**Generating Acetylene.**—Lake, H. H.; a communication from La Compagnie Continentale d'Incandescence et de Chauffage, System Franck et Potrimol, of Brussels. No. 14,713; July 4, 1898.

This apparatus consists of a generator A, adapted to be charged with the carbide of calcium from an automatic charging apparatus B, of a gas-holder C, and of a purifier F. The two last-named parts are of ordinary construction; and it is therefore only necessary to describe the generator and its charging apparatus.

The generator is of cylindrical form, standing on end and closed at the top; and it has at its lower end a conical or funnel-shaped portion, provided with an outlet-valve D. To one side of the cylindrical portion of the generator is fixed a pipe E rising above the generator, and formed with an enlarged mouth arranged in proximity with the charging apparatus

B. This latter consists of a horizontally arranged carrier-plate P, firmly secured to a vertical spindle, and supporting a number of buckets O, distributed around its circumference, each of which contains a predetermined charge of carbide. The buckets, suspended by pivots, are capable of being tipped in order to discharge the carbide into the mouth of the pipe E. This tipping of the buckets may be effected either in a plane passing through the radius or in a plane at right angles, according to the form of bucket.

The buckets are so constructed as to have a tendency to tip automatically; and this may be effected either by placing the pivots out of centre or by weighting the front of the bucket. A pivoted catch is provided to automatically lock the buckets and retain them in their normal or upright position by engaging in an eye-piece on the buckets. The catch, together with the bucket held by it, revolves with the carrier-plate P; and they pass at the required moment beneath a fixed incline J, whereby they are disengaged from the bucket and allowed to tip forward so as to discharge the carbide with the mouth of the pipe E.



On the spindle, but below the carrier-plate P, is a pulley controlled by a rope, having a weight M, and passing over a guide-pulley. The tendency of this pulley is to revolve the entire charging apparatus; but its motion is checked by a pivoted and forked lever L, adapted to act against two series of pegs provided in the sides of the pulley. These pegs are so arranged as to permit of an angular movement of the pulley at each complete oscillation of the forked lever equal to the distance between two consecutive buckets. By this arrangement, each complete oscillation of the forked lever L causes one of the buckets O to arrive in close proximity to, and be discharged into, the pipe E. The lower end of this pipe extends into the interior of the generator, and so prevents gas-bubbles from rising vertically or by capillary action into the pipe.

The gas generated in the interior of the generator is balanced by a column of water contained in a vertical pipe N in communication with the generator, by an opening situated somewhat above that of the pipe E, and protected against the entrance of gas-bubbles by an inclined screen or shield. This pipe N is provided with an overflow-tube R, through which any excess of water from the generator is allowed to escape, while serving at the same time as a safety device for limiting the maximum pressure of gas in the generator.

The gas as generated flows through a bent tube S into the holder C, which is of sufficient capacity to receive the gas generated from a charge of carbide; the gas causing the bell of the holder to ascend with its uppermost position, and then to descend gradually in accordance with the consumption of the gas.

On the bell is secured a tappet T, so arranged as to strike against the tail-end of the forked lever L when the bell C reaches its lower position. It thereby causes a fresh charge of carbide to be discharged into the generator, whereupon the bell ascends again. The forked lever now being disengaged from the tappet T is returned to its former position by means of a spring U.

This method of charging repeatedly, and only in small quantities, permits of both the holder and the generator being of small size while yet being of a working capacity limited only by the number of buckets carried by the charging apparatus. These buckets may be arranged to be re-charged during the operation of the apparatus, in which case the operation is only interrupted for the purpose of removing through the plug or valve D the residues which accumulate in the lower part of the generator.

#### APPLICATIONS FOR LETTERS PATENT.

- 18,514.—POTTER, W. G., "Gas-burners." Aug. 30.
- 18,515.—POTTER, W. G., "Gas-governors." Aug. 30.
- 18,543.—BILBIE, J., and DRIVET, H., "Acetylene generators or lamps." Aug. 30.
- 18,575.—EDWARDS, F., and FRAZER, J., "Generating and burning acetylene gas." Aug. 30.
- 18,591.—QUATTANNENS-MOENS, R., and CARREER-DILGER, E., "Production of acetylene gas." Aug. 30.
- 18,741.—WISE, W. L., "Generating and supplying acetylene gas." A communication from F. C. Wilson. Sept. 1.
- 18,768.—RILEY, W., and KERSHAW, A., "Oxygen gas generators and gasholders." Sept. 2.
- 18,770.—RILEY, W., and KERSHAW, A., "A new or improved gasholder." Sept. 2.
- 18,835.—BOND, E. S., "Acetylene gas apparatus." Sept. 3.
- 18,854-5.—EVANS, A. F., "Internal combustion engines." Sept. 3.



## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### The Local Government Board and the Protection of Water Supplies from Pollution.

SIR,—All water engineers will be grateful to Mr. Percy Griffith for bringing to the notice of the readers of the "JOURNAL" the subject of the pollution of water supplies. The Local Government Board are not experts in this matter, and cannot be expected to deal with the question intelligently unaided by water engineers. Therefore, as is suggested, it is imperative that a Royal Commission be appointed without delay, with full powers to examine expert water engineers who have made hydrogeology and water supply their lifework. There is an expert Committee already appointed by the British Association of Water-Works Engineers, who have very valuable information ready to offer. It is quite time that water engineers asserted their position, and demanded equal laws for all works of water supply throughout the United Kingdom—not a law for England, and another for Scotland; but let it be a Public Bill. The Local Government Board appear to be imitating the London County Council, by setting themselves the task of harassing every company seeking new powers before Parliament.

All readers of the "JOURNAL" are fully aware that, when the small works of water supply are in the hands of the corporation or urban authority, there is great neglect of proper precautions; and progress is barred so as to meet the popular cry of keeping down the rates. I can point to works at present giving a very inadequate supply of water of third-class quality, because the rates are supposed to be already too great, and if they went for a new source the rates would be increased. These are watering-places, advertising and clamouring for an accession of visitors. Any Public Bill brought forward should include such cases, and compel them to provide a pure and wholesome constant supply.

The standard of a pure and wholesome potable water is now generally understood. The source from which the water is obtained, and all other information, are given to the analyst, who makes a chemical and bacteriological examination. These combined analyses, although they may be made daily, are not sufficient to protect the public from danger. Assuming the analyses and bacteriological examination to be capable of always discovering the bacilli, it would be too late to prevent an epidemic, as the mischief would have been already done. The source of supply and the entire watershed should be purchased, and remain entirely under the control of the water authorities; and the land should not be allowed to be manured. Almost all the epidemics that happen are derived from shallow wells sunk near cesspools; and notwithstanding these facts—which are well authenticated and published—numerous cottages are still being built in precisely the same manner, even by water-works officials and rural sanitary authorities. If we travel through almost any village, we shall find the village pump within a few yards of the burying ground, or adjacent to the asphalt or cesspool in sewage polluted soil. The recent epidemic at Maidstone is always quoted, and many deductions made from the experience; but whether the farmstead or cottages were within the sphere of influence or otherwise, I maintain that on the whole of the gathering-grounds farmyards and cottages should be removed entirely. Koch states that subsoil water, which is abundant and found everywhere, is a fine filtered water, and may be thoroughly protected against infection. Surely this is a dangerous remark to put forward when a deep source of supply can be obtained. Whether it is safe or otherwise to use water derived from the subsoil, when all drains, sewers, and cesspools are properly built, it is far safer to remove the dangerous cesspools and defective sewers, &c., the leakage from which may be carried long distances—in the fissures of the chalk formation especially. We are already in possession of sufficient bye-laws, if the authorities did their duty, to compel every company to provide a pure and wholesome supply of water; but immediate practical legislation is required. All laws should be made compulsory; and corporations and rural sanitary authorities, &c., should stop every source of pollution by making bye-laws binding on the landowner, to abolish all defective cesspools, drains, sewers, and shallow wells.

The cone of depression caused by excessive pumping, and the protective area usually allowed in theory around the wells, are most uncertain and very unreliable data to depend on in the construction of either shallow or deep wells. Therefore the source of supply should be owned by the company, and properly protected from all and every probable source of pollution. This is now being recognized; and in many countries the watersheds are purchased, properly fenced in, not allowed to be manured, and the land cleared of all cottages, &c. The power to take samples of water is to be given into the hands of any sanitary official—no matter how incompetent or unscrupulous, or any ignorant, cantankerous consumer. It is well known whence this extraordinary piece of law-making emanated, and the *modus operandi* by which the authority essayed to take samples of water. I have known the inspector to scrape holes in the mud of a dirty reservoir left out for cleaning purposes, and carry away samples of water in phials stored in his trousers pocket. I have seen the sanitary official walk four miles with small bottles in his pocket, to take samples of water from the open reservoir. These bottles are filled with the surface water and called samples, whereas the water passes through perfect sand filters afterwards. The medical officer of health does not take the samples of water himself, nor see them taken, sealed, packed, and forwarded to the expert analyst. His aim is simply to find a dead end or disused main, or a filter-bed running out for cleansing, and collect samples from every available source and exhibit them to the committee, who find yet another opportunity to air the war cry: "Compulsory purchase or confiscation." They do not even come on the works with proper apparatus for taking samples of water; any bucket or pot serves the purpose to dip water to fill the bottles. I consider that the proper authority to take samples and report on the wholesomeness of the supply should be a qualified water engineer and expert analyst properly appointed by the London Local Government Board; and his duties should be defined similarly to the Water Examiner of the Metropolis. All reports should be recorded in the same form. Major-General Scott does not prattle about by night taking samples, as suggested in the new bye-laws; neither is he in collusion with interested unqualified local medical officers of health, or the "zealous water consumer."

This busy "water consumer," no matter whether he has paid his water-rate or not, or however unqualified, may give six hours' notice and enter anywhere to take duplicate samples from any stopcock, &c., &c. He should leave one sample with the Company; and he may analyze the second sample if he likes, and retain the third for future comparison if required—say, in twelve months' time. Can the ignorance of our law-makers be allowed to proceed further? We must have a practical and safe method of collecting the samples; and rules and regulations must be observed in all cases as to the forwarding of the samples to the analyst, and a standard be made compulsory for the examination of the water.

As to Rule 4 suggested by Mr. Griffith, it is altogether too arbitrary; and could not work well, nor be sanctioned by any properly conducted company—viz., to allow the referee to enter all or any consumers' premises for inspection. Neither should he have power to open all or any hydrants. It is well known that in many places the water is a little coloured at or near a dead end, where we always place a blow-out hydrant. It is quite sufficient for the water to be drawn from specified points on the distributing mains, where it is always being used and is in constant circulation. This is the system adopted by Sir William Crookes, Professor Dewar, and Sir Edward Frankland.

And, lastly, as to the suggested "Amendment of the Water-Works Clauses Acts"—"(4) Giving power to the referee to order the immediate closing or disconnection of any part or the whole of any works, or the alteration thereof for the purpose of protecting the water from pollution." Even a water-works engineer expert referee cannot be armed with such peremptory powers. Recent cases show that, where the referee would have closed the works immediately, Sir E. Frankland and other eminent experts declared there was no danger whatever, and the health of the community was never in a more satisfactory state—in fact, Mr. Griffith will know that, when before Parliament, it is a difficulty to get even water engineers to agree. Where would these referees be, when under examination before a Committee? The referee might report the advisability of closing certain wells or streams; but first of all he should close the cause of pollution, which probably would be outside the power of the company to do. But surely before closing the "whole of the works," and depriving the town of its water supply, the water engineer should be heard, and have ample opportunity and power given him to remedy any defect, and at the same time give the town a supply of water.

Sept. 8, 1898.

SUPERINTENDENT.

### Profit Sharing.

SIR,—I have been away from London, or would before this have asked you for space to say a word on "Profit Sharing." I had hoped that, after the last half-yearly meeting of the South Metropolitan Gas Company, when Mr. George Livesey dealt exhaustively with the subject, also with that of the workman director, that some enthusiasm would have been evoked in your columns. With the exception, however, of one or two very feeble letters from "Profit-Sharers" in the South Metropolitan Gas Company, I see no sign of any interest in the matter at all; the majority of them care nothing about profit sharing, especially when any of the "profit" has to go to those who produce all the profit.

We were told some time ago, by Colonel Makins, that Mr. George Livesey was the "Jeremiah" of the gas companies. Mr. Livesey admitted the soft impeachment; but, as an outsider, I prefer Mr. Livesey's description of himself—"I am the voice of one crying in the wilderness." From these two biblical quotations, I am fain to believe that both Colonel Makins and Mr. G. Livesey are "mighty in the Scriptures."

In the case of Mr. Livesey I am not surprised, because the first "profit-sharing" scheme is recorded in the book of Genesis; and it may be that he got a "tip" from the narrative, feeling, however, after the failure of this scheme that he would hedge his "own scheme" around with restrictions, useful to himself and the workman, so that it should not come to the same end—viz., a "strike."

Whether it is liked or not, profit sharing is with us, and has come to stay. Trades Union leaders may sneer at it; and some directors may quibble, and damn it with faint praise—as did one of the Directors of the South Metropolitan Gas Company. He was, however, only the "old lady with the broom." Since the year 1838, when the idea first suggested itself to the practical head of Edme. Jean Leclair, the French decorator, the idea has taken some root. His workmen did not believe in it; but when at the end of the working year, he threw a bag containing £500 on the table, as their share of the profits in addition to their wages, they saw it at once. During the next twenty years he distributed £140,000, or about 14 per cent.; and after dealing thus generously with his work-people, Leclair died a very wealthy man. The above statement has been dictated to me by a learned French gentleman, and can be relied on.

Success also attended the profit-sharing scheme at the Godins Iron-Works, at Guise, and was crowned with great success. M. Godin said: "Ever since the system was established, the workmen are interested in improving the output. They are quick in pointing out sources of loss; and they often make new and valuable suggestions." Mr. Lowe Whille, an English representative of the Board of Trade, reported: "Out of a squalid ignorant peasantry, M. Godin has produced an industrial community with the commercial alertness of the market place."

In this country the system of profit sharing is not of long standing. It was, I believe, first adopted by the Messrs. Briggs, at the Whitworth collieries in Yorkshire. It lasted ten years, and then it collapsed on account of a strike. During the ten years, the workmen received, in addition to their wages, £50,000. It will here be perceived that the strike put an end to the beneficent scheme.

It must here be noted that, in none of the cases referred to, was any provision made for investing the profit-sharing money in the company or firm where the men were employed. It was simply paid to the workman at stated times; so that there was no permanent interest as a shareholder in the company or firm. Herein lies the difference between these schemes and that of Mr. Livesey.

I need hardly point out that profit sharing will have a hard fight. Every Trades Union will be opposed to it, and every leader of every Union will do his best to vilify it with his followers; because the moment it is an accomplished fact his occupation is gone. The idea of the Union leader is to get up a strike; take all he can get; and then leave his dupes to get back as best they can—generally at a less rate of wages.



For a half-century I have carefully watched every strike in the country; and in almost all instances, the strike has been disastrous to the workman and to the profit of the leader. If anyone challenges this statement, I will try to give some remarkable instances.

I now, Sir, proceed to consider the profit-sharing scheme of the South Metropolitan Gas Company. In 1889 the great gas strike took place at the South Metropolitan Gas-Works. The strike cost the Company £100,000, and a little more. What it cost the strikers in money and misery, I do not know. I do know, however, that it cost Thorne and his friends nothing. So soon as the men had "had enough" and the strike was over, Mr. Livesey formulated his profit-sharing scheme; and from then till now the whole aspect has been changed—"mistrust giving place to friendliness and confidence."

In consequence of the scheme, the workmen have become shareholders and co-partners to the tune of £106,000; and all in about eight years. Soon the workman director will be on the Board, to look vigilantly after the interests of his fellow workmen.

At the Co-operative Congress at the Crystal Palace, presided over by Earl Grey (no mean authority), his Lordship said: "The profit-sharing scheme of the South Metropolitan Gas Company has solved the problem of co-partnership, which insists that labour shall have an equal share with capital in the surplus profits that remain, after the initial obligations to capital have been satisfied. The progress of civilized mankind being from status to contract, is to be from working for wages to co-partnership." His Lordship then focussed the idea that £1 of wages should receive £1 of dividend. I hope to see the time when labour will get a little more than this. Here, however, is the crux of the matter, and the solution of the problem. Let, at any rate, every gas company read—and digest.

I, as an uninterested outsider, say all honour to Mr. Livesey for his scheme and the courage with which he has carried it out in the teeth of opposition; and that it will be a success is certain. I would say to all employers—"Go thou and do likewise."

Sept. 9, 1898.

VINCENT TAYLOR.

## LEGAL INTELLIGENCE.

### THAMES POLICE COURT.—Monday, Sept. 5.

(Before Mr. MEAD.)

#### The Curtailment of the Water Supply at the East-End.

Mr. E. BEDFORD, of Arbour Square, Commercial Road, attended at the Court to-day with reference to an application he made to his Worship in the previous week in regard to the supply of water to certain baths. He was then told that if he could find any parliamentary authority for taking proceedings against the East London Water Company, a summons would be granted. He now stated that he had obtained the Company's Act, and found that section 62 contained a provision that "the Company shall not be liable to any penalty for not laying down any such main pipe or communication-pipe, if they be prevented from so doing by any unavoidable cause or accident, or for not supplying water if the want of such supply arise from frost, unusual drought, or other unavoidable cause or accident." For the moment he was not going to do anything in that matter; but his present application was with regard to a supply of water for domestic purposes. The words that met him were those in the section he had mentioned—"unusual drought;" and the question was whether he had any cause of action.

Mr. MEAD: Of course, the words you have to meet are "unusual drought."

Mr. BEDFORD: I am going to urge that it has not been an unusual drought. For the last few years there has been a species of famine; and in 1897 the Water Company applied for a fresh Act of Parliament, when they said that after it had been granted they would construct new reservoirs, and that sort of thing would never occur again.

Mr. MEAD: This is only 1898. Have the reservoirs been built?

Mr. BEDFORD said they had; but the reservoirs were absolutely useless, for they had been depleted to such an extent that the supply had been further reduced from six to four hours a day.

Mr. MEAD: You cannot get blood out of a stone. If the water is not there, you cannot get it.

Mr. BEDFORD: But there has been no famine with regard to any other Company.

Mr. MEAD: It is common knowledge there has been a famine in other parts of the country; and I myself know one place on the south coast that has been on short commons. I should say this has been a most unusual drought, for it was prophesied in the winter. The cause is not due to the dry weather, but is owing to the deficiency in the rainfall some months back.

Mr. BEDFORD, resuming, said that after the steed had been stolen the Company were waking up. Here they had a Company with an output greater than their inlet. They obtained an Act giving them certain powers, but had neglected to fulfil their statutory obligations until famine occurred. They had now started on the work; but it would be six weeks before it could be completed. Were the people in the East-end to go on suffering in this way while the Company sheltered themselves behind their Act? The question was a serious one; but unless something could be done he did not wish to "tilt at windmills." He therefore asked whether his Worship could assist him in the matter. An extraordinary fact in connection with it was that in ordinary times the sanitary inspectors were always coming to the Court on account of drains not being flushed; but now they never came near.

Mr. MEAD said whether anything could be done or not the people who were suffering had his utmost sympathy, for it was not only the consideration of convenience but of health which was involved. As it might be said he had no right to bring into Court knowledge that he had obtained elsewhere, Mr. Bedford might take a summons to see whether there had been an "unusual drought;" but it would only be heard on the ordinary terms. He (Mr. Mead) could not help feeling the evil had been aggravated by the waste that had been going on.

Mr. BEDFORD thanked his Worship, and said he would consider the matter.

## MISCELLANEOUS NEWS.

### THE STRIKE AT THE LLANELLY GAS-WORKS.

#### Settlement Concluded by Mutual Concessions.

With the manning of the gas-works by non-unionists at the beginning of last week, the trouble at Llanelly did not by any means cease. In their difficulty the Company sought the assistance of Mr. Graeme Hunter, of the Labour Exchange, Glasgow and Manchester; and he supplied the men required. The measures taken for getting them into the works without disturbance appear to have been very carefully planned; but nevertheless their entrance into the town provoked a good deal of hostile demonstration. Some of the "free" men reached Llanelly station during Monday evening, where they were met by Mr. Arthur D. Davies, the Chairman of the Company, Mr. A. R. Cawley, the Manager, and a police escort. They were immediately driven to the works in an omnibus, one of the windows of which during the journey was broken by a brick; Mr. Cawley only just luckily escaping the missile. Not expecting that any more would come that night, the Union men and the crowd which had assembled afterwards dispersed; but they were mistaken, for at 2 a.m. seventeen other men who had travelled as far as Landore by the midnight express reached their destination, by means of a brake, without incident. Complete arrangements had been made for lodging and provisioning the men on the works. The local Secretary of the Gas Workers' Union was very active in trying to intercept the non-unionists for the purpose of persuading them not to enter the gas-works. But he was unsuccessful; and by Tuesday evening there was again sufficient gas to partially light the streets, and a fairly good supply for private use. During the night there were two or three instances of consumers having their windows broken through burning what was termed "blackleg" gas. Evidently Mr. Morgan was not altogether satisfied with the course the contest was taking; for he telegraphed to Mr. W. Thorne, the General Secretary of the Union, requesting his assistance. Mr. Thorne complied; and there is no doubt that his presence and influence did much towards bringing about a settlement of the differences between the Company and their old hands. On Wednesday, there were indications that the strikers were desirous of concluding the dispute. The Union officials had an interview with Mr. Cawley; and the strikers had a private conference with their leaders. In the evening, a public meeting was held, which Mr. Thorne addressed. In the course of his remarks, he stated that the men whom it was sought to have taken on again in the order of seniority were thoroughly competent. It had been clearly set forth in the case of *Allen v. Flood* in the House of Lords that workmen had a perfect right to say with whom they would work; and the men's claim to promotion by seniority ought to be recognized. At the private meeting of the stokers resolutions had been passed to the effect that there should be an eight-hour day, and payment for the same at 4s. 3d., as at present. At an early hour on Thursday, the Union officials and three of the leading men on strike had an interview with the Directors and Manager of the Company; but nothing was then determined. In the afternoon, there was a second conference, which continued between two and three hours, and ended in a settlement being arrived at by a little yielding of points on both sides. The old hands resumed work the same night, greatly to the satisfaction of the gas consumers and the inhabitants generally. The whole trouble has now terminated, except for the actions that are threatened against the Company for alleged breach of contract.

### AUSTRALIAN GASLIGHT COMPANY.

The Annual General Meeting of this Company was held at the Head Office of the Company, in Sydney, on the 25th of July—Mr. G. J. COHEN, the Chairman, presiding.

The SECRETARY (Mr. R. J. Lukey) having read the advertisement convening the meeting, the report of the Directors was taken as read. In it the Directors expressed much pleasure in stating that the profits for the six months ending June 30, after making provision for bad and doubtful debts, deducting interest on borrowed money, repairs and renewals, depreciation of plant, working expenses, and all other charges, amounted, with the balance brought forward, to £54,559 14s. 8d. They recommended the payment of a dividend for the six months of 9s. per share, free of income-tax, which would absorb £51,134 17s.; leaving a balance of £3427 17s. 8d. to be carried to the next account. The Directors stated that the consumption of gas was steadily increasing, notwithstanding the almost general use of incandescent burners for private and public lighting. To improve the supply of gas, more particularly in the city, it had been found necessary to lay an additional 24-inch main; and the work would shortly be completed. More than 1000 new consumers had been obtained at Balmain, through the fitting up of small dwellings and supplying them with penny-in-the-slot gas-meters. The system was being extended to other suburbs with satisfactory results. After much negotiation between the Board and the Company's workmen, an Employees' Mutual Benefit Society was established in February last. A sound financial basis having been adopted, the Society is likely to prove of permanent advantage.

The CHAIRMAN, in moving the adoption of the report, expressed the pleasure he felt at meeting the shareholders with so favourable a balance-sheet. The expenditure was somewhat in excess of that of the corresponding period last year, due to the extra cost of labour in connection with the fitting up of small dwellings for prepayment meters, the maintenance of the incandescent burners for the public lights, and the payment of two years' land-tax. On the other hand, the consumption of gas had increased, and better prices were obtained for residuals; consequently, the extra income from these sources had more than met the increased expenditure. Gas cookers, stoves, and other gas appliances, were being more generally used; resulting in a large increase of gas consumed during the daytime, which now equalled 36.6 per cent. of the total sales. To meet this extra demand, it became necessary to lay the additional 24-inch main mentioned in the report. Touching upon general subjects, the Chairman said the Company's "Historical Sketch," promised at the last meeting, was issued to the shareholders in March, and had been kindly



received and favourably commented upon. With reference to the penny-in-the-slot meters, the success anticipated had been more than realized. Applications were coming in at a rapid rate; and before long this new class of customer would become very great indeed. It was with much satisfaction that he mentioned the establishment of an Employees' Mutual Benefit Society. The whole of the workmen were members of it; and the interest they took in its management augured well for the future prosperity of the Society. The Company's contribution was 25 per cent. of the amount subscribed by the members, but not, however, to exceed £200 per annum. The usual care had been bestowed upon the plant and works; and the Engineer (Mr. T. J. Bush) reported them to be in thorough order and condition. An ambulance class in connection with the St. John Ambulance Association had been established at the head station; and in February last he was afforded the pleasure of presenting "First Aid" certificates to 39 of its members. Everything necessary to meet ordinary accidents was now provided on the works, which he thought was highly essential in gas-works of the magnitude of those belonging to the Company. During the past year, 92 additional public lights had been erected, and 51 miles of mains and service-pipes laid. The gas-cookers, including those sold other than the Company's, numbered 8182. There were 320 gas-engines and 35,936 gas consumers.

Mr. W. G. ROBINSON seconded the motion; and it was unanimously adopted.

The retiring Directors and Auditors were re-elected; and a unanimous vote of thanks was accorded to the Directors and officers for their successful management of the Company's affairs.

### THE INCREASE IN THE PRICE OF GAS AT NEWCASTLE.

#### The City Council Disapproves of the Company's Action.

The Newcastle City Council had before them last Wednesday a report by the Gas and Water Committee on the subject of the recent increase in the price charged for gas by the Gas Company.

Mr. RILEY LORD, in moving the adoption of the report, said the Committee had inquired of the Company the cause for the increase of 2d. per 1000 cubic feet; and they gave it that there was a decrease in the amount received for residuals, and also that there had been a very considerably larger sum paid for coals. In addition to this, the Company were laying out at Walker half a million of money in new works, a great deal of which for years would be entirely unremunerative. The price for gas would now be the same as it was in 1890 (it was reduced 2d. in 1891), when the reserve in hand was £60,000. The reserve was now £8000. The reduction in the price of gas in 1891 had placed in the pockets of the consumers of gas about £90,000; while it had only put into the pockets of the shareholders some £18,000. He believed that the increased cost of coal and the reduced income from residuals more than covered the increase which would be obtained by the increase of 2d. However, the real protection of the consumers was this: That the shareholders themselves would see that the price was reduced as soon as possible, in order that they might get increased dividends. Their interests were bound up in the interests of the consumers.

Alderman STOUT could not understand why, when the consumption of gas was increasing by leaps and bounds, the consumers had to pay for the extension of the gas-works and to augment the Company's reserve fund.

Mr. T. CAIRNS did not think it was fair that the public of Newcastle should have to contribute to the capital expenditure of the Company, with the prospect of getting no return, or practically no return. He moved that the Town Clerk be asked to inquire into the legality of increasing the price of gas for the purpose of capital expenditure.

The TOWN CLERK said he had already inquired into the whole matter; and he was quite satisfied that the Corporation had no power whatever to interfere beyond their statutory authority.

Alderman NEWTON said they certainly ought to record their opinion of the action of the Gas Company in the matter; and he moved—"That the report is unsatisfactory, and is hereby rejected, inasmuch as this Council disapproves of the action of the Gas Company in taxing the inhabitants for the purpose of erecting the new works at Walker and St. Anthony's."

Alderman TEMPLE seconded the amendment.

Alderman STEPHENSON said the increase in the price of coal for the year ending June 30 next, the contracts for which had already been made, would cost the Company considerably more than they would get from the 2d. increase in the price of gas.

After further discussion, Alderman NEWTON agreed to modify his amendment so as to make it read: "That this Council disapproves of the action of the Gas Company," &c.

The amendment in its altered form was carried.

### HARROW AND STANMORE GAS COMPANY.

The Half-Yearly Meeting of this Company was held yesterday week, at the Albion Tavern, Aldersgate Street, E.C.—Mr. JAMES GLAISHER, F.R.S., presiding.

The SECRETARY (Mr. J. L. Chapman) having read the notice calling the meeting, it was agreed to take as read the report and accounts, of which an epitome appeared in our issue for the 30th ult.

The CHAIRMAN said he had no doubt the shareholders had looked with interest at the accounts for the past six months; and, if they had examined them carefully, he was certain that, at the end of their investigation, they had felt satisfaction, for it was a good record of work done. He should like first to say a few words as to the working. The quantity of coal carbonized was 3111 tons; being 358 tons more than in the corresponding period of 1897. Considering the warmth of January and February last, and the effect that it had on most gas companies, it was remarkable that he should have to speak of an increase of almost one-tenth in the amount of coal carbonized. The quantity of gas made was 31,789,000 cubic feet; being an increase of 3,350,000 feet. The quantity sold was 27,870,000 cubic feet, which was an advance of 1,644,000 cubic

feet, or nearly 6 per cent. The unaccounted for gas was no less than 3,569,000 cubic feet, which was almost equal to 11½ per cent. of the make, and nearly twice as much as they had hitherto had to report. He need scarcely say that this loss of gas had caused great anxiety both to the Engineer and himself. Mr. Chapman had sought everywhere to find the cause; and in a letter which he had addressed to him (the Chairman) on the subject, he spoke about the new gasholder being started, and mentioned that for a time the holder at Stanmore was worked without a meter. He further stated that considerable lengths of electric light mains had been laid near the gas-mains, resulting in a number of old services being disturbed; that many new drainage pipes had been put down; and that heavy steam-rollers were being used by the smaller rural councils. These things, and the comparatively dry season, had all tended, their Engineer said, to increase the leakage account; and he had found a few considerable leakages. He (the Chairman) must confess that the causes referred to did not, in his opinion, account for the loss of so much gas as they had experienced—an increase of nearly 2 millions. From the communications he had had with Mr. Chapman, and after reading over the accounts, and seeing the profit they had made, he could not but think that there was a mistake somewhere, and that such a large amount of leakage could not have taken place. He had suggested to Mr. Chapman that the station meters were rather fast; but he did not agree with him. However, their Engineer assured him that no effort would be wanting on his part to find the cause of the leakage, and to bring it back to its normal condition. This he (the Chairman) felt certain he would do. The quantity of gas sold in Harrow was 15,394,000 cubic feet; being an increase of 491,000 feet. At Sudbury and Harrow Weald, they had sold 3,418,000 cubic feet; being an increase of 569,000 feet. At Stanmore the consumption had been 6,038,000 cubic feet, or an increase of 547,000 feet. These figures were exceedingly gratifying. The Sudbury increase was really remarkable, and was not merely an evanescent one. As to the residual products, they made 1866 tons of coke, of which 1548 tons were sold. About 480 tons were also used on the works. Of tar they produced 31,551 gallons, which was at the rate of 10 gallons per ton of coal carbonized. Of sulphate of ammonia 30 tons were made, which was nearly equal to a ton per 100 tons of coal used. Turning to the monetary results, they had received £6417 for gas and meter and stove rentals; and for residual products, £1110. The total revenue was £7529, which was an increase of £538. As to the expenditure, coal only cost £212 more than in the first half of last year, which was very gratifying, considering the additional quantity carbonized. The total expenditure for the half year was £5017, which exceeded that of the corresponding period by £351. The profit amounted to £2512, which was an improvement of £187. He ought also to mention that £100 had been written off suspense account. Referring again to the growth in consumption of gas, he said that, from the investigations he had made, the increases had been well maintained, half year by half year, ever since Stanmore was amalgamated with the Harrow undertaking. With the one exception of leakage, the accounts were satisfactory, and promising for the future. He had much pleasure in moving their adoption.

Mr. CHARLES HORSLEY, J.P., having seconded the motion, it was unanimously carried.

Dividends were next declared at the rates of 7½ per cent. per annum on the original "A" capital, 7 per cent. on the "B" capital, 5½ per cent. on the "C" capital, and 6 per cent. on the guaranteed shares.

The hearty thanks of the shareholders having been accorded to the Secretary and Engineer, a similar compliment was passed to the Chairman and Directors, on the proposition of Mr. A. F. PHILLIPS, seconded by Mr. T. H. MARTIN.

### NOTTINGHAM CORPORATION GAS SUPPLY.

#### Annual Reports and Accounts.

We have received from the Engineer and General Manager of the Nottingham Corporation Gas-Works (Mr. W. R. Chester), the reports and accounts referring to his department for the year ending March 31 last. Viewed generally, they show that, owing to the exceptionally mild weather during the winter months, the increase in the consumption of gas was small; but, on the other hand, there was a substantial addition to the number of new services laid and meters fixed, which, with changed climatic conditions, cannot fail to produce a considerably greater increase in the consumption. The Gas Committee's report shows that the quantity of gas sold during the year was 1,588,041,000 cubic feet, against 1,572,699,400 feet in the previous year; being an increase of 15,341,600 feet. The amount realized from the sale of gas was £190,891, against £189,758; being an increase of £1133. The return for coke and sulphate of ammonia, as compared with last year, exhibited an increase of £2715; but the amount received for tar, &c., was less by £1702. The net profit for the year is £27,152. Of this, £24,000 will be paid over to the Finance Committee, by order of the Council, in aid of the current expenditure of the municipal year; and £3000 transferred to the reserve fund, in repayment of loan—leaving a balance of £152 to be carried to the annuity redemption fund.

Mr. Chester's report deals with the works and distribution system. He says that the plant, machinery, and buildings at the various stations have been kept in good repair, and that their efficiency has been fully maintained. The mechanical appliances for carbonizing and handling coke at the Basford works have been in continuous operation since November last, and continue to work well. More than 100,000 tons of coal have now been dealt with by this machinery. Considerable attention has been paid to the distributing portion of the apparatus. The trunk mains coupling up the various works have now been completed; and for the future it will be possible to supply the whole of the districts from any two of the three works, should an accidental cause arise for so doing. The average illuminating power of the gas for the year was 18.84 candles; and the sulphur compounds were kept down to 21.80 grains per 100 cubic feet. Regarding the distribution department, Mr. Chester reports that the total mileage of mains is 296.11; 5.66 miles having been added during the year. The number of meters fixed on March 31 (including 355 lamp meters) was 43,124; being an increase of 1522. Of these 40,637 belong to the department, and 2487 to consumers. The demand for prepayment meters continues to increase. At the end



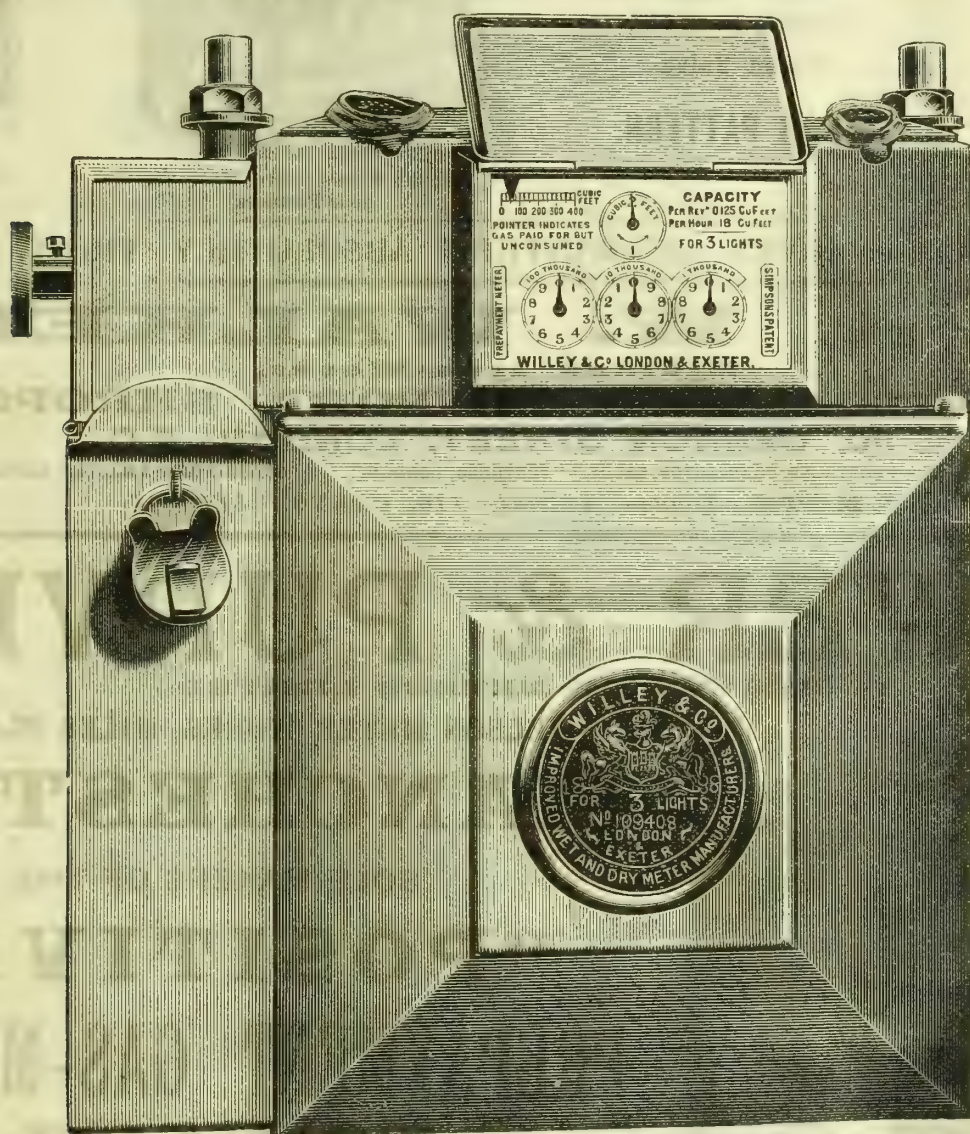
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**IMPROVED COIN METERS,  
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**Absolute Accuracy. Works independently of Springs.**

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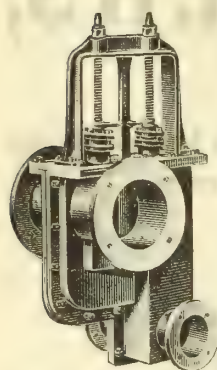
Thousands of these Meters in use. Continuous supplies to the London and leading Provincial Companies, giving the greatest satisfaction. Gas Engineers may fix them with the confidence that they will give no trouble. Returns for readjustment average less than 1 per thousand.



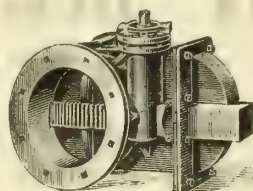
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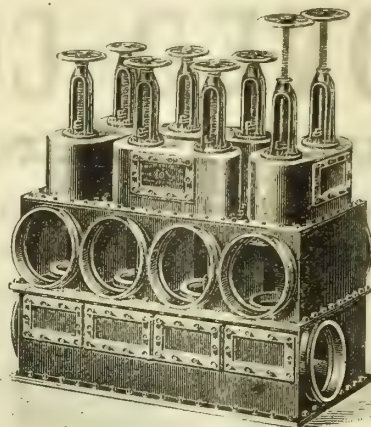


Walker's Hydraulic  
Main-Valve.

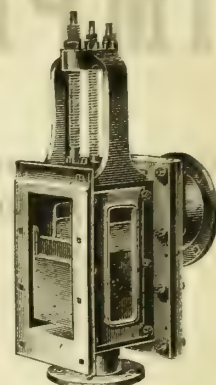


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Weck's Patent Centre-Valve for  
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**"POSITIVE"**  
**PREPAYMENT GAS-METERS**  
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**SIMPLICITY IN MECHANISM**

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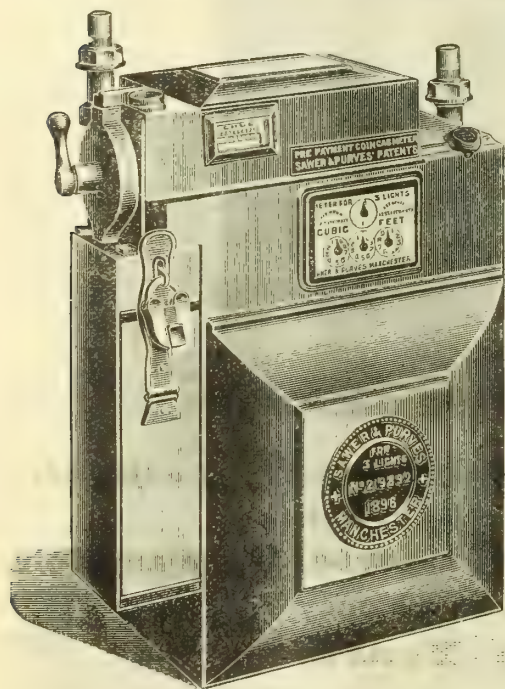
**PRICE OF GAS EASILY CHANGED.**

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**TIN-PLATE CASE.**

**MADE TO TAKE ANY COIN.**

**PRICES AND ALL PARTICULARS CAN BE HAD ON APPLICATION.**





of the financial year 5369 were in operation—being an increase of 1096. New services to the number of 2348 were laid, against 1602 in the previous year. The application of gas for trade and domestic purposes, other than for lighting, also continues to increase. There are 4850 gas cooking-stoves at present in use, 5040 gas-fires, and 377 engines, besides a very large number of other appliances of almost every description, which have not been numbered. Of the 4850 cookers in use, 4503 are rented from the department.

The accounts accompanying the reports show that the total amount received on capital account to March 31 was £1,026,333; and the total expenditure was £1,025,268, of which £11,647 was spent during the year. From the total expenditure is deducted £500 transferred from the net revenue account for depreciation of gas-stoves; and consequently the balance in hand is only £1565. From the revenue account, it is seen that the private consumption of gas produced £181,525; public lights, £9366; rental of meters, £6224; rental of stoves, £1982; coke and breeze, £19,794; tar and its products, £14,156; sulphate of ammonia, £8993; refuse lime and oxide, £1057; and sundries, £4300—making the total revenue £247,398. Under the head of manufacture of gas, on the expenditure side of the account, coal is entered at £75,227; purifying, at £4103; works salaries, £1867; carbonizing wages, £23,767; and repair and maintenance of plant, &c., £28,261. Under "distribution," a total of £20,657 was spent; and for rents, rates, and taxes, £11,269. The management expenses amounted to £6677; and some smaller items (of which bad debts, £324, was the largest) made the total expenditure £172,231. Thus there was a balance of £75,166 to be carried to the net revenue account. Of this balance £43,374 is required for interest and annuities; £500 for depreciation of gas-stoves; £618 for sinking fund (loans and debentures); and £3522 for the consolidated stock sinking fund account. After satisfying these demands, the net profit, as already mentioned, is £27,152.

The above reports and accounts were submitted at the meeting of the City Council yesterday week, and were adopted without discussion.

### BELFAST CORPORATION GAS UNDERTAKING.

#### The Payment for New Works out of Revenue.

The minutes of the Gas Committee having been moved and seconded at the last monthly meeting of the Belfast Corporation, Alderman Dempsey questioned the policy of the Committee in having appropriated a considerable portion of the past year's profits for the payment of new works. He said that, according to the Committee's report, the balance brought forward from the previous year was £2054; and there was now left available £32,333. It seemed to him that so profitable a sale of gas would entitle the Committee to consider the question of further reducing the price, especially as the electric light was coming into competition, and as the use of oil was so dangerous. Instead, however, of their proposing to reduce the price of gas, they had agreed to distribute the amount as follows: "For the depreciation of meters, 10 per cent., £2661; for the depreciation of lamps, 10 per cent., £630—£3291." Then the Committee stated, without a word of explanation, and with the skill of financiers of a very high order, that the expenditure on new works and mains, £19,393, and on new meters, £7728, should be simply written off out of the year's profits. He thought the Corporation were entitled to some explanation of this proposal to wipe out a capital sum of nearly £30,000. He hoped such excessive expenditure as had caused the necessity for this extraordinary step would not be continued by any of the departments having control of the borough fund. Mr. Stewart mentioned that, when this matter came before the Committee, he objected to the resolution for the payment of new works out of revenue. None of them would take such a course in his own private business; and he must join Alderman Dempsey in protesting against it. Mr. Wheeler proposed that the matter be referred back for further consideration. The Town Clerk intimated that the borrowing powers under the Act of 1874 were virtually exhausted; and the Committee had no other means than the revenue of paying for these works. Mr. Wheeler hoped someone would second his resolution. The Committee, he urged, could properly consider the question of obtaining power to borrow more money on the gas undertaking. The Town Clerk: That would involve an Act of Parliament. Mr. Wheeler: Very well, let us obtain one. The Town Clerk: It would serve for the future, but not for the past. Mr. Jaffé explained that this mode of dealing with the surplus profit was commenced virtually only last year, because it became clear to the Committee that their borrowing powers were exhausted, and they had to make certain extensions which could not be carried out by any other means. Mr. Wheeler did not press his amendment; and the proceedings were confirmed.

### BOLTON CORPORATION GAS AND ELECTRIC UNDERTAKINGS.

#### Large Profits.

Mr. George Swainson, the Bolton Borough Treasurer, has just issued his "Blue-Book" dealing with the finances of the several undertakings of the Corporation for 1897-8.

He records that the total income for gas and lighting was £135,053; this being rather less than was the case in the preceding twelve months—due to the lessened amount received from the sale of residual products (£23,588, as against £25,464). The revenue from all sources, however, was only £200 less; and the Committee were enabled to transfer £26,466 in aid of the rates. This was the largest sum ever transferred to rating account out of the profits of the department; being equal to £4 3s. 7d. per cent. on the capital outlay. The Committee were able to do this because the average cost per ton of coal and cannel carbonized was only 9s. 6d., compared with 10s. 2½d. the year before—the figure quoted being the lowest for the past nine years. The Committee also reduced the capital account by £5000; and £4000 was spent on Arrol Foulis mechanical stokers. In the electricity department, the capital account has grown from £24,459 in 1895 to £57,037 in 1898. The current supplied to customers last year brought £5720, as against £3736 the previous year. The profit of £917 was carried to the reserve fund.

### THE DANGERS OF PARAFFIN LAMPS.

#### A Coroner's Testimony to the Value of the Prepayment System of Gas Supply.

A few days ago, an inquiry was held at West Bromwich relative to the death of Hannah Turner, a widow, who kept a small shop where she sold lamp oil. She lived alone; and it appears from the evidence adduced that she met with her death through a fire caused by the breaking of a paraffin lamp. The Captain of the Fire Brigade (Mr. W. H. Wayte) testified to finding the body of the deceased lying upon the floor of her house, with the lower part of it badly burnt, some of the clothing burnt off, and the rest smouldering. A broken lamp lay beside the body; the oil having all burnt away. From the way in which the table was burnt, his opinion was that the deceased, who had taken off her boots, had sat down beside the table, fallen asleep, and in her sleep accidentally upset the lamp, which had burnt through the table, and set her clothing and the chair on fire. The Coroner (Mr. J. Clark) thought the inspection of the body bore out the theory of Captain Wayte. The case was just another instance of the old, old story with these lamps. If there was one thing in this world which he abominated more than another, it was glass lamps with common oil. So long as they were used, so long would they have these terrible fatalities to inquire into. He was glad to say, so far as the governing authorities of the town were concerned, the reproach could not be put upon them that they gave no opportunity to the people of having any other illuminant than these glass lamps. The people could now have gas laid on under an arrangement by which the Corporation put in the fittings free of cost; and the payment for the gas was small, and made in a convenient way. There was no longer any excuse, on the ground of expense, for the use of these dangerous lamps. The Jury returned a verdict of "Accidentally burnt to death."

### ELECTRIC LIGHTING NOTES.

The Local Government Board have given their sanction to the borrowing of £33,000 by the Salford Corporation for electric lighting purposes. Of the sum named, £23,000 is for the establishment of three battery substations, and £10,000 for the land for new generating stations.

The Walker and Wallsend Union Gas Company are proposing to apply for a Provisional Order to empower them to supply electricity in their district. They have asked for the consent of the District Council to their application; but that body have declined to give it, on the ground that they intend to seek for similar powers.

A memorial is being framed for presentation to the Wallingford Town Council, praying for the introduction of a system of electric lighting in consequence of the high price of gas. The Gas Company charge 4s. 9d. per 1000 cubic feet, and have refused to entertain the proposal to sell their undertaking to the Corporation for the sum of £7500.

The Electric Lighting Committee of the Tunbridge Wells Town Council certainly merit the heartiest thanks of the ratepayers. They have agreed to contribute towards the general district rate a sum of £900 from the profits of their undertaking, instead of £450 originally decided upon. This doubling of the contribution, we are told, will obviate the necessity of putting an extra penny on the rates.

It was reported to the Stockton Corporation last Tuesday that the Local Government Board had sanctioned the borrowing of £28,482 for a period of 25 years for the carrying out of the electric light scheme, and had also approved the use of certain ground in close proximity to the gas-works for the station. Alderman R. Hind, the Chairman of the Gas Committee, intimated that the contract for the works would be completed in a few days; and the Committee hoped within twelve months to be able to supply the town with electricity.

Telegrams from Geneva last Thursday state that the great electric power station of the City of Geneva, situated at Chevres, was almost entirely destroyed by fire during the night. The works, which were only erected in 1896, were considered the best in Switzerland, and cost about 5,000,000 frs. During the night one of the wires fused, and set fire to the roof, which was soon in flames, for a distance of 150 yards, and, falling into the interior, set fire to the contents, which were burnt. Numbers of manufactories will be thrown idle through the lack of motive power.

The Electric Lighting Committee of the Bristol Corporation have arranged to reduce the price of their supply from 6d. to 5d. per unit on and after the 1st prox. This will represent between £3000 and £4000 a year; and the Committee hope that the increased demands will more than cover that within a short period. The reduction is practically equal to the profit which the Committee estimate to make in the current year. It is stated that, if it had not been that part of the cost of the new works has fallen upon the Committee this year, the profit would have been larger. These new works are as yet unproductive, because, though the structure is finished, the machinery is not fixed. It is hoped, however, that it will be in working order by October, and then the capacity of the establishment will be equal to 80,000 incandescent lamps—the present number served being 54,700 out of a possible 60,000.

At last Wednesday's meeting of the St. Pancras Vestry, the Electric Lighting Committee formally reported the explosion in Cumberland Terrace on the 12th ult. (*ante*, p. 390), and stated that Major Cardew, on behalf of the Board of Trade, and representatives of the London County Council, had visited and inspected the area disturbed. On the report made to them by Major Cardew, Mr. F. J. S. Hopwood, of the Board of Trade, had forwarded a communication to the Clerk in which he said: "Having regard to the grave risks to the public safety and the disorganization of the supply of energy involved by accidents of this nature, I am to urge upon the Vestry the necessity of taking all possible precautions to prevent accumulation of gas in their culverts; and as it would appear to be impossible in all cases to provide adequate ventilation, I am to suggest the desirability of frequent inspection of street-boxes." The Vestry wisely received this communication in silence, and agreed with the action of the Committee in formally notifying The Gaslight and Coke Company that, in consequence of the damage done to the Vestry's property, a claim in respect of the cost for making good will be made. It is understood that about 400 yards of the Vestry's culverts and mains were affected.



## THE DRY WEATHER AND THE WATER SUPPLY.

### The Curtailment of the Supply at the East-End.

Our record of the principal events arising out of the enforced curtailment of the water supply at the East-end opens this week with a notice of a meeting held at the Hackney Town Hall on Monday, the 5th inst., called by a requisition signed by fifty ratepayers. Mr. T. Hosgood, the Chairman of the Vestry, presided; and there was a large attendance. Dealing with the object of the gathering, the Chairman said the water famine was one of the greatest scandals of the nineteenth century. The Water Company said there had been waste, and that waste took place then. They further said they pumped  $26\frac{1}{2}$  gallons per head into the district. All he could say was that if this quantity of water were pumped into the district, it did not reach the inhabitants. As Chairman of the Vestry, he did not wish to strongly condemn the Company, as the Vestry had taken action in a Court of Law to ascertain what really were the rights of the ratepayers and the Company. He hoped there would be no deaths in East London as a result of the water famine; but if there were, then it was probable that some of the Directors might be charged with manslaughter. Mr. H. R. Taylor moved a resolution calling upon the Government to place the water supply in the hands of a representative body like the London County Council. Mr. Cohen seconded the resolution, which was supported by Professor Stuart, M.P., who stated that the East London Water Company had been for eighteen months in possession of the power to make connections with the mains of other Companies; and he asked why the making of them was delayed until now. Mr. W. Steadman, M.P., read a letter from Mr. Chaplin, the President of the Local Government Board, dated the 31st ult., in the course of which he said: "There can be no doubt of the hardship, especially in the hot weather, which is inflicted upon many of the poorer classes by the curtailment of their water supply. Many, and indeed most, of them have no adequate means of storage in their houses; and you may rest assured that, so far as this Department is concerned, everything that can be done is being done and shall be done to mitigate the evils of the situation. I have not the smallest doubt that, in view of the prolongation of the drought and the depletion of the reservoirs, the restriction of the supply as a precautionary measure was a necessity; but I am in communication with the Company as to the various measures which may be possible for increasing the supply. Some of them have been adopted already; others are in progress; and I have every reason to believe that the Company are willing and anxious to do everything that is possible to relieve the situation. There is one thing which I view with considerable apprehension—viz., the amount of waste which is undoubtedly occurring—in some cases, it is alleged, intentional waste, though how far that is true I do not know. But it is greatly to be regretted; for at present the Company have not got the water to justify them in continuing the old rate of supply, and every gallon that is wasted now will only hasten the time, if the drought continues, which will render a further curtailment inevitable." The resolution was carried *nem. con.* An overflow meeting of upwards of 1000 people was held outside the hall.

By Monday morning the officials of the Company were able to ascertain the result which had accrued from the further restricted service of water of four hours daily to their customers, which came into force on the previous Saturday. It was reported that the effect was far from what had been anticipated, and was most disappointing. With the water turned on for a period of a third less than before, it was expected that, as a matter of course, there would be a proportionate saving; but that hope had not been realized. The quantity pumped into the district on Saturday showed that during the four hours only a million less gallons were used by the consumers than was the case during the six hours' service, although a saving of 10 million gallons was expected. The consequence was that the reserve stock, which it was hoped to keep for an emergency by means of the curtailed supply, had after all to be drawn upon. It was reported by Mr. Bryan, at the Directors' meeting on Thursday, that during the previous week 33 million gallons of water per day were pumped into the district; this being equal to  $25\frac{1}{2}$  gallons per head.

The project for increasing the supply indirectly by connecting the mains of the Grand Junction and New River Companies took definite shape on Tuesday. The Engineers of the three Companies met in conference, and settled all the arrangements for commencing the work at once. The scheme is this: The New River Company's district is situated between the two others, having the East London on its eastern and the Grand Junction on its western side. Since the commencement of the scarcity, they have been giving the East London all the water they can spare, by way of the River Lea, which is common to both. They could give no more from their own resources, nor could the East London obtain any directly from the Grand Junction, though the latter have now a certain surplus. The plan is, therefore, to connect the Grand Junction with the New River, and pass so much water into the mains of the latter, who will then be able to allow this additional quantity to flow down to East London. To make the connection, it will be necessary to lay  $1\frac{1}{2}$  miles of 24-inch piping; and the work will probably take a couple of months, if not longer. "The Times" Special Correspondent regards this scheme as being "chiefly interesting as another step in the direction of that amalgamation of the Water Companies which has been made inevitable by recent events." Owing to the time which it will take to complete, the scheme offers no prospect of relief in the present emergency.

On the other hand, the work of connecting the Southwark and Vauxhall Company with the East London by the Thames subway is making rapid and satisfactory progress. No exact date can yet be stated for its completion; but there is a fair prospect that the other resources of the Company will hold out until then, and render further curtailment unnecessary, despite unfounded statements to the contrary. Several of the Local Authorities are doing their best to assist in tiding over the interval; and the bulk of the consumers are showing a rational appreciation of the situation. Complaints are much fewer than they have been, in spite of many "indignation meetings." The investigations of the Special Correspondents of "The Times" and other papers clearly prove that the statements made at these gatherings are no indication whatever of the real feeling of the people or of the actual condition of things.

On Friday, a deputation consisting of members of the London School

Board, waited upon Sir Hugh Owen, Permanent Secretary to the Local Government Board, with respect to the supply of the schools within the East London Company's area of supply. It was pointed out by the speakers that about 100 of the Board's schools were supplied by the Company, and that the children attending those schools numbered about 110,000. In 23 of the schools, representing an attendance of 25,000, the water supply was very unsatisfactory. The Company had promised to provide a constant supply during school hours; and the speakers strongly urged that this promise should be carried out. They asked that the voluntary schools, which were not as favourably situated as the Board schools (in whose case the meter system was in vogue), should be placed on an equal footing with the Board schools, and that any improvement in the supply which might be procured for the Board schools should be also extended to voluntary schools. Complaint was also made that, although there was a guarantee given by the Company in 1895 to maintain a constant supply, there was no guarantee as to pressure, and cases were cited in which the pressure did not extend above the ground floor. Mr. John Lobb asserted that the Company's increase of supply during the past twenty years had not been commensurate with the increased demand, and also complained that during that time the pipes had not been properly repaired and renewed. Economy was at the root of the present trouble. Sir Hugh Owen, having expressed his sympathy with the objects of the deputation, said the arrangement made by the Company appeared to be a liberal one when it was considered how great their difficulties were with other consumers. The pressing question was how to meet the present difficulty; and he believed the Company were doing all in their power. Of course, they had not anticipated the present state of affairs; and as recently as three months ago, the Local Government Board received a communication from the Company stating that they did not anticipate any difficulties. The Company would probably have to be dealt with after the present difficulties had ceased. It is understood that Sir Hugh Owen will write a letter to the Company in which he will embody the views of the deputation—practically making them the views of the Local Government Board, and calling upon the Company to fulfil their promise, made in 1895, of a constant supply to the schools.

During the week some of the Local Authorities addressed indignant letters to the Local Government Board in reply to the circular sent out by the President. The Hackney Vestry observed, "with surprise and pain," that the Board had no doubt that, notwithstanding the deficiency of the water supply, there was a large waste of water in the district; the waste being in some cases wilful and in others the result of carelessness. They strongly condemned such a charge being made by the Company, without a shred of evidence in its favour. Indeed, the letter said, the evidence relating thereto was strongly against it, as when a deputation from the Vestry waited upon the Company on Aug. 23, the Engineer (Mr. Bryan) admitted that he had no special complaint to make regarding this. As a matter of fact, there were a large number of roads in the poorer districts where there was actually no supply from the Company's pipes; the only present source being the water-carts provided by the Vestry. The letter expressed the astonishment of the Vestry that the Board should have made such an accusation against the people in the East of London. The Shoreditch Vestry, in a reply, emphatically declined to insult the intelligence of the water consumers of their district by urging them, as suggested, not to waste water which they did not get for twenty hours out of the twenty-four, or to assist the Board in thus trying to shift some of the blame of this famine on to the wretched victims of it. The letter proceeded: "The only waste of water known to this Vestry is that caused by the leaky and defective pipes and mains of the Company . . . and to assume because the Company alleged they pump so many gallons of water per consumer into their mains, that such amount ever reaches such consumer to be wasted by him, is to confess a faith in the condition of the Company's mains that would be rudely shaken if your Board would cause a test to be made of them by raising the pressure therein to 100 lbs. per square inch, as provided by the New River Company." The Vestry also desired to take this opportunity of informing the Board that public opinion in the district was beginning, after contemplation of the history of this water question, "to have very considerable doubts as to the disinterestedness or intelligence of the Government in their dealings with this matter."

Replying to a request from Mr. H. Robertson, M.P., for full particulars regarding the drought, Mr. Bryan has addressed a long letter to the Member for South Hackney, in the course of which he says that the drought has now lasted thirteen months. The total rainfall from July 30, 1897, to Sept. 5, 1898, was under 15 inches; and the rainfall from Jan. 1 to Sept. 5, 1898, was 8.62 inches. The rivers and springs are always dependent upon the winter rainfall; and consequently although the Company's reservoirs were full on June 20, the flow of the river has been so minute since then that depletion of the reservoirs was abnormally rapid. The present drought has beaten all records; and he cannot see how it is possible for any reasonable man to blame the Company for what no living person could have foretold. All he knows is that the water available for his Company after the New River Company have taken their 22½ million gallons a day does not amount to more than 3 million gallons.

A Water Consumers' Defence Association has been formed in the East-end with the following objects: "(1) Control of the water supply of London by the London County Council; (2) to provide legal aid to all members who will refuse to pay rates for water not supplied, and against whom action may be taken by the East London Water Company. All ratepayers who are prepared to resist the payment of water-rates are requested to communicate with the Association in order to ensure an organized combination to resist the unjust demands of the East London Water Company."

Mr. C. E. Jones, the late Gas and Water Engineer of Chesterfield, who now resides at Leyton, takes, as would be expected of him, a very common-sense view of the present water difficulty. He spoke on the subject at the meeting of the Woking Water Company last Tuesday—a question having been previously asked by a shareholder as to whether the Company proposed charging the consumers the full amount of their rate seeing that the supply of water had been curtailed. Mr. Jones said he lived in a district in London where they only received four hours' supply per day; and it was sufficient. An intermittent supply was, until a very few years ago, quite general in London. Then the constant service was adopted; and people did not like to go back to the intermittent service. He well remembered supplying a whole district, containing a mining



population, with 8 gallons of water per head per day; and the consumers were perfectly satisfied. But they had it by meter; and so it was to their advantage to economize. The abolition of cisterns, and the increasing sanitary notions of people, had led to a larger consumption of water; but whether it was necessary or not was a question which experience would have to prove. His own opinion was that half the water supply was a matter of waste; and he saw no harm whatever in shutting off the supply at night. The saving of waste by so doing was enormous; and he believed that, if the Company supplying the district in which he resided had shut off the water at night time two months ago, they would not have been in the dreadful state in which they now were. There had been a succession of twelve dry years; and it took a strong water company to stand against that. With regard to the payment for water during the period of the restriction of the supply, a shareholder had asked, on behalf of the consumers, for "equity" and "justice." The Act of Parliament provided that a water company should be compensated for the care, trouble, and expense to which they were put, whether they furnished a supply for three, six, or twenty-four hours; and this was perfectly just. The charge was not for the quantity of water supplied; it was a charge upon the property. The water supply was considered by Parliament to be such an important matter that the smaller property—property largely inhabited by what were known as the working classes—was rated lower than that occupied by the middle and richer classes. The water-rate was a charge upon the property just as much as the rent was. The company supplying the water had to maintain their reservoirs, pumping plant, distribution system, and staff; and then when they were short of water they were almost worried to death. He therefore thought that the question of "equity" was easily answered; and as to the question of "justice," he presumed that what was legal might be considered to be justice as well as law. To his mind, although he was a sufferer, he thought this was a very just law.

The Special Commissioner of the "Pall Mall Gazette" who has been investigating the water difficulty in the East-end for our contemporary contributed another article on the subject in its issue of yesterday week. Speaking of the reduction of the supply to four hours, he confessed that the outlook was most grave; but, while admitting that the consumer must feel the inconvenience of the shortage more, he did not think that the curtailment from six to four hours need give rise to any serious apprehensions. The Commissioner pointed out that the statistics prepared by the responsible officials of the Company prove that, since the beginning of the interruption of the constant supply, a quantity of water had been supplied sufficient to give every head of the population, in their district at least, 19 gallons per diem for purely domestic purposes; and certainly no one can contradict him in the opinion he expresses that, without wilful neglect or gross carelessness, everyone ought to be able to manage on such an allowance without endangering his sanitary well-being in the least. With the supply limited to four hours in the twenty-four, the average allowance should work out at something between 12 and 13 gallons; but this reduction is not enough to justify the description of the scarcity as a "famine," if the word have any meaning left. The Commissioner hits hard at the rhetoric of some of the platform speakers—sarcastically described as "wordy tub-thumpers"—at the public meetings which have been held in connection with the curtailment of the supply. Such rhetoric, he says, can serve no good end, and can only be intended to embitter the relationship, which is already hostile enough, between the Company and the consumer. In the East-end the Water Company and the public are, and have for a long time been, at loggerheads; and this attitude of hostility on the part of the local bodies who represent the consumer, whether justifiable or not, seems to him to be the bedrock of the present difficulty. He gives an account of an interview which he has had with the Secretary of the Company (Mr. I. A. Crookenden) regarding the reckless charges which have been made against them. One of the most grave of the assertions publicly made is that, since the constant supply was interrupted, certain houses had been without a drop of water for two and even three days. But the Commissioner himself has failed to find anyone of the several persons recounting this grievance who could give the addresses of the houses where the total failure of the supply had occurred; and Mr. Crookenden declared that no cases of the kind had come to his knowledge. Mr. Crookenden also explained that the Company had every reason to believe that an enormous quantity of water was wasted, either from sheer wantonness or from gross carelessness. The Company's Inspectors reported that, during the hours the water was running, the sewers ran a continuous stream of 12 to 18 inches in depth. It was almost impossible for the Company to check such waste. For one thing, wilful waste on the part of the consumer was difficult to prove; for another, it was impossible to have an official standing over every tap in East London for six or four hours a day. The Chairman of the Company (Mr. George Banbury) also impressed upon the Commissioner that if the new reservoirs sanctioned by Parliament last session, and which are now being constructed, had been ready, the Company would have had no difficulty in meeting even the present emergency. They would have had storage for an additional 1000 million gallons of water. "Unfortunately," added Mr. Banbury, "it is impossible to build reservoirs of these dimensions overnight." The Commissioner was further informed that the Company's main supply comes from the River Lea, after the New River Company have tapped it of the amount due to them by statute. The Lea is affected by drought sooner than any river in England. Last year about 140 million gallons reached the Company; but until the end of August this year they have only had 28 millions. Their Engineers say that a rainfall of 2½ inches would enable them to resume the constant supply. The only point on which the Directors think they have any reason to blame themselves is for their leniency in years past to the landlords. They ought to have insisted on their putting cisterns in every house supplied by the Company.

Owing to a diminution in the yield at the springs at Evesham, it has been agreed to restrict the supply of water to the town to sixteen hours a day. The yield has fallen to 193,000 gallons per day, or 43,000 gallons less than at this time last year, which is attributed to the dry winter.

**Reductions in Price.**—On the advice of the Gas Committee, the Lincoln City Council have resolved to reduce the price of gas from 2s. 3d. to 2s. 1d. per 1000 cubic feet from the 29th inst. The Andover Gas Company have reduced their charge by 3d. per 1000 cubic feet.

## METROPOLIS WATER SUPPLY.

Sir B. Baker and Mr. Deacon's Report on "The Sources of Supplemental Supply."

The London County Council have issued the report by the above-named eminent Engineers on their investigations and calculations as to the projected scheme of water supply for the Metropolis from Wales. Sir Benjamin Baker and Mr. G. F. Deacon also entered fully into the whole question of the practicability, and the cost, of carrying out schemes of storage for providing 200, 300, and 400 million gallons of water per day respectively from the Thames, on the lines of the report of the Royal Commission of 1892-93. The general conclusions at which they arrived were as follows:—

(1) That for the next 10 or 15 years the Thames must necessarily remain the chief source of supply for London.

(2) That, together with the wells and probably the Lea, the Thames will always be maintained as an alternative or contributory source of supply, if for no other reason than that set forth by the Duke of Richmond's Commission—viz., the undesirability of any change by which the Metropolis would become dependent upon a single source of supply which might be liable to accidental interruption.

(3) That the evidence brought before the Royal Commission as to the quality of the existing supply, when perfectly filtered, shows that there is no reason for entirely abandoning the present sources of supply, though views differ in deciding as to the maximum quantity that may be taken from the Thames with impunity.

(4) That the practical question for decision within the next year or two is whether 12 to 15 years hence the additional supply shall come from the Thames or from Wales.

(5) That the personal prejudices and sentiments of the public—rather than the opinions of engineers, chemists, and accountants—are the most powerful factors in deciding such questions; and therefore it is not necessarily a wise course to accept the lowest tender, and take an inferior article where water supply is concerned.

(6) Personally, we should feel no hesitation in deciding that the additional supply of water should, as far as possible, come from Wales, because we should then, in our opinion, have had all reasonable regard both to true economy and to existing and future prejudices and sentimental or real objections to an initially polluted and subsequently more or less purified supply. We should, in short, be doing for the population collectively what we should be doing for ourselves individually in going to a pure spring, if there was one reasonably available, for our own domestic supply, although it might involve a little more trouble and expense.

(7) The extra trouble and expense to individual householders in London of getting the additional supply of water from the purest source available, rather than out of the nearest stream, would be insignificant, compared with that willingly incurred by country residents and cottagers for the same object, since, on the basis of the figures given in this report, the first 200 million gallons a day would involve an additional expenditure of less than 1d. per week for an average household; while for the second instalment of 200 million gallons Welsh water would be the cheaper of the two.

The Water Committee of the Council add that, pending the sittings of the present Royal Commission on Water Supply, they have postponed the consideration of this report; and the work connected with the question of a supplementary supply of water from Wales has been confined principally to proceeding with the plans and sections of the Wye portion of the scheme.

## MANCHESTER CORPORATION WATER SUPPLY.

### Reduction in the Charges—The Position of the Thirlmere Works

At the Meeting of the Manchester City Council last Wednesday, the Water Committee reported that, after careful investigation of the financial position of the department, they were able to recommend that the surplus revenue be appropriated as follows from April 1, 1899: That the public water-rate be reduced 2d. in the pound; that the charges for water for domestic purposes be reduced 1d. in the pound; and that 5 per cent. discount be allowed off all accounts for supplies of water by meter amounting to 10s. per quarter and upwards, on condition that such accounts were paid within a specified period, to be afterwards fixed. These reductions, amounting to a total of about £35,000 per annum, would probably exhaust the accruing surplus during the next few years; and, should the financial position of the department, at the end of that time, allow of a readjustment, it was recommended that the charges for water by meter be again taken into consideration, with a view of a further reduction being made, as this largely affected the trade of the district. The Committee remarked that they were much gratified in being able to make these reductions, considering the large expenditure incurred in carrying out the Thirlmere works. The works were commenced in 1886, and would eventually supply 50 million gallons per day and provide for 160 days' consumption at that rate, even without any rainfall. The total length of aqueduct was nearly 96 miles. Of this 14½ miles of "tunnel" and 36½ miles of "cut and cover" had been constructed large enough for the whole 50 million gallons per day. For the remaining 45 miles, a single pipe, capable of conveying 10 million gallons per day, had been laid; and this would be supplemented by additional pipes, each to carry 10 million gallons per day, as occasion required. The total capital expenditure on the Thirlmere works so far amounted to rather more than £2,696,000. This included the purchase of 11,000 acres of land forming the watershed, as well as all interests therein of every description, and the wayleave for the aqueduct. The Corporation thus owned the freehold of the whole of the watershed, which consisted mostly of mountain land and farms. Suitable arrangements had been made for the management of the works; and everything in connection therewith was working exceptionally well. The report was adopted.



## STOCKPORT CORPORATION AND THE WATER COMPANY.

### Revival of the Purchase Question.

At a Special Meeting of the Stockport Town Council on Monday last week, the following motion was discussed: "That, in the opinion of this Council, it is desirable to acquire the undertaking of the Stockport District Water-Works Company."

Alderman W. LEES, the Chairman of the Finance Committee, proposed the adoption of the motion. He said that the subject had been before the Council on various occasions during the last forty years; but the financial aspect of the question had up to now debarred the Corporation from acquiring the undertaking. He had no hesitation, having given the matter great consideration for several years, in asking the Council to take it up earnestly with a view to purchase. The object of giving municipal corporations more control was to promote the health, good government, and well-being of the people; and it could not be denied that water was one of the first necessities of life. He hoped nothing would be said to cause friction between the Corporation and the Company. The Company stepped in the breach, and supplied a public necessity when the municipal life of the borough was not sufficiently vitalized to undertake the duty. Of course, private water companies were not to be considered in the light of philanthropists; their object was to secure the best possible dividend upon their investments. He said nothing as to the quantity or quality of the water supply, which had been improved during recent years; but as the population of the town and district increased, it became more necessary that the water supply should be in the hands of the Corporation. When this question was last seriously considered, in 1886, it was said that a rate of at least 1s. in the pound would have to be levied to make up the deficiency; but he thought the estimate then formed was incorrect. He had satisfied himself that there would probably never be a more favourable time, and that, by methods now open to them, they might acquire the undertaking for an extra rate of a few pence in the pound at the commencement, which extra rate would gradually pass away. The Company's present supplies were as follows: Lyme Park reservoirs, 1,250,000 gallons; Manchester Corporation reservoirs, 1,100,000 gallons (the price paid being 2½d. per 1000 gallons for a quantity not exceeding 1,000,000 gallons, 6d. per 1000 for the Bredbury supply, and 8d. and 9d. per 1000 for any further quantity required); and 750,000 gallons from the new well at Wilmslow—making a total supply of 3,100,000 gallons for a population approximately estimated at 150,000. He understood it was usual to have a supply calculated to meet the probable requirements of the district ten years hence. They might be told, therefore, that it would be necessary to provide new works, to which his reply was that these new works could be undertaken by a corporation on better terms and more effectually than by a private company. From a sanitary point of view, it was important that the Corporation should have control of the water supply; and the Government were now most favourable to the transfer of such undertakings to municipal authorities.

Alderman JOHN TURNER, Vice-Chairman of the Finance Committee, seconded the motion—remarking that, if it was right that the Corporation should have control of the gas supply, it was tenfold more important that they should have control of the water supply. The object of the Corporation would not be solely to make dividends. They had to remember that their first duty was to preserve as far as possible the health of the people. The suburbs of Stockport were being covered with property, the area of the gathering-ground was being built upon, and the sources of supply would be much curtailed if they did not move early.

Mr. T. HIDERLEY said that, on the last occasion this question was discussed, it was found that the purchase would involve a rate of 1s. 2½d. in the pound; and, after the transfer, the difficulty would be that the public would want a better supply at a cheaper rate. He believed it was misleading to say that the purchase would mean only a few pence extra on the rates.

MESSRS. BURROWS and LIEVESLEY having spoken in support of the motion, it was unanimously agreed to.

A Committee was afterwards appointed to negotiate with the Company.

## DEVONPORT CORPORATION AND THE WATER-WORKS.

### A Purchase Bill Agreed Upon.

A Special Meeting of the Devonport Town Council was held last Tuesday to consider the recommendation of the Water Committee that application be made to Parliament for power to compulsorily acquire the undertaking of the Devonport Water Company. The MAYOR (Mr. W. J. Waycott) presided.

Mr. H. WHITFIELD, the Chairman of the Water Committee, moved the adoption of the Committee's report. He said the town was unanimous as to the propriety of the step; and the only difference would be as to the wisdom of the step from the financial standpoint. If it had been possible to purchase the works 25 years ago, the undertaking could have been obtained for a much smaller sum; and if it were left for 25 years more, its value would have increased out of all proportion to the figures they had to take into their calculation now. The Committee had made overtures to the Company, and had offered by stages the maximum dividends, which in any case they would be entitled to earn if they continued as a Company for all time. These overtures had been rejected; and they could only conclude that the Company's one and substantial reason for refusing to sell was the enormous capitalization of their effects that was constantly in progress. The Company must be on the eve of making very large additions and alterations to their plant. It was expected that the Devonport leat must be piped from end to end. The Company must also create a large storage reservoir to take the place of the smaller reservoirs which it had hitherto been the policy of the Company to construct—a policy which was not considered wise by those who had advised the Committee. If that money must be spent, it should be spent by the Municipality, and not by the Company. The Committee had no strong feeling in the matter. They threw on the Council and the town the responsibility of

rejection, if rejection was to be the policy of the town. They did not pretend that the purchase of the water undertaking would not constitute a charge upon the rates. They were, however, advised that it would be from the outset a diminishing charge; and they were confident it would be met by an increase of revenue arising from an increase of population. The scheme was the one means within a few years of relieving the rates, and was the great means by which Devonport might begin to municipalize all the articles common to the consumption of its inhabitants.

Mr. CHEW seconded the motion.

Mr. BANBURY moved, as an amendment, that the question be considered that day twelve months. He complained that Mr. Whitfield had given the Council very little data, and said they could not contend with Devonport that the water was bad or the supply intermittent. If the undertaking cost only half a million—and he believed it would cost a great deal more—the annual charge would be £22,500. The gross income of the Company was something under £13,000; and if they took the net income at £6000, and subtracted this from the £22,500, they would have a deficiency which would be equal to a rate of 1s. 5d. in the pound in addition to the present charges for water.

Mr. STEPHENS seconded the amendment.

Mr. HARVEY said the Company were not a bit afraid of the proposal; and the Corporation had not the slightest chance of getting the works. If they should succeed, the ratepayers must be prepared to pay a heavy rate, and the cost of water would be about 25 per cent. higher than now.

Mr. EMDON believed the cost of the works would be from £450,000 to £500,000, which would mean an immediate rate of 1s. 0½d.—a probable rate of 1s. 3d. Delay would not enhance the value of the works.

The TOWN CLERK, in replying to a question, said retaining fees would be paid to certain counsel and engineers, who had been retained. The disposition of Parliament towards the purchase of water-works had undergone considerable change during the last 25 years. If the works could be bought upon a system of annuities, the question of purchase money would not arise. The maximum dividends of the Company ranged from 14 to 6 per cent.

Mr. ROLSTON, while in favour of the principle that the water supply should be in the hands of the Corporation, said he was not prepared to ask the ratepayers to pay an outrageous sum for the principle. Of 48 members of the Council, only 26 were present; so that there did not seem to be a very strong feeling on the subject. It was preposterous to engage counsel, and enter into other expensive arrangements, without knowing whether or not the ratepayers would endorse the proposal. The speech of Mr. Whitfield would only "bamboozle" them.

Mr. HORNBECK was of opinion that delay would make purchase more difficult.

Mr. JAMES said it was for the ratepayers to decide; but they should be supplied with data, which would enable them to come to a conclusion.

Mr. WHITEY thought the time inopportune for the purchase. The rates were now 5s. 2d., and would be 6s. 2d.; and if 6d. were added on account of the water-works, that would mean 6s. 8d., in addition to which their assessments had been increased 33 per cent.

Other members having spoken in opposition to the proposal,

The amendment was put and defeated by 13 votes to 9—four of the members being neutral. Another amendment to the effect that the Committee should be asked to consider the matter with a view to furnishing data which would help the Council, was defeated by 13 votes to 10; Mr. Whitfield remarking that the Town Clerk advised the Committee to "sit tight," and not give information the Company could take advantage of. The resolution was finally carried, but with several dissentients.

## WORKING WATER COMPANY.

The report which was submitted at the half-yearly meeting of this Company last Tuesday, stated that the revenue for the six months had been £3881; and the expenditure, £1498. The amount carried to profit and loss account was £2383, which gave a balance available for division of £2445. From this the Directors recommended the payment of an interim dividend at the rate of 4 per cent. per annum, which would absorb £1565, and leave £880 to be carried forward. Commenting upon the report, the Chairman (Mr. Charles Horsley) said the business was increasing satisfactorily. But he was sorry that the unusual drought had compelled the Directors to reduce the supply of water to thirteen hours per day. Other companies, however, with larger resources than they had, were unable to provide a constant supply; and all over the country there was a shortness of water. The Directors had been for some time engaged in negotiations whereby they hoped to obtain an appreciable addition to their present source of supply; but they had not been brought to a satisfactory conclusion. If they could not get the site they wanted, they would have to take steps to secure another one. The reservoir which had been constructed at Clandon, to contain 500,000 gallons of water, was now completed. Under present circumstances, the Directors had gone to some little expense in opening up the first well, which they previously left. They were getting from 10,000 to 15,000 gallons of water per day from it; and if they could obtain from 20,000 to 25,000 gallons, it would be a considerable help. He also referred to a matter which was explained more fully by Mr. R. Hesketh Jones in seconding the motion for the adoption of the report. He said it would be recollected that some time since the Company ceded a portion of their district to the Frimley Water Company, in consideration of the payment by them of £5000 worth of their shares, which, however, were not to receive any dividend until the Frimley shareholders obtained 5 per cent. The Frimley Company having occasion to go to Parliament in the past session, the Directors thought it would be a good opportunity to get clear of the shares; and after a good deal of negotiation, they had succeeded in making an arrangement by which they would receive from the Frimley Company £4500 for them. Mr. C. E. Jones made some remarks on the general question of the drought and water supply; and these will be found recorded in the article on "The Dry Weather and Water Supply." The report was adopted, and the dividend recommended declared. At a subsequent extraordinary meeting, the Directors were authorized to raise the additional sum of £10,000, by the creation and issue of new ordinary £10 shares, and to borrow £2500.



**HALIFAX NEW WATER-WORKS SCHEME.**

By a resolution on the agenda at the meeting of the Halifax Town Council last Wednesday, the Water Committee sought to be authorized to carry out forthwith the construction of the Walslaw scheme of water-works, authorized by the Corporation Act of the past session, at an estimated cost of £157,000. Mr. Josiah Wade, the Chairman of the Committee, in moving the adoption of the minutes, reminded the Council that they decided a year ago to go to Parliament for powers to carry out the Wishaw scheme. Having now obtained authority, it would be wise to begin the work at once; for were a dry season to come, there would be a risk of scarcity in the supply. The total requirements amounted to 4,350,000 gallons per day. The present storage system gave them (say) 4,624,000 gallons per day; showing a very narrow margin. If they began the work of construction now, it would take eight years to complete it; and their powers only extended to ten years. Mr. C. Parker having seconded the resolution, the discussion was adjourned to a special meeting.

**CARNARVON WATER SUPPLY.****Sources of Pollution.**

A report has recently been presented to the Local Government Board by Dr. S. W. Wheaton with reference to the sources of water supply for the borough of Carnarvon, which has for some years past been unsatisfactory, more particularly by reason of its liability to pollution by liquid refuse coming from the village of Rhyd-ddu. The supply is obtained from the River Gwyrfa, which issues from Llyn-y-Gader as a large stream, and 3 miles lower down the valley, falls into Llyn Quellyn. At the intake,  $6\frac{1}{2}$  miles distant from the town of Carnarvon, the water flows from a dam through copper gauze screens directly into an iron pipe, by which it is conveyed, without filtration, to a reservoir constructed  $2\frac{1}{2}$  miles outside the borough. The whole of the Gwyrfa Valley above the intake is occupied by farms; and, with one exception, these are situated on the banks of a stream which falls into the River Gwyrfa. Dr. Wheaton describes the sanitary surroundings of the farms and other buildings whose sewage is suffered to pollute the source of water supply for the borough of Carnarvon, with its population of nearly 10,000, and states that the Gwyrfa is allowed to receive the whole of the liquid refuse from the village of Rhyd-ddu, which has a population of about 150 persons. There can be no doubt, he adds, that the sanitary circumstances of the village are such as to form a serious danger to the consumers of the water from the Gwyrfa River; and there would be grave risk to such consumers should enteric fever or cholera at any time break out in the village. The two authorities in whose districts the village is situated—the Gwyrfa and Glaslyn Rural District Councils—have up to the present failed to come to any arrangement for a joint system of sewerage, though there can be no doubt that combination for this purpose is indicated by the local circumstances. Each Council has caused plans to be prepared for the sewerage of that portion of the village which is under its jurisdiction; but nothing further has been done. Dr. Wheaton's inquiries led him to the conclusion that the work of preventing pollution of the Carnarvon water supply is a very difficult undertaking, requiring the exercise of constant vigilance over a very large area. Doubting whether filtration, as ordinarily carried out, can, in the present condition of the supply, be trusted to secure a uniformly wholesome water, he indicates the further measures which are necessary before such a result can be attained; but he expresses his preference for Llyn-y-Aywarthen as a source of supply, which is almost entirely free from risk of pollution. At the present time the water of the last-mentioned lake is not used for any purpose.

**PREVENTING THE POLLUTION OF WATER SUPPLIES.**

Readers of the "JOURNAL" are aware that the above subject has been brought very much to the front during the past twelve months. An opinion has been pretty freely expressed that there should be some general legislation with the view of protecting sources of water supply; and, though the proposals in this direction put forward by the Local Government Board, which have recently been dealt with in our columns, were abandoned last session, there is every reason for believing that some general Bill will be introduced next year to remedy what are regarded as existing defects. The subject is one of far-reaching importance; and it is arousing attention in other countries than our own. We learn from the "Engineering Record" that Baltimore is now passing through one of those periods of agitation which are bound to occur in communities relying upon surface waters for their supply. The city is furnished with water from two streams. The first is Jones's Falls, impounded in Lake Roland; the second, the Gunpowder, impounded in Loch Raven. It has recently been estimated that, without considering the storage capacity of the reservoirs and the periods of turbid water, the former supply falls about  $10\frac{1}{2}$  million gallons a day short of the demands made upon it in times of minimum discharge; while the latter exceeds by about 33 million gallons the draught on it during similar periods. The supply from Lake Roland recently became decidedly unpleasant; and an examination of the watershed was made by Mr. G. P. Hopkins, of the Water Department. He found all the tributaries of the lake badly polluted; and he reported that there was hardly a sink or a barnyard near these lakes which was not connected with them directly by pipes. Outhouses overhanging the channels in many places; and other sources of danger to the water supply were often found. The reports read very much like those made a few years ago concerning the watershed of the New York supply; and this similarity naturally suggests that the remedy adopted by the community of the larger city may be found efficient for that of the smaller one. Baltimore may abandon the Lake Roland supply, and yet have enough water for some time to come. But the city is growing so rapidly that such a course seems hardly desirable. An ample supply of water is necessary for the success of any community; and the Lake Roland supply, guarded against nuisances along the lake and its tributaries, and filtered before delivery to the consumers, might enable that city to tide over accidents to the Gunpowder supply which would otherwise cause

serious annoyances. Whether the city will require any special legislation to enable it to abolish these nuisances is a subject for lawyers rather than engineers; yet a decision on this question recently given by the Supreme Court of New York is so important that it may be briefly reviewed.

Under the provisions of chapter 490 of the New York State laws passed in 1883, the Commissioner of Public Works of the City was directed to prepare plans and maps for the construction of a new aqueduct, "and for the construction of one or more dams and reservoirs to detain such water, and for the construction of such sluices, culverts, canals, pumping works, bridges, tunnels, blow-offs, ventilating shafts, and other appurtenances, as may be necessary to the proper construction, maintenance, or operation of such aqueduct, dams, and reservoirs." These maps and plans were to be filed and open to public inspection; and the works were to be constructed according to them. The owner of a portion of the property indicated as necessary for one of the reservoirs objected to its being taken for two reasons. The first was that the land was not required for the "construction, maintenance, or operation" of the reservoir, and that consequently there was no authority for its appropriation by the city; and the second was that the Act was unconstitutional. The latter claim was set aside in conformity with previous decisions in the State, while the former was discussed at some length.

The Act mentioned provides that the Commissioners of Appraisal appointed by the Court shall take, subscribe, and file the constitutional oath providing for the faithful discharge of their duties, and, upon such filing, "the said Mayor, aldermen, and commonalty of the City of New York shall be and become seized in fee of all those parcels of real estate which are on the maps in the fourth section referred to described as parcels of which it has been determined by said Aqueduct Commissioners that the fee shall be acquired." The decision of the Commissioners, as indicated in the filing of the plans and other papers, was therefore final and conclusive as to the lands necessary to carry out the purposes of the Act. They were not confined to an area which would be overflowed because of the construction of a dam, for they could take whatever area was necessary for the maintenance and operation of the works as well. "This includes the taking of lands which were likely to be overflowed even in extraordinary freshets, or which were necessary to protect the water supply from pollution or injury."

The testimony in the case showed that considerable land was taken outside the high-water line of the reservoir "for the purpose of securing the waters to be contained in the reservoir from pollution around the borders, and for the purpose of securing a certain amount of property over which the city will have jurisdiction, so as to prevent nuisances from establishing themselves near the flow-line." It was stated by the Chief Engineer of the New Croton Aqueduct Commission that such zones were maintained about all the reservoirs in the Croton watershed, except in the case of the old Croton Lake. The bad results of neglect in this instance were noticed every year. The water supply of New York is still further protected by an Act passed in 1893, which provided that the Commissioner of Public Works might, within three years of the passage of the Act, take proceedings to acquire title to any real estate "for the sanitary protection of all rivers and other watercourses, lakes, ponds, and reservoirs in the counties of Westchester, Putnam, and Dutchess, so far as the same now are, or hereafter may be, used for the supply of water for the City of New York." Under this law, all nuisances can be abated without delay; but the decision on the appeal in the case reviewed shows that the old law of 1883 was sufficient for the purpose.

**THE WATER SUPPLY AND DRAINAGE OF SCOTTISH BURGHS.**

Just before the prorogation of Parliament, a Bill was introduced into the House of Commons by the Lord Advocate and Mr. Anstruther, to amend the law in regard to the sewerage, drainage, and water supply of burghs in Scotland. It consists of only eight clauses. It is proposed to vest all sewerage, drainage, and water supply works in the Town Councils and Commissioners under the Burgh Police (Scotland) Act, 1892. Where sums of money have been borrowed or are owing by any Town Council or Commissioners of a burgh as the Local Authority under any Public Health Act for purposes of sewerage, drainage, or water supply, the Town Council or Commissioners, as the authority under the Burgh Police Act, are to provide the sums necessary for repaying the principal and paying the interest on such sums out of special sewer and water assessments to be levied. These together are not, in any burgh or special drainage district, to exceed, as a general rule, 4s. in the pound. If, however, the produce of this rate is insufficient to meet the expenditure (including the annual charge for interest and repayment of debt) actually incurred or contemplated, the rate is to be increased to such an extent as may have been approved of by the Local Government Board for Scotland. Special drainage districts formed under any Public Health Act are, subject to the provisions of the proposed Act, to be deemed special drainage districts under the Act of 1892; but special water supply districts partly within a burgh and partly within a county are not to be affected. If any difficulty should arise in regard to the transfer of works, the Local Government Board for Scotland may, after inquiry, make such orders as they may deem necessary for altering or giving effect to the abolition of special districts formed under any Act, or otherwise providing for the removal of such difficulties. The Town Council or Commissioners of any burgh, as the authority under the Burgh Police Act, 1892, in addition to the powers conferred upon them by that or any other Act, are, with reference to sewerage, drainage, or water supply, to have the same rights, powers, and privileges as are conferred by the Public Health (Scotland) Act, 1897, upon Local Authorities under that Act in districts other than burghs; and in so far as is necessary for giving effect to this enactment, the last-mentioned Act and the Acts and parts of Acts incorporated therewith are, subject to the necessary modifications, to be incorporated with the Burgh Police Act. All costs and charges incurred by the Town Council or Commissioners are to be provided for out of the assessment before mentioned; and where it shall be necessary for the Council or Commissioners to borrow money for the purposes of sewerage, drainage, or water supply, they are to be entitled to do so on the security of the assessment in lieu of the assessments mentioned in the Act of 1892, and that Act and the schedules thereto are to be read and construed accordingly. Certain sections of the Act, as well as of the Public Health (Scotland) Act, 1897, are to be repealed. The Bill under notice was only read the first time.



## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

With the holding of the Waverley Association meeting at Duns on Thursday last, the gatherings of Scotch gas managers are wound up for the year. I am satisfied a more useful series of meetings has never been held. The subjects discussed may not have been so striking as has sometimes been the case; but they were, on that account, probably more within the reach of the larger number of managers than if they had been of a higher order. The spirit of comradeship, of helpfulness, which was displayed, was, however, the leading feature of all the meetings; and it is a feature which is exceedingly pleasant to behold. The Waverley Association is the one in which the members come nearer to each other than is perhaps the case in any other body of the kind. The members—at least those of them who attend the meetings—are all managers of works of small size; and their experiences are consequently to a large extent similar. Each is therefore able to contribute something for the common good. There is a further bond of unity in the Waverley Association in the belief that theirs is the parent of all the Associations. On this subject, whatever question there may have been, it would seem to be now dispelled, and the claim of the Waverley to be the pioneer to be established. Mr. Adamson's remarks at the dinner are conclusive, unless there be documentary evidence to the contrary, which is not likely to exist, or it would have been produced already. The spring meeting of the Association is to be held in Edinburgh, on the second Thursday of April. The autumn meeting is to be at Melrose, on the second Thursday of September. A more delightful spot, or one more appropriate for the holding of a Waverley Association meeting, could not be selected; it being adjacent to Abbotsford, the home of the great author of "Waverley." This circumstance may be expected to stimulate the zeal of the members. There should, considering the attractions, be a good attendance at both next year's meetings. The remark is not confined to the Waverley, but applies to all Associations, that those who do not attend the meetings are not aware of how much they lose.

The Aberdeen Corporation gas accounts, of which a summary has been given in this column, were before the Town Council at a meeting on Monday. Mr. Johnston, the Convener of the Gas Committee, who presented them, said: "The income from the sale of gas was £70,276, or £1166 less than last year; but you must remember that a reduction of 2d. per 1000 cubic feet took place, which would be equal at least to very nearly £4000. The amount of revenue has exceeded the estimate by £451. The income from residual products amounted to £9960, an increase of £938 over the previous year, and of £560 over the estimate. This, with the income from other sources, amounts to a grand total of £83,203; being an increase over the previous year—notwithstanding the reduction of 2d.—of £2201. The amount of coal carbonized was 49,179 tons, and the average price per ton 14s. 10d.—an increase of 2134 tons over the previous year. The amount paid for coal was £36,494, which, with other expenditure, amounted to £64,733, or £6932 less than last year. But notwithstanding this there is a handsome balance of £18,469 to be carried to the net revenue account. After meeting all charges, payment of annuities,

interest on mortgages, sinking fund, and a larger sum by £1556 than has ever been set aside in any one year since the Corporation took over the gas-works for the redemption of gas annuities, there is still a balance of £2210, which, with the sum brought from last year's account, gives the net balance to be carried to next year's account of £5864. The reserve fund now amounts to £20,503 15s. 11d.; and it will be in your remembrance that in my remarks last year I mentioned that a new valuation of the whole undertaking had been made, and would be incorporated in the accounts for the following year. This has now been done; and the figures in the capital account show the actual value of the works. This value is brought out at £278,581 15s. 2d., which is a very large increase on the figures (£151,000 odd) which represented the book value of the undertaking last year. An estimate of the revenue and expenditure has been prepared and based on the assumption of selling 448 million cubic feet of gas at 3s. 1d. per 1000 cubic feet. It is calculated that the revenue will amount to £79,566, and the expenditure to £81,625; thus drawing upon the present surplus by about £2000, but still showing a balance on the right side of £3800, which will, I think, be admitted a fair surplus for any contingency that may arise. It is interesting to note the progress of the undertaking from 1871, the year the Council took over the works. The manufacture of gas for that year was 146 million cubic feet, producing £33,100. The figures for the year just ended are 494 millions, bringing in £70,276. The manufacture has thus considerably more than trebled itself, while, on account of the gradual reduction in the price charged, the income has only been a little over double—thus controverting a common phrase that the reduction in the price of gas makes no difference to the gas bill of consumers. I now beg to propose that the price of gas be reduced by 1d. per 1000 cubic feet, making the price 3s. 1d., with the usual discount. I must add that the Committee, along with myself, have to congratulate Mr. Smith, Mr. Cran, and the whole staff on the good results brought out in conducting this large undertaking, the income of which, along with the electric undertaking, is about equal to the assessment on the whole city and water-rate. Taking into account the great distance we have to carry our coal, besides other large cities in the South, I think the statement must be very satisfactory to everybody." Mr. Johnston concluded with the remark that the undertaking was well managed and well conducted—an opinion which his statement of the accounts quite bears out. The Corporation give discounts to the amount of 1d. per 1000 cubic feet for gas consumed of not less than 35,000 and under 50,000 cubic feet; rising to 6d. for gas consumed of over 4 million feet.

The Corporation of Inverness on Monday adopted the recommendation of Mr. J. Thomson (the Gas Manager) to reduce the price of gas from 3s. 9d. to 3s. 4d. per 1000 cubic feet. The number of consumers is yearly increasing; and last year the output rose by 6·84 per cent.

The annual meeting of the shareholders of the St. Andrews Gas Company was held yesterday. Mr. Jesse Hall, the veteran Manager of the Company, reported that the income from all sources had been £5723, and the total expenditure £4358; leaving a balance of profit of £1365. Gas manufactured amounted to 33,789,000 cubic feet—an increase of 1,287,000 cubic feet over the preceding year. The new works which are nearly

## GAS AND WATER COMPANIES STOCK AND SHARE LIST.

Referred to on p. 580.

| Issue.    | Share | When ex-<br>Dividend. | Dividend<br>or Bonus. | NAME.                      | Closing<br>Prices. | Rise<br>or<br>Fall<br>in<br>Wk. | Yield<br>upon<br>Invest-<br>ment. | Issue.    | Share | When ex-<br>Dividend. | Dividend<br>or Bonus. | NAME.                                 | Closing<br>Prices. | Rise<br>or<br>Fall<br>in<br>Wk. | Yield<br>upon<br>Invest-<br>ment. |
|-----------|-------|-----------------------|-----------------------|----------------------------|--------------------|---------------------------------|-----------------------------------|-----------|-------|-----------------------|-----------------------|---------------------------------------|--------------------|---------------------------------|-----------------------------------|
| £         |       |                       | p. c.                 |                            |                    |                                 | £ s. d.                           | £         |       |                       | p. c.                 |                                       |                    |                                 | £ s. d.                           |
| 590,000   | 10    | Apr. 15               | 10½                   | Alliance & Dublin 10 p.c.  | 22½-23½            | ..                              | 4 9 4                             | 75,000    | 5     | June 29               | 6                     | Malta & Medn., Ltd.                   | 42-54              | ..                              | 5 14 3                            |
| 100,000   | 10    | " 1                   | 7½                    | Do. 7 p.c.                 | 16½-17½            | ..                              | 4 5 9                             | 541,920   | 20    | June 10               | 5                     | Monte Video, Ltd.                     | 134-144            | ..                              | 6 18 0                            |
| 300,000   | 100   | July 1                | 5                     | Australian 5 p.c. Db.      | 105-107            | ..                              | 4 13 6                            | 617,946   | Stk.  | Aug. 31               | 9½                    | Newcastle & Gateshead Con.            | 230-240            | ..                              | 4 1 3                             |
| 200,000   | 5     | May 26                | 6                     | Bombay, Ltd.               | 61-7               | ..                              | 4 5 9                             | 269,375   | Stk.  | Jan. 8                | 3½                    | Do. 8 p.c. Db. Stk.                   | 119-117            | ..                              | 2 19 10                           |
| 40,000    | 5     | " 6                   | 6                     | Do. New, £4 paid.          | 41-5               | ..                              | 4 16 0                            | 150,000   | 5     | May 26                | 5                     | Oriental, Ltd.                        | 74-8               | ..                              | 5 0 0                             |
| 380,000   | Stk.  | Aug. 12               | 12                    | Brentford Consolidated     | 275-280            | ..                              | 4 6 0                             | 135,000   | 5     | " 8                   | 8                     | Do. New, £4 10s. pd.                  | 62-7               | ..                              | 6 2 11                            |
| 240,000   | "     | " 9                   | 9                     | Do. New                    | 210-215            | ..                              | 4 3 9                             | 35,000    | 5     | " 8                   | 8                     | Do. 1879, £1 pd.                      | 12-13              | ..                              | 4 11 5                            |
| 50,000    | "     | " 4                   | 4                     | Do. 5 p.c. Prf.            | 140-145            | ..                              | 3 9 0                             | 60,000    | 5     | Mar. 11               | 7                     | Ottoman, Ltd.                         | 6-5½               | ..                              | 6 6 2                             |
| 159,375   | "     | June 10               | 4                     | Do. 4 p.c. Db. Stk.        | 130-135            | ..                              | 2 19 3                            | 500,000   | 100   | June 1                | 6                     | People's Gas 2nd M.<br>of Chicago Bd. | 103-108            | ..                              | 5 11 1                            |
| 220,000   | Stk.  | Mar. 30               | 11½                   | Brighton & Hove Orig.      | 268-273            | ..                              | 4 4 3                             | 848,070   | 10    | May 26                | 6                     | River Plate Ord.                      | 91-97              | ..                              | 6 3 1                             |
| 226,320   | "     | " 8½                  | 8½                    | Do. A. Ord. Stk.           | 195-200            | ..                              | 3 16 11                           | 250,000   | Stk.  | June 29               | 4                     | Do. 4 p.c. Db. Stk.                   | 90-101             | ..                              | 3 19 3                            |
| 933,500   | Stk.  | Aug. 31               | 5                     | Bristol, 5 p.c. max.       | 51-53              | ..                              | 3 15 6                            | 250,000   | 10    | Apr. 29               | 10                    | San Paulo, Ltd.                       | 15-16              | ..                              | 6 5 0                             |
| 420,000   | 20    | Mar. 30               | 10½                   | British                    | 25-27              | ..                              | 4 5 2                             | 185,000   | Stk.  | Mar. 30               | 10                    | Sheffield A. . . .                    | 247-250            | ..                              | 4 0 0                             |
| 50,000    | 10    | Aug. 12               | 11½                   | Bromley, Ord. 10 p.c.      | 20-22              | ..                              | 3 17 3                            | 203,053   | "     | " 10                  | 10                    | Do. B. . . . .                        | 247-250            | ..                              | 4 0 0                             |
| 75,000    | 10    | " 8½                  | 8½                    | Do. 7 p.c.                 | 9-9½               | ..                              | 6 6 4                             | 447,427   | "     | " 10                  | 10                    | Do. C. . . . .                        | 247-250            | ..                              | 4 0 0                             |
| 500,000   | 10    | Apr. 29               | 6                     | Buenos Ayres (New) Ltd.    | 94-100             | ..                              | 4 0 0                             | 5,600,000 | Stk.  | Aug. 12               | 5½                    | South Metrop., 4 p.c. Ord.            | 140-143            | ..                              | 3 14 7                            |
| 98,122    | Stk.  | June 29               | 4                     | Do. 4 p.c. Db. Stk.        | 20-30              | ..                              | 5 10 0                            | 1,460,000 | "     | July 14               | 3                     | Do. 3 p.c. Db. Stk.                   | 101-104            | ..                              | 2 17 8                            |
| 150,000   | 20    | July 14               | 8½                    | Cagliari, Ltd.             | 15-16              | ..                              | 4 7 6                             | 60,000    | Stk.  | Aug. 31               | 12                    | Tottenham and J. A.                   | 280-290            | ..                              | 4 2 9                             |
| 100,000   | 10    | June 10               | 7                     | Cape Town & Dis., Ltd.     | 58-60              | ..                              | 5 0 0                             | 182,380   | "     | June 10               | 7                     | Edmonton J. B.                        | 200-210            | ..                              | 4 5 9                             |
| 50,000    | 50    | May 3                 | 6                     | Do. 6 p.c. 1st Mori.       | 315-325            | ..                              | 4 3 1                             | 149,900   | 10    | July 1                | 5                     | Tuscan, Ltd.                          | 103-113            | ..                              | 6 1 9                             |
| 550,000   | Stk.  | Apr. 15               | 13½                   | Commercial Old Stock.      | 252-257            | ..                              | 4 1 8                             |           |       |                       |                       | Do. 5 p.c. Dbs. Red.                  | 100-103            | ..                              | 4 17 1                            |
| 200,750   | "     | " 10½                 | 10½                   | Do. New do.                | 148-153            | ..                              | 2 18 10                           |           |       |                       |                       |                                       |                    |                                 |                                   |
| 200,750   | "     | June 10               | 4½                    | Do. 4½ p.c. Db. do.        | 207-212            | ..                              | 5 13 2                            |           |       |                       |                       |                                       |                    |                                 |                                   |
| 801,000   | Stk.  | June 10               | 12                    | Continental Union, Ltd.    | 197-202            | ..                              | 4 9 1                             |           |       |                       |                       |                                       |                    |                                 |                                   |
| 200,000   | "     | " 9                   | 9                     | Do. 7 p.c. Prf.            | 305-310            | ..                              | 4 10 4                            | 746,164   | Stk.  | June 29               | 10½                   |                                       |                    |                                 |                                   |
| 51,600    | Stk.  | Aug. 31               | 14                    | Croydon A 10 p.c.          | 255-265            | ..                              | 4 3 0                             | 150,000   | "     | " 10                  | 10                    | Chelsea, Ord.                         | 313-318            | ..                              | 3 6 0                             |
| 168,400   | "     | " 11                  | 11                    | Do. B 7 p.c.               | 125-130            | ..                              | 4 0 9                             | 160,000   | "     | " 13½                 | 13½                   | Do. 5 p.c. Prf.                       | 170-175            | ..                              | 2 17 2                            |
| 555,000   | Stk.  | Aug. 12               | 5½                    | Crystal Palace Ord. 5 p.c. | 140-145            | ..                              | 3 9 0                             | 175,785   | "     | Mar. 30               | 10                    | Do. 4½ p.c. Prf. Stk., 1875           | 148-152            | ..                              | 2 19 3                            |
| 60,000    | "     | " 5                   | 5                     | Do. 5 p.c. Prf.            | 29-34              | ..                              | 4 11 8                            | 1,720,560 | Stk.  | Apr. 15               | 8½                    | Do. 4 p.c. Db. Stk.                   | 157-162            | ..                              | 2 15 7                            |
| 486,090   | 10    | July 28               | 11                    | European, Ltd.             | 163-174            | ..                              | 4 14 4                            | 654,740   | "     | June 29               | 4½                    | East London, Ord.                     | 217-222            | ..                              | 3 12 1                            |
| 354,060   | "     | " 11                  | 11                    | Do. 27 10s. paid.          | 288-293            | ..                              | 4 3 6                             | 590,000   | "     | " 3                   | 3                     | Do. 4½ p.c. Db. Stk.                  | 157-160            | ..                              | 2 16 3                            |
| 5,922,230 | Stk.  | Aug. 12               | 12½                   | Gaslight & Coke, A. Ord.   | 130-125            | ..                              | 3 4 6                             | 700,000   | 50    | June 29               | 7½                    | Do. 3 p.c. Db. Stk.                   | 163-165            | ..                              | 2 17 2                            |
| 100,000   | "     | " 4                   | 4                     | Do. B, 4 p.c. max.         | 305-310            | ..                              | 3 4 6                             | 310,000   | Stk.  | Mar. 30               | 4                     | G'd Junction, 10 p.c. max.            | 115-118            | ..                              | 3 3 7                             |
| 665,000   | "     | " 10                  | 10                    | Do. C, D, E, 10 p.c. Prf.  | 153-157            | ..                              | 3 3 6                             | 705,000   | Stk.  | Aug. 12               | 14                    | Do. 4 p.c. Db. Stk.                   | 142-147            | ..                              | 3 3 7                             |
| 30,000    | "     | " 5                   | 5                     | Do. F, 5 p.c. Prf.         | 230-240            | ..                              | 3 2 6                             | 150,000   | "     | " 7                   | 7                     | Kent . . . . .                        | 364-369            | ..                              | 2 14 5                            |
| 60,000    | "     | " 7½                  | 7½                    | Do. G, 7½ p.c. do.         | 195-200            | ..                              | 3 10 0                            | 1,043,600 | 100   | June 29               | 10                    | Do. New, 7 p.c. max.                  | 212-217            | ..                              | 3 15 11                           |
| 1,300,000 | "     | " 7                   | 7                     | Do. H, 7 p.c. max.         | 305-310            | ..                              | 3 4 6                             | 406,000   | 100   | " 7½                  | 7½                    | Lambeth, 10 p.c. max.                 | 298-303            | ..                              | 3 4 6                             |
| 463,000   | "     | " 10                  | 10                    | Do. J, 10 p.c. Prf.        | 182-187            | ..                              | 3 4 6                             | 350,000   | Stk.  | Mar. 30               | 4                     | Do. 7 p.c. max.                       | 27-232             | ..                              | 3 4 8                             |
| 476,000   | "     | " 6                   | 6                     | Do. K, 6 p.c. Prf.         | 131-133            | ..                              | 3 0 2                             | 500,000   | 100   | Aug. 12               | 13½                   | Do. 4 p.c. Db. Stk.                   | 140-145            | ..                              | 2 15 2                            |
| 1,061,150 | "     | June 10               | 4                     | Do. 4 p.c. Db. Stk.        | 148-153            | ..                              | 2 18 10                           | 1,000,000 | Stk.  | July 28               | 4                     | New River, New Shares                 | 430-435            | ..                              | 3 0 11                            |
| 294,550   | "     | " 4½                  | 4½                    | Do. 4½ p.c. do.            | 198-203            | ..                              | 2 19 1                            | 902,300   | Stk.  | June 29               | 6                     | Do. 4 p.c. Db. Stk.                   | 140-145            | ..                              | 2 15 2                            |
| 958,000   | "     | " 6                   | 6                     | Do. 6 p.c. do.             | 14-15              | ..                              | 5 6 8                             | 128,500   | 100   | " 6                   | 6                     | Southwark & V. Hall, Ord.             | 166-171            | ..                              | 3 10 2                            |
| 70,000    | 10    | May 12                | 8                     | Hongkong & China, Ltd.     | 215-220            | ..                              | 4 10 11                           | 489,269   | Stk.  | " 5                   | 5                     | Do. do. 7½ p.c. max.                  | 157-162            | ..                              | 3 14 1                            |
| 8,800,000 | Stk.  | " 2                   | 2                     | Imperial Continental       | 98-101             | ..                              | 3 19 3                            | 1,019,585 | "     | Apr. 15               | 4                     | Do. do. 5 p.c. Prf.                   | 168-172            | ..                              | 2 18 2                            |
| 376,400   | 100   | Aug. 2                | 4                     | Do. 4 p.c. Dbs. Red.       | 101-104            | ..                              | 3 7 4                             | 1,155,066 | Stk.  | June 10               | 10                    | Do. 4 p.c. A Db. Stk.                 | 141-144            | ..                              | 2 15 7                            |
| 473,600   | Stk.  | Aug. 12               | 3½                    | Do. 3½ p.c. Db. Stk.       | 111-113            | ..                              | 4 8 10                            | 200,000   | "     | " 4½                  | 4½                    | West Middlesex . . .                  | 300-305            | ..                              | 5 5 7                             |
| 560,000   | 100   | Apr. 1                | 5                     | Met. of Mel. 5 p.c. Db.    | 107-109            | ..                              | 4 2 7                             | 200,000   | "     | Mar. 11               | 3                     | Do. 4½ p.c. Db. Stk.                  | 162-165            | ..                              | 2 14 7                            |
| 250,000   | 100   | " 4½                  | 4½                    | bourne 4½ p.c. Db.         |                    | ..                              |                                   |           |       |                       |                       | Do. 8 p.c. Db. Stk.                   | 104-106            | ..                              | 2 16 7                            |

† Next dividend will be at this rate.



completed have cost £1177, to meet which £1000 was borrowed at the rate of 3 per cent., and the balance has been taken out of the past year's accounts. The income was £180 less than in the preceding year, which was due to a reduction of 2d. in the price of gas and the receipt of a less sum for residual products. The balance-sheet showed a surplus of £1565, besides £869 which has been paid for 1096 tons of coal which is in stock and is applicable to this year. A dividend was declared at the rate of 50s. per share. Mr. Hall has been Manager of the Company since 1850. When he was appointed, there were 180 consumers on the books; there are now 1688. Ten years ago the price of gas was 5s. per 1000 cubic feet; and now it is 3s. 4d.

The Peebles Town Council on Thursday resolved to adopt the Burghs Gas Supply Act, with a view to the completion of the agreement for the transfer to them of the undertaking of the Peebles Gaslight Company. Both Provost Ballantyne, who moved the adoption of the Act, and Treasurer Williamson, who seconded, expressed themselves as confident that the step they were taking was the right one. With this view, there will be general agreement; and there should be as general satisfaction at the fact that what threatened at one time to be a costly and offensive proceeding has been, or is all but, concluded in an amicable manner. A second special meeting of the Town Council is to be held on Nov. 14, in terms of the statute, for the confirmation or rejection of the resolution to adopt the Act.

The accounts of the Dunfermline Corporation Gas Department for the past year show that the capital of the undertaking was increased from £97,880 to £99,320. Of this sum, £5700 has been raised by means of mortgage bonds, and the balance is Corporation stock. The total revenue amounted to £13,097, of which £11,414 was received for gas sold, £640 from the sale of coke, £734 from the sale of tar and ammoniacal liquor, and £309 from meter and stove rents. The expenditure included £3322 for coal and £941 for distribution of gas, and amounted to £6963—leaving a gross profit of £6134. Out of this, interest upon capital to the amount of £3050 was paid, and other charges met; and there was left as the net balance £2938. The past was the first complete year of Corporation management; the preceding year having been short of a complete twelvemonth by sixteen days. In the year, the revenue from gas amounted to £10,073; from meter and stove rents, to £272; from residuals, to £1336; and the net profit was £1742.

The Banff Gaslight Company have, since their works came under the management of Mr. W. Marshall, entered upon a period of prosperity. This is due to the renovation of plant, and its maintenance in a better state of efficiency. During the past year, the yield of gas per ton of coal carbonized was 9321 cubic feet. Of 6,301,300 cubic feet of gas made, 732,500 cubic feet, or 11.62 per cent., was unaccounted for. The average illuminating power was 26.25 candles. The quantity of gas sold was greater than in the preceding year by 18,200 cubic feet.

There has been some dissatisfaction among the users of prepayment gas-meters in Falkirk at the charge for gas consumed through them not having been reduced when a reduction was given to ordinary consumers. A deputation of the aggrieved waited upon the Gas Committee, who

afterwards recommended that 3d. per 1000 cubic feet be given back to consumers using prepayment meters from and after the commencement of next quarter; the return to be made when each 1000 cubic feet is consumed. The recommendation was adopted.

The Water Committee of the Glasgow Corporation on Monday had the subject of the water-pipe contract which had been sent back to them by the Town Council under consideration. They agreed to recommend the acceptance of the offer of Messrs. R. M'Laren and Co., of Glasgow, for 1000 tons of cast-iron pipes, from 3 to 12 inches. Four offers had been received; and the lowest was found to be that sent in by Messrs. Henry Merton and Co., on behalf of Messrs. R. D. Wood and Co., of Philadelphia. The offer of this firm was to supply the 995 tons required at £4 18s. 4d. per ton; while the next lowest offer was that of Messrs. R. M'Laren and Co., £4 19s. 8d. The matter was sent to the Engineer (Mr. J. M. Gale) for report; and his report was that, as the difference in price was only 1s. 4d. per ton, representing a total of £66 7s. 4d., he did not think it was worth while going to America for the pipes.

The Wishaw Police Commissioners on Monday night considered the water scheme which they obtained parliamentary powers last session to promote. A report by the Engineer to the Commissioners (Mr. James Tait, of Wishaw) was submitted, which contained the cost of constructing a compensation reservoir, and bringing in a supply of water to the present burgh reservoirs in the parish of Carluke from the streams of Portrail, Potrinick, and Redin, in the parish of Crawford. The probable estimates were made with piping in four different diameters. The cost of carrying out the works, including land, wayleaves, and surface damages, was as follows: Reservoir, with an 18-inch pipe-line (delivering 2,200,000 gallons of water per day), £93,000; 16-inch pipe-line (1,640,000 gallons), £81,000; 15-inch pipe-line (1,400,000 gallons), £78,000; and 12-inch pipe-line (780,000 gallons), £67,000. Attached to the report was a certificate signed by Mr. R. Copland, of Glasgow, saying he had examined the estimates on which the report was based, and he considered the sums sufficient. After discussion, it was unanimously agreed to adopt the 18-inch size of pipe, at a cost of £93,000; and the Engineer was instructed to prepare specifications and schedules.

Lord Pearson, in the Outer House of the Court of Session, has issued an intermediary judgment in an action relating to the pollution of water by discharges from chemical works. The pursuers, Messrs. Robert Reid and Sons, timber merchants, of Ladybank, Fifeshire, seek remedial orders against Mr. W. Briggs, asphalte manufacturer, of Ladybank, who, it is alleged, has, by discharges from his works, caused pollution to two wells on their property, thereby rendering the waters in them unfit for primary purposes. The defence is a denial of pollution; and the case therefore depends on matter of fact—no question of principle being raised. The evidence was long and costly, as is usually the case in questions of water pollution. Lord Pearson has found that the defender has polluted the water of well No. 1 by discharging, in close proximity thereto on his own ground, large quantities of spent ammoniacal liquor, so as to render the water unfit for domestic and other natural primary uses; that the pursuers have failed to prove that any of their wells has been polluted by the defender with sulphuric acid, either in a free state or in combination;

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|--------------------------------------------------------------|---------------------|-------------------------------------------------|------------------|
| BLACKBURN . . . . .                                          | 1,250,000           | TORONTO (Second Contract; Remodelled) . . . . . | 2,000,000        |
| WINDSOR STREET WORKS, BIRMINGHAM . . . . .                   | 2,000,000           | MONTREAL . . . . .                              | 500,000          |
| MININGHAM . . . . .                                          | 2,000,000           | BELLEVILLE . . . . .                            | 250,000          |
| SALTLEY WORKS, BIRMINGHAM . . . . .                          | 2,000,000           | OTTAWA (Second Contract) . . . . .              | 250,000          |
| COLCHESTER . . . . .                                         | 300,000             | BRANTFORD (Remodelled) . . . . .                | 200,000          |
| BIRKENHEAD . . . . .                                         | 2,250,000           | ST. CATHERINES (Remodelled) . . . . .           | 250,000          |
| SWINDON (New Swindon Gas Co.). . . . .                       | 120,000             | KINGSTON, PA. . . . .                           | 125,000          |
| SALTLEY WORKS, BIRMINGHAM (Second Contract) . . . . .        | 2,000,000           | PETERBOROUGH, ONT. . . . .                      | 250,000          |
| WINDSOR STREET WORKS, BIRMINGHAM (Second Contract) . . . . . | 2,000,000           | WILKESBARRE, PA. . . . .                        | 750,000          |
| HALIFAX . . . . .                                            | 1,000,000           | ST. CATHERINES (Second Contract) . . . . .      | 250,000          |
| TORONTO . . . . .                                            | 250,000             | BUFFALO, N.Y. . . . .                           | 2,000,000        |
| OTTAWA . . . . .                                             | 250,000             | WINNIPEG, MAN. . . . .                          | 500,000          |
| LINDSAY (Remodelled) . . . . .                               | 125,000             | COLCHESTER (Second Contract) . . . . .          | 300,000          |
| ROCHESTER . . . . .                                          | 500,000 Cubic Feet. | YORK . . . . .                                  | 750,000          |



and that they have also failed to prove that any part of the damage set forth in their statement of loss has been caused through or by the pollution of well No. 1 with spent ammoniacal liquor or any other cause for which the defender is responsible. Further, he has found that the defender has failed to prove that the remedial works executed by him are effectual to prevent the risk of similar pollution. With these findings, he appoints the case to be enrolled for further procedure, and reserves all questions of expenses. Leave is granted to reclaim to the Inner House.

#### CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Sept. 10.

**Sulphate of Ammonia.**—There has again been a quiet market; but prices have been fairly well maintained—the closing quotations being £9 18s. 9d. per ton f.o.b. Hull, £10 1s. 3d. f.o.b. Liverpool, and £10 2s. 6d. f.o.b. Leith. Dealers, following their method for some months past, continue to hold aloof; but the larger makers, having contracts against which to deliver, are very firm. Among the smaller makers there is nowhere any pressure to sell; and parcels offered have been absorbed by direct demand. In the forward position, makers' quotations for October-March delivery are £9 17s. 6d. per ton, ordinary terms, f.o.b. Leith and London, Beckton terms, October-December delivery, £9 15s. per ton. Abroad, speculators are quoting the equivalent of something under these prices; but they are not taking any great liberties with the market.

**Nitrate of Soda** is a shade firmer on spot; and 7s. 7½d. per cwt. is now required for fine quality. Further ahead, the market is rather quiet; but shippers maintain their quotations firmly.

LONDON, Sept. 10.

**Tar Products.**—The principal feature in connection with tar products has been the steady advance in the value of pitch, the prospective outlook for which is much more encouraging. Benzols are still flat, and so is carbolic acid. Pyridine is more inquired for, and may improve.

Prices are as follows: Tar, 13s. to 17s. Pitch, east coast, 24s. 6d.; west coast, 22s. 6d. Benzols, 90's and 50's, nominal, 9½d. Toluol, 1s. 2d. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 1½d. Crude, 30 per cent., naphtha, 4½d. Creosote, 2½d. Heavy oils, 42s. 6d. Carbolic acid, 60's, 2s. Naphthalene, pressed, 55s.; drained salts, 30s. Anthracene, nominal, "A," 4d.; "B," 3d.

**Sulphate of Ammonia**, after having touched about £10 5s., has now receded again to about £10, less 3½ per cent.; but it is firm at that.

**The Buckley District Council and the Gas-Works.**—The Buckley (Flintshire) District Council have lately offered the Gas Company £3500 for their works; but the Company consider they are worth £4750, and consequently decline to sell excepting at their own price. No doubt with the idea that they will force the Company to "climb down," the Council have resolved to apply for a Provisional Order to empower them to light the town by electricity.

#### COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—Since the commencement of the month business has been somewhat unsettled, partly owing to the advance in prices, and also to lessened requirements for house-fire purposes; while the termination of the South Wales dispute still further restricts buying for shipment, which during the last two or three months brought forward quite a pressure of orders for all classes of round coal. The advance, so far as Lancashire collieries are concerned, is, however, being well maintained; and South Yorkshire collieries, who are close competitors, are also gradually following—many of them having decided to advance their prices on the 15th. But there has still been no general move; and coal from Derbyshire and Staffordshire is still competing in outside districts at old rates. This, of course, renders the position of many Lancashire collieries rather difficult in markets where they come into direct competition with coal from other districts; but there is no anticipation that they will be in any way compelled to recede from the advanced prices they have put in force. At some collieries the better qualities of round coal have been accumulating; but as the stocks held are generally below the average for this time of year, that is not a matter of any concern. Steam and forge coals are in generally good request for inland requirements. Engine fuel is moving away readily; and supplies of these, if anything, are rather scarce, with the result that there is a decided hardening up in quotations for forward contracts. At the pit mouth, best Wigan Arley coals range from 11s. to 11s. 6d. per ton; seconds Arley, 10s. to 10s. 6d.; Pemberton four-feet, 9s. to 9s. 6d.; common round coals, 7s. 6d. to 8s. 6d.; and engine fuel, from 3s. 9d. to 4s. 3d. for lower qualities, to 4s. 9d. to 5s. 3d. for best descriptions. For shipment, there is still a moderately active inquiry; but prices are tending to ease down, buyers not being disposed to pay the special rates which were obtained last month. About 9s. 6d. per ton is now the average figure for steam coals, delivered at the ports on the Mersey.

**Northern Coal Trade.**—The change which was inevitable in the coal trade has begun now that the Welsh collieries are beginning to work fully. Prices are weaker, especially for steam coals; and the demand is not so great, though it gives full work to all the great pits. Best Northumbrian steam coals may now be quoted at about 11s. 3d. per ton f.o.b.; second qualities, about 10s. 6d.; and steam smalls, about 6s. Gas coals are still very firm; and the conclusion of the Shields contracts proves that good prices are being realized. The accepted tenders ranged, it is understood, between 9s. and 9s. 6d. per ton, delivered; and thus there is a very considerable advance on the prices for the past year. Occasional cargoes of gas coals are also firmly held; and high prices are quoted. Manufacturing fuel is steady, with a fair demand. Gas coke is also steady, with a fairly good demand, and prices firm.

**Scotch Coal Trade.**—Trade in Scotland is in somewhat of a transition state, consequent upon the settlement of the Welsh trouble. There is an expectation, in many quarters, that prices will come down considerably; but the opinion seems to be growing that little coal will be got from South Wales for a good while yet, and that consequently the winter

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will be well begun before prices are much affected. In Fifeshire, where the miners have made a demand for an advance of 12 per cent., the masters offered 5 per cent., which seems to indicate that both sides look forward to continued high prices. The men are to vote upon the master's offer. The prices quoted are: Main, 9s. 9d. to 10s. per ton f.o.b. Glasgow; ell, 11s.; and splint, 10s. 6d. to 10s. 9d. The shipments for the week amounted to 241,632 tons—a decrease of 9340 tons when compared with the preceding week (the decrease being altogether in the Forth and Fife districts), but an increase of 73,183 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,569,814 tons—an increase over the same period of last year of 1,215,777 tons.

**Bury Corporation Gas and Water Finances.**—The annual report of the Auditors (Messrs. C. M. Merchant and Son) upon the finances of the borough of Bury for the financial year ending March 31 last has been issued to the members of the Corporation. It shows a loss of £1607 on the gas-works and of £2794 on the water-works.

**Rugby Gas Company.**—At the recent meeting of this Company, the Directors reported that the receipts during the half year ended June 30 amounted to £6874; and the expenditure, to £4060—leaving a balance of £2814 to be carried to the profit and loss account. The balance-sheet was adopted; and an interim dividend at the rate of 12½ per cent. per annum was declared.

**The Management of the Southport Gas-Works: The Committee Visit Widnes.**—We are afraid that Mr. Isaac Carr, of Widnes, will find the honour of being the supplier of "the cheapest gas in the world" a little irksome if he is worried by many deputations from local authorities who are anxious to know "how it is done." We learn that the Southport Corporation Gas Committee, who are engaged in an investigation into the general management of their works, has paid him a visit; and we have noticed that members of other public bodies have pointed to Widnes as an example of what ought to be done locally, and have asked why it cannot be. So that no doubt Mr. Carr will shortly hear (if he has not already done so) of many others who are desirous of journeying to Widnes in quest of information. In connection with the question of the management of the Southport undertaking, it was mentioned in last week's issue that the Committee had decided to appoint an expert to report on the whole working; and we now understand that their choice has fallen on Mr. Corbet Woodall. It is reported that for the four months ending last Tuesday, by the use of clay retorts and a higher temperature, the gas per ton of coal carbonized has been increased to 10,400 cubic feet, which is equal to a reduction in the cost of production of 2d. per 1000 feet. During the same period there has been an increase of 10 million cubic feet in the quantity of gas sold, which (the working staff being the same) is equal to another 2d. per 1000 feet. With the maintenance of the system throughout the year this will mean a reduction in the capital charges for interest and sinking fund of at least another 1d. Better prices are also being obtained for the bye-products; so that the result of the year's working is likely to prove extremely satisfactory.

**The Garston District Council and the Supply of Water Gas.**—The Liverpool United Gaslight Company have decided to close (for the present at any rate) the correspondence with the Garston District Council on the subject of the supply of water gas. A letter announcing this determination of the Directors was read at a meeting of the Council last Tuesday. It stated that, pending the Home Office inquiry, the Company had nothing further to add to their statement and assurances contained in communications already made to the Council. Upon this the Chairman (Captain Turner) remarked: "We cannot expect anything more from the Company after our dealings with them."

**Proposed Purchase of the Shipley Gas-Works by the Bradford Corporation.**—In furtherance of their boundary extension scheme, the Bradford Corporation are now seriously taking in hand the question of purchasing the subsidiary gas undertakings. The Shipley Gas Company have at present supply rights in Frizinghall and Heaton within the city, in addition to their legitimate area, which includes Shipley, Baildon, and Windhill—all of which it is sought to include in Bradford. The Pudsey Gas Company have rights in Thornbury and Bradford Moor; the Clay-ton and Allerton Company in Allerton; while other Companies, such as the Eccleshill Company and the Cleckheaton Company, have rights in districts proposed to be abolished. The Finance and General Purposes Committee last Friday decided, in the event of the incorporation of Shipley within the city, to purchase, either by agreement or compulsorily, the undertaking of the Shipley Company; and in well-informed quarters it is regarded as inevitable that the Corporation should ultimately give similar assurances to other districts affected by the extension scheme.

**Gas-Works Extensions at Selby.**—On behalf of the Local Government Board, Lieut.-Col. A. C. Smith attended at the Selby Town Hall last Friday to hear evidence in regard to an application by the District Council for sanction to borrow £8400 for extensions at the gas-works. The Clerk to the Council (Mr. J. H. Bantoft), in opening the proceedings, gave some particulars as to the population and rateable value of the town. He also stated that the balance on the gas-works loan was £20,082. The present storage capacity was equal to 105,000 cubic feet; while last month the highest day's consumption was 180,000 cubic feet. Therefore the Council had practically little more than storage for half the maximum day's consumption. The Gas Manager (Mr. W. J. Mott) stated that at nightfall there was a great draw on the supply; and they were sometimes unable to keep up to the demand. Last winter, on one or two occasions, the Manager had to decrease the pressure and otherwise restrict the supply, and also ask the Railway Company to turn their lights low. The Council were under very great obligation to the North-Eastern Railway Company, inasmuch as all their signals at the station were lit by gas; and any interruption in the supply to them might be disastrous. The proposed new gasholder would have a capacity of 196,000 cubic feet; and it would be constructed with a view to two other lifts being added. This closed the inquiry. During the day the Inspector visited the works, and expressed himself satisfied with the substantial character of the additions, though he said it was somewhat irregular to commence the work before the loan was sanctioned. He saw, however, that the Council had been placed in a fix.

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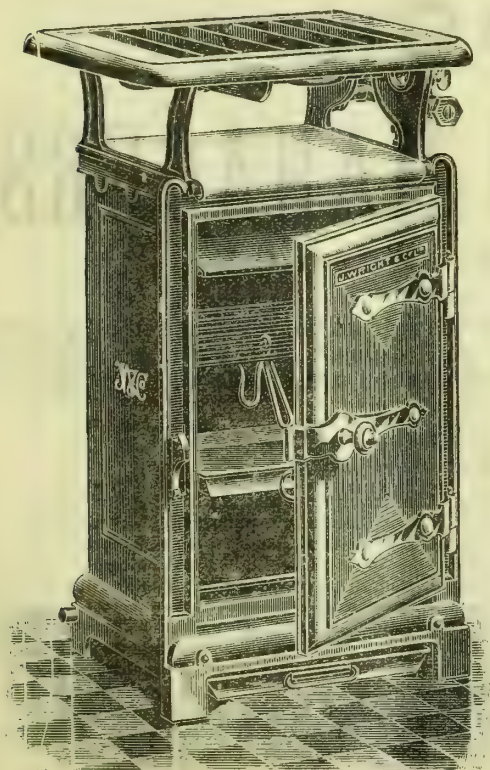
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**British Gaslight Company.**—At the forthcoming meeting of this Company, the Directors will recommend a dividend for the past half year at the rate of 10 per cent. per annum.

**Sale of Shares.**—Last Friday week, Mr. H. Mundy disposed of 1000 new ordinary shares in the Westbury Gas Company. They were put up in 22 lots, and realized from £10 14s. to £10 18s. per share.

**Bangor (Ireland) Water Supply.**—An inquiry was held on the 5th inst. at Bangor, by Mr. C. P. Cotton, the Chief Engineering Inspector of the Local Government Board for Ireland, in regard to an application for a loan of £2700 required by the Town Commissioners for improving the water supply of the town. It appeared from the evidence that the size of the distribution-pipes had been found insufficient; and a portion of the town had suffered from want of water. It had consequently been decided to lay an additional 8-inch pipe from the water-works into the town, and to continue it from there by a 5-inch main.

**Ottoman Gas Company, Limited.**—The report of the Directors of this Company for the half year ended June 30 states that the gas-rental amounted to £8996 (compared with £8599 in the corresponding half of 1897); and the net profit, to £2900. The amount standing at the credit of the profit and loss account is £4438; and the Directors recommend the declaration of a dividend at the rate of 7 per cent. per annum on both classes of shares, which will absorb £2625. The £20,000 of 5 per cent. debentures, which the shareholders authorized the Directors to issue, have been applied for and allotted. Since the last meeting contracts have been entered into for a gasholder and additional mains. The latter are already laid; and it is fully expected that the holder will be completed by the end of November.

**The Debt on the Teignmouth Gas-Works.**—At a meeting of the Teignmouth District Council last Tuesday, Mr. Wheatley proposed the adoption of the estimate for the new rate of 2s. 6d. in the pound—an advance of 10d. in the pound as compared with the previous rate. He explained that the increase was necessary to pay the outstanding debt of £824 due to Mr. Walker for coal. This amount they were compelled to pay, for they were practically in a state of bankruptcy, and the sooner they got out of it the better. The Auditor required them to charge Mr. Walker's account to the general district rate; and by this means they would extinguish the debt, which had been an encumbrance for many years. A rate of 2s. 6d. in the pound would not entirely clear them; and Mr. Walker and other creditors since March were not provided for. The Chairman (Colonel Morrison) said the Committee had come to a wise conclusion in increasing the rate. They would be able to pay their way now. The resolution was carried. Subsequently on the presentation of the minutes of the Gas Committee recommending the purchase of 2000 tons of coal, the Chairman said that owing to the "pigheaded obstruction" of some members of the Committee, who refused to buy coal at 9s. 9d. a ton, they now had to pay 11s. Mr. Jarvis said it would be "pigheaded" to enter into a contract now at 11s. Coal was bound to drop; and meantime they could buy it as they wanted it. It was eventually agreed to enter into a contract with Mr. Walker for six months.

**Kettering Water-Works Purchase Question.**—The Kettering District Council last Wednesday considered in private a communication from the Water Company in which, in response to a notice from the Council that they required to purchase the undertaking, they claimed, "as compensation for the purchase money," £175,000, exclusive of the mortgage and other debts of the Company, of compensation to officers, and of the costs and expenses referred to in section 6 (sub-section 3) of the Kettering Water Act, 1898. The Company's terms were discussed at some length; and the opinion was freely expressed that the sum named was excessive. A previous resolution of the Council that the price be fixed by arbitration will now take effect.

**Land for Water-Works Extensions at Harrogate.**—At a meeting of the Harrogate Town Council last Thursday week, the Water Committee recommended the confirmation of an agreement with Sir Henry D. Ingilby for the acquisition of land at Scargill as the site of a new reservoir. Alderman Fortune, in moving that the Corporation seal be affixed to the agreement, said Sir Henry had been served with notice to treat; and the matter would be submitted to arbitration. It had been arranged, however, that the Corporation should have possession of the site at once, in consideration of their paying 5 per cent. upon what was ultimately decided to be the purchase price. These terms, however, did not include compensation to tenants and damage to farm property. There were only seven or eight tenants to deal with. The motion was carried.

**Further Parliamentary Powers for the Shotley Bridge and Consett Gas Company.**—The half-yearly meeting of this Company was held on Friday; Mr. George Peile presiding. The Directors reported that the quantity of gas sold in the six months amounted to 25,215,000 cubic feet, which was an increase of  $4\frac{1}{2}$  per cent. on the corresponding period of last year. The total expenditure amounted to £3276; and the receipts to £4683—leaving a balance of £1407, which, after providing for interest on loans, would suffice to meet the usual dividends, and carry forward £39. Having mentioned that during the half year 300 prepayment meters had been fixed, the Directors stated that, consequent upon the expenditure necessary for the development of the district, and the introduction of the prepayment meters, the capital had become exhausted; and it was now necessary to obtain further parliamentary powers. For this purpose the Directors had, therefore, resolved to apply to Parliament for additional powers; and they had instructed the Solicitors to take the necessary steps. The report was adopted; and dividends of 5 per cent. on the consolidated stock, 5 per cent. on capital A, and  $3\frac{1}{2}$  per cent. on capital B, were declared.

Messrs. W. C. Holmes and Co., of Huddersfield, have secured the contract for the construction of a new gasholder at Hunstanton, tenders for which were invited in our advertising columns on July 19.

Messrs. Richmond and Co. have secured the contract for supplying one of their largest "Holborn" treble cookers, gas hot-closet, and carving table, gas boilers, and other fitting work for the new kitchen of the Vestry of Clerkenwell.

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## EDITORIAL NOTES.

## Strikes and Sundry other Aspects of Trade Unionism.

ANOTHER strike has broken out suddenly, and provided the newspapers with welcome matter. We allude to the absurd revolt of the horsekeepers on the North Metropolitan tramway system, which is only noteworthy here because the strikers pretend to have the aid and comfort of the London County Council in their practical protest against the management. It is to be supposed that the particular trouble will be all over by the time these lines see the light; the very fact of Mr. John Burns, M.P., having been reported as favouring the strike being sufficient to damn it. When the London County Council meet after the holidays, there will be some awkward questions asked as to the conduct of certain members who are reported to have interfered with the "quiet enjoyment" of the tramway property, which is leased of the Council by the Company. The mischief grows out of the practical working of the "fair wages" clause in the County Council contracts. The trouble over this clause is only beginning, as local authorities all over the country will soon discern. The London County Council found their Trade Union-inspired contract conditions an obstacle to their doing business with Messrs. Yarrow; and it remains to be seen how the leased tramways can be worked under the same interfering influence. The Wigan Corporation are confronted by trouble of the same kind. On the face of it, the desire of public bodies to exclude "sweating" firms from their list of contractors is laudable. The "underseller" who takes work that can only be done at his price by swindling all parties concerned, including the workpeople, does not deserve any encouragement; but the practical difficulty lies in the execution of a "fair dealing" clause without making it an agency for the propagation of Trade Union tyranny.

While on the subject of trade unionism, we desire to note that a most trenchant criticism of the recent Trade Union Congress has been furnished to the "Engineer" by Mr. J. Stafford Ransome, who has done so much to expose the fallacy that "organization" is good for workpeople. He calls it a "conference of the professional labour agitators;" and remarks how at these annual meetings "nothing is done, no work is effected, no tangible policy is agreed upon that can either assist trade, or trade unionism, or labour, or anything else." Yet the congress, hollow mockery that it is, has its uses, especially in respect of the light it throws on the character of the delegates and their performances. To begin with, Mr. Ransome shows that these so-called representatives of the working man do not represent him at all. There are 15 millions of what are called the working classes in Great Britain. The delegates at Bristol claimed to represent 1,200,000 working men and women—that is, less than one-twelfth of the British working classes. But the case is not even so good as this; for the delegates are not elected by the ordinary members of their Unions, but by "a handful of minor Trade Union officials who are all most anxious to become delegates one day themselves, and whose retention as salaried Unionists is dependent on the very men whom they elect as delegates." Hence the delegates adequately represent only themselves and the rest of the paid element in the Trade Unions to which they are attached. Assuming the Trade Unions represented at the Bristol congress to have among them 60,000 paid officers of different grades, then "we have in the Trade Union Congress a Labour Parliament adequately representing the views of 1-250th portion of the working population of our country; it being taken for granted that a paid Trade Unionist should be considered as a real working man." Mr. Ransome is sarcastic about the hackneyed matter that constituted the bulk of the presidential address; and he agrees with us in regarding as the most interesting points in this composition its references to the Workmen's Compensation Act and the engineers' strike. Stress is laid upon the evidences supplied by the congress debates that the Trade Unions and their professional leaders are of no use to working men; and the following conclusions are formulated as all that the week's talking and voting by the delegates really amounted to: "(1) They consider that 'their trade unionism as at present carried on by them is practically useless.' (2) They do not believe in their own 'Parliamentary Committee.' (3) They do not believe in



"their own labour members of Parliament. (4) They do not believe in each other. (5) They consider that the control of the legislation of the country should be handed over to them." It is a strong indictment; but not one whit too strong in the circumstances.

The last bit of Trade Union news for the week is a tale of the result of an iron-workers' strike in Pennsylvania. The strike was over the refusal of a manufacturing company to sign a union scale of wages, which was put forward upon the principle, heard of so much in South Wales of late, that "wages should govern prices." The Company procured other labour; and the strikers arranged to start a co-operative mill on their own account. A very laudable resolve; but, remarkable to relate, when the millworkers applied to be taken on at the co-operative works, they found that the management refused to sign the union scale of wages! Comment would only spoil this truly magnificent story. It is apparently genuine. It was the Scott-dale Iron and Steel Company whose men struck for the "principle;" and the Old Meadow Rolling Mill is given as the name of the co-operative concern which the strikers declined in their turn to run on Trade Union lines.

#### The Gas Supply of Sheffield—A Case against Municipalism.

THE half-yearly general meeting of the Sheffield United Gas Company was held under the presidency of Sir F. T. Mappin this day week, when the shareholders were bidden to rejoice in the existence of a very satisfactory condition of affairs. Although the price of gas had been reduced, the dividend was covered by the profit for the half year. An interesting piece of intelligence in this connection is that when the price of gas is reduced, the staff receive a bonus of 10 per cent. upon their salaries. Altogether, the accounts show that the Company are doing well for themselves, and excellently well for Sheffield. As usual, the Chairman's speech was full of characteristic touches. After disposing of the matters arising out of the half-yearly accounts, Sir F. Mappin took up a challenge of a Sheffield newspaper that raised the general question of whether it is not better, in the general interest, for gas supply to be municipalized. The challenge was expressed as follows: "We know of no one instance in which the transference of gas-works from trading companies to the municipal authorities has not been to the marked gain and the unchallenged satisfaction of the community in which the change has taken place. If anyone knows of a case to the contrary, we invite him to name it." This is a pretty safe way of mooting the point; because those communities that have municipalized their gas undertakings must make the best of it in any case. As Chairman of a Gas Company, however, Sir F. Mappin undertook to show the other side of the picture, and to prove by the example of Sheffield that there is little advantage for the gas consumer in the much-vaunted operation in question. This he did by comparing the reductions in the price of gas at Sheffield during the last few years with the practice of Birmingham and Nottingham, drawing the conclusion that "Sheffield gas consumers had been more fortunate in deriving their gas supply from a Company than the consumers in other large towns where the works were in the hands of the Corporation." Sir F. Mappin is usually to be trusted to bring out and rub in facts of this description. There is no getting over the fact that the Sheffield gas consumer can get his supply of 17 $\frac{3}{4}$ -candle gas at from 1s. 10d. to 1s. 6d. per 1000 cubic feet, according to the amount of his consumption; while most Municipalities think their gas "cheap enough" when it is at least 6d. per 1000 cubic feet dearer.

#### Gas Affairs at Leeds and Bradford.

At last it looks as if Leeds were going to pluck up heart of grace, and make the magnificent reduction of 2d. per 1000 cubic feet in the price of gas, to date from the beginning of next year. As will be seen by the report published in another column, at the last meeting of the Corporation Gas Committee the Chairman (Mr. Lowden) carried a resolution to this effect. The Committee were unanimous, which was the best possible preparation for the inevitable battle in the Council over the proposal. We desire to deal as tenderly as possible with this momentous affair of the cheapening of Leeds gas, because experience shows that it is a most difficult matter to get a Corporation to reduce the price of gas, when once a few of the members have got it into their heads that the price is "cheap enough." It has been a local superstition in Leeds that the

town's gas is very cheap; and when the price is down to 2s. per 1000 cubic feet, without meter-rents, and with 5 per cent. discount for cash, Mr. Lowden flatters himself that the supply will "perhaps be the cheapest in the kingdom." It is a laudable ambition to sell the cheapest gas in the kingdom; but it will hardly be realized by the step now in contemplation in the case of Leeds. Sheffield is not so far off that the selling prices of gas there can be overlooked by consumers of Leeds gas. Mr. Lowden's speech to the Committee is a good example of the laborious way in which a proof of the safety of making a reduction in the price of municipal gas has to be clinched at all points. The Chairman did not lay sufficient stress upon the prospect that the estimated loss of revenue by the reduction of price would be recovered by a greater return; and this is rather a pity. To say that a reduction of price means a decrease of revenue of £21,000 a year is an alarming way of putting it. But if it is shown at the same time that the decrease is not likely to be realized by reason of the expansion of business—as in the case of Sheffield—the matter has a different aspect. Cheap gas is as much a need of Leeds as of other localities; and the Corporation will be well advised if they let the townspeople see that in this respect there will be no shortcoming.

Another Yorkshire town—Bradford—is on the eve of an important development of its municipal and gas politics. There is a grand scheme afoot for the extension of the borough; and the Corporation are quite willing to give the Local Government Board an assurance that they will apply for powers to purchase every Gas Company supplying a district which might be annexed to Bradford. There are three gas undertakings of considerable importance to which this engagement would apply. The movement would receive public support in the localities affected; and it is not likely that old Bradford would object. It is a coincidence that just when this expansion is being thought of, the consumption of gas in the present city should show a slight decrease. It is true that the falling-off is only about 2 $\frac{1}{2}$  per cent., which is referred by the Mayor (Mr. Thomas Speight) to "mild winter, bad trade, the extension of the system of incandescent gas lighting, and also to some extent to the progress of electricity in the city." He thought, however, that the last-named is a "very slight" item. When the supply of the added districts is taken in hand, the Corporation will have to face a financial problem which may necessitate their dropping the gas profits for a time—if not in perpetuity. The electric lighting of the city is done practically at cost price; and the consumers of gas ought to receive the same treatment as the users of electric lamps. Bradford should certainly have as "Progressive" a gas policy as that governing the electricity department.

#### The Telephone Committee on Municipal Trading.

It could scarcely be supposed that the editorial department of the "JOURNAL" would be under any obligation to study, in the interest of habitual readers of these columns, such an obviously foreign document as the report of the Select Committee on Telephones. We candidly confess that the report escaped notice, until interest in it was excited by a passing remark of Mr. Pearson, a Bristol Town Councillor, who read a paper on Municipal Trading at the British Association meeting. Mr. Pearson claims to be a municipal trader who believes in the profit-making side of municipal enterprises; and he objected in his paper to a passage in the Telephone Committee's report which "shadowed forth" a restriction on profit-making. This reference sent us to the report in question, for further information. The search did not reveal very much; but what there was, was to the point. The Committee considered that a telephone service might be undertaken by a Local Authority; but only under conditions differing widely from those under which the National Telephone Company carry on their business. The observations of the Committee in this regard are instructive, so far as they bear upon the much-discussed problem of the ethics of competition between a public authority and a private undertaker. It is laid down that where a Company are actually doing business, municipal competition, if permitted, should be conducted so far as possible on equal terms. As regards a telephone service, however, it would be difficult to put a Local Authority on equal terms with the Company in possession. The sole "pull" which the Local Authority would have over the Company would



be the right to give to themselves, and refuse to their rival, permission to lay wires under the public streets. This is a trifling matter in the case of a telephone service, which is mainly carried on by the agency of overhead wires. It is outweighed by the superior freedom in bargaining possessed by the Company. If a Local Authority established a public telephone service, this must be subject to the requirements of the Post Office, must be governed by a maximum rate, and no opportunity could be afforded to Local Authorities "to carry on the service with a view to lighten the burden of local taxation." Here we have the kernel of the matter, as it concerns ourselves and our readers. The Telephone Committee must have been deeply impressed by the practice of so many English Municipalities in making the consumers of their gas bear a heavy burden of indirect taxation; and they were agreed that the telephone service, if it ever came into the same hands, should not similarly suffer. This is, indirectly, the strongest parliamentary condemnation of the principle of municipal trading at a profit that has yet been placed upon record. The Committee find that competition with the National Telephone Company is desirable in the public interest; but they cannot trust Local Authorities to institute a real and effective competitive service, because of their hunger after "profits." So inspired, a Municipality might even agree with the Company to share the plunder between them, and resist an extension of the service by the Post Office. The earnest attention of profit-making Municipalities may be directed to this consideration. They will perceive by it that, for the sake of a problematical gain, to be dissipated belike by their own spending departments, they have forfeited the confidence of Parliament in the reliability of municipal institutions to conduct their operations with a view to securing the greatest benefit to the community. It is, really, a serious indictment.

#### The Meeting of the Eastern Counties Association.

THE Eastern Counties Gas Managers' Association met at Romford, Essex, last Thursday, under the presidency of Mr. W. D. Child, whose Inaugural Address will be found in another column. It is a composition of a severely practical character. Mr. Child expressed the general opinion of the profession when saying that there are quite enough gas managers' associations in the country. He might even have gone further, and hinted that a reduction of the number by amalgamation would be hailed with general satisfaction. Mr. Child made another good point in drawing attention to the comparative scarcity of gas managers who have worked their way through the chemical laboratory, as contrasted with the number of those whose early training has been in the way of mechanics. Romford supplies an example of a town where the old gas-works have been replaced by a new station, without overcharging the capital account. The President showed how this process was effected. He professed a liking for carburetted water gas, and is ready to adopt an auxiliary plant for making it under certain conditions. The whole of the address was marked by admirable candour, and was inspired by a praiseworthy desire to impart information based upon the facts of experience. Mr. Child is to be congratulated upon his address; which will considerably enhance his professional reputation. The rest of the business meeting was devoted to a discussion, opened by Mr. H. Wimbhurst, on the Workmen's Compensation Act. The next meeting will be held in Cambridge.

#### General Lessons from the British Association Meeting.

AN interesting and instructive meeting of the British Association has drawn to a close amid a chorus of mutual congratulations. Bristol has surpassed itself in the matter of hospitality to the more or less learned men who have attended the meeting; and the visitors in return have filled the local newspapers with a vast flood of scientific "copy." One or two criticisms of a general character have been applied to the proceedings of the Association, and may be repeated here for the sake of the instruction they convey to all who at any time have to read papers or deliver addresses at scientific or technical gatherings. We have already drawn attention to the President's utterance respecting the composition of Inaugural Addresses. Another criticism, both of addresses and papers, is offered by "The Times." It is observed that there is a deplorable separation between the literary and scientific culture of the age. There are in our midst plenty of people who, in any literary sense, must be described as educated, yet whose ignorance alike of science

and of scientific methods and reasoning is amazing. There is too frequently an almost equal ignorance of literature among men of science; but usually the latter are able to express themselves lucidly and adequately. One faculty is almost as valuable to the world as the other; and there is ample need for both. It is unfortunately true that "multitudes are ready to draw conclusions when they have no proper power of judgment in the cases." What is wanted by the world at large is the encouragement of scientific methods of thought, which is possible without accepting as proved all the teachings of contemporary science. It is declared to be desirable, however, that "leaders of science would themselves become sufficiently literary, to avoid offending the ears of scholars by a barbarous, unintelligible, and unnecessary nomenclature." This is an old grievance. Men of science and technicians, unlike literary men, are constantly in need of fresh words to designate new things. When the necessary word does not exist, it has to be made; and it must be conceded that the result is frequently terrifying. "Men of science who are imperfectly acquainted with English, but who have retained from their school days some small smattering of Greek, make up words . . . and then proceed to define the meanings which they attach to them, and which other folk are expected to remember." And when the learned gentlemen who read the papers containing these monstrous appellations do not "speak up," the grievance for those who desire to follow the flow of contemporary science from the fountain-head is serious indeed. There must be a scientific and technical nomenclature; but a robust common-sense, with perhaps a sense of humour, will always save those who have to employ it from being either unintelligible or ridiculous.

#### Close of the Acetylene Exhibition at the Imperial Institute.

THE Acetylene Exhibition at the Imperial Institute was brought to a conclusion on Thursday last, the 15th inst. It has been open for precisely three months, in accordance with the scheme of the original programme. The lighting of the Intermediate Gallery by acetylene was continued, and all the exhibits were *in situ*, up to the last day of the exhibition, though during August there were very few visitors to the Institute. There is no doubt that the opening day should have been fixed for a month earlier than June 15, had it been possible to have the exhibits in place by that time. Nevertheless, exhibitors seem well satisfied with the results achieved; and we understand that a fair amount of business has been transacted by many of them. Turning from the commercial to the educational purpose of the exhibition, we believe that it has rendered good service. It has shown the world at large that an illuminant of the safety of which many were sceptical can, in proper hands, be prepared and employed on an extensive scale for three months without a single mishap. This practical demonstration of the good behaviour of the new gas will do more towards establishing and consolidating the acetylene industry than volumes of praise from interested parties. The authorities of the Society of Arts and of the Imperial Institute are to be congratulated on the successful issue of their joint efforts to give a public display of the potentialities of the new illuminant. We look forward with great interest to the appearance of the official report on the exhibits.

#### WATER AND SANITARY AFFAIRS.

WITHIN a very much shorter period than was at one time thought possible, the work of connecting the Southwark and Vauxhall system with the East London by means of the Tower Subway has been successfully completed, the task being finished on Sunday last. Great credit is due to all parties concerned, and important relief will thus be given to the district in which the supply has been restricted, though an intermittent service appears inevitable until there is some considerable augmentation of the rainfall. While success has thus attended the exertions put forth to counteract in some measure the effects of the terrible drought, the agitation which has arisen is not likely to cease. The controversy between Mr. Beachcroft and Mr. Stuart, to which we referred last week, has been prolonged by a second letter on either side, published in "The Times." Mr. Stuart evidently seeks to convince the public that the



East London Company might have prevented all short-coming in the supply, had they immediately exercised the powers they obtained in 1897, for uniting their mains with those of other Companies, so as to obtain a larger supply for the benefit of the district in time of extremity. Here, according to Mr. Stuart, was a sufficient remedy. It is curious that such a plan was never promoted and pressed forward by the London County Council. The proposal laid before Parliament emanated from the Company, who sought for unrestricted power to enter into contracts, agreements, and arrangements for the purpose of using the works of other Companies in order to supplement their own. What could have been more in the interest of East London as a protection against the results of drought? But, as Mr. Beachcroft states, this most desirable plan was strongly opposed in Parliament by the County Councils of London and Hertfordshire. Hard pressed, the East London Company yielded, and allowed a proviso to be introduced, by which it was stipulated that the extra supply should only be available in cases of emergency, and with the consent of the Local Government Board. The drag was thus put on, and impeded progress. Had the Company proposed in the Midsummer of last year to unite their mains with those of the South-wark and Vauxhall Company, which they have just now successfully accomplished, what would have been said to it by the County Council? That body would doubtless have urged that the "emergency" required in the proviso had not yet arrived, and that the clause gave no power to proceed until the emergency was actually present. The Company can always be opposed on some ground or other. They are either too early or too late. When the East London Bill was before the House of Commons in the session of 1894, Mr. Stuart moved its rejection, arguing that the Bill was "unnecessary and not urgent," a view supported by Mr. Shaw Lefevre and the member of Parliament for the Tower Hamlets. Now in the matter of junctions the Company are blamed for not having discerned "emergency" before it arrived; and when the crisis has become too evident to be longer denied, the efforts of the Company to supplement their supply are denounced as "belated." As we argued a little time ago, it is to the Company and not to the Council that the people of East London are indebted for the water they now receive. The Bill of 1894 was carried by a bare majority of one; and had it been rejected, the present restricted supply of over 20 gallons per head daily could not have been given, but in its place there would have been a "water famine" only too worthy the name.

Mr. Stuart now makes the whole question of the East London supply turn upon this one point—the junction of mains. But who proposed this junction; and who threw difficulties in the way? To unite the various water systems of the Metropolis so as to render them mutually helpful, would have been a project adapted to fire the enthusiasm of the Progressive party in the County Council, had they really been anxious to benefit the consumer. But they left this enterprise to the Water Companies, and when one of the latter made an attempt to carry it out, the Council first opposed the scheme, and afterwards strove to strangle it. At one of the so-called "indignation" meetings in East London, we find Mr. Stuart making a speech in which he says that the East London Company are "simply playing for purchase." We rather think such a phrase would well describe the policy of the County Council. What Mr. Stuart really intended to signify by these words is perhaps doubtful. There is a very curious rumour abroad that the Local Government Board have a project, to be laid before the Cabinet, by which the East London Company are to be subjected to a compulsory sale of their undertaking; the other Companies being left where they are. We need hardly say that most serious objection lies against any such proposal—all the greater if the property is to be handed over to the County Council, and fraught with confusion let the ruling power be what it may. If there is to be purchase it must comprehend all the Companies, or a most unequal and unjust form of competition will be introduced. Of course the County Council will fight to the death against any proposal for creating a special Board to deal with the water question. But what the public are to gain in either case is not clear; for whether the Council or a newly created body is placed in the position of the Company, that will not bring down rain from heaven.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 654.)

ON the Stock Exchange last week, things went from bad to worse. To the depressing influences marking the close of the preceding week were added the Fashoda incident, and the critical position of the French Ministry. So that, from the opening, the tendency was flat. And this was accentuated by growing fears lest a considerable drain of gold should set in. About Thursday, some reaction from the state of uneasiness supervened, and things looked brighter. But there was not much recovery; and the week closed dull. Prices generally are down, though there is no serious fall. The supply of money was abundant; and the requirements of the Stock Exchange settlement make no impression, but discount rates were better. In the Gas Market, there was a welcome increase in the volume of business transacted, though it would still bear a considerable augmentation without exceeding moderate limits. It was for the most part confined to the big issues, which showed out firmer. The general tendency was good, though actual changes in quotation are few. In Gaslights, the "A" was much more brisk; and, after some hesitation at first, it took an upward course—rising from 289 on Monday to a closing mark of 295 on Saturday. There was a moderate amount done in the secured issues at fair prices. South Metropolitan was pretty active; and though it did not advance, the last prices were the best. There was nothing to notice in Commercials. The Suburban and Provincial Companies were as quiet as they well could be; and they made no sign. Brightons were made practically easier on *ex div.* quotation. Among the Continental undertakings, Imperial had a further rise on the strength of rumours from Vienna, which seem to require some degree of confirmation; and European advanced. None of the rest presented any feature calling for notice. Business in Water stocks was even more limited than in the preceding week, and movements were the same as then. East London had a slight reduction, and New River a slight advance.

The daily operations were: Business in Gas was more brisk on Monday than it has been lately. Imperial Continental improved 2. Transactions on Tuesday were about on the same scale; but Gas quotations did not move. In Water, East London fell 2. There was somewhat of a lull on Wednesday; but the tendency was good despite the lack of support, and Gaslight "A" advanced 2. Business remained on Thursday at about the same level in point of volume. Prices were quite steady, but not really strong enough to push quotations up. Friday was firm and buoyant; and prices held up their heads well. Imperial advanced 1; and European part paid,  $\frac{1}{2}$ . In Water, East London fell 2; but New River gained 1. On Saturday, the tendency remained good. Gaslight "A" rose 1. In Water, New River further advanced 1.

### ELECTRIC LIGHTING MEMORANDA.

The Prospects of Artificial Nitrate of Soda produced Electrically—Councillor Pearson, of Bristol, on Municipal Trading—The Correct Principle in Municipal Trading.

THE Presidential Address of Sir W. Crookes to the British Association revealed electricity as the good spirit who at the proper time will be available to save the earth from starvation by supplying all the artificially-made nitrate of soda required for manuring corn crops. The centre of this new manufacture will be at Niagara; and it must be a great consolation to the power company who are exploiting this "water privilege" to know that at last there is something for them to make in any quantity they like. Sir W. Crookes says that Lord Rayleigh has effected the electrical burning out of nitrogen from the air, so as to leave argon behind, at such a rate that he (Sir W. Crookes) could see a product of a ton of nitrate of soda for the consumption of 14,000 units of electricity. In making this statement, the President of the British Association followed Lord Beaconsfield's advice in regard to making interesting conversation—he gave results, omitting the steps leading up to them. It is to be understood, however, that by the Crookes-Rayleigh process, atmospheric nitrogen is to be burnt to nitric and nitrous acids; and these are to be fixed with soda so as to form the nitrate of this base. Taking steam machinery as the motive power, the cost of the unit of electricity is estimated at  $\frac{1}{3}$ d. A "ready reckoner" does the rest of the presidential calculation. At Niagara the cost of the unit is so considerably reduced that it can be sold "at a profit" for one-seventeenth of a penny. "At this rate, nitrate of soda would cost not more than £5 per ton." So there you are! Seeing that the natural product is quoted at about £7 10s. per ton on the spot, the question suggests itself—Why not start the manufacture at once? Lord Rayleigh's laboratory results are a slender foundation for Sir W. Crookes's computations. It is only reasonable to suppose that if the Niagara power people once grasped the principle of the combination, they could do the work on a large scale at considerably under the original laboratory figure. Then,



why not? Is it really true that artificial nitrate of soda can actually be put upon the market as indicated by Sir W. Crookes? If so, we may expect some startling developments. The herd of patentees who have been busying themselves with the production by electric furnaces of calcium carbide, will fall on the nitrogen flame; and there will be a fresh crop of "syndicates." Sulphate of ammonia, of course, will become a mere drug.

One of the few papers read at the British Association meeting which come into the category of the matters usually dealt with in the "JOURNAL" was that on "Municipalities as Traders," read by Mr. Councillor Pearson, of Bristol, before the Economical and Statistical Section. The author opened his subject very pleasantly by referring to the period when it could be said with truth that "if each man swept his own doorstep, the village would be clean." The world has moved a long way since then; and the community has now to do many things which the individual cannot by reason of his circumstances do for himself. Among other services, Mr. Pearson thinks the local authority ought to supply electric light; but only at a profit. He holds that all municipal trading should be at a profit, subject only to the condition that the profit is not made out of trading at a higher price than would be charged by a company. Apparently Mr. Pearson had no suspicion of the extent of the debatable ground left open by this qualification. With regard to the municipal supply of electric light, however, there is the disturbing factor that this service is admittedly a luxury for the few. Whatever may be the "pious opinion" of Mr. W. H. Preece as to the electric light being properly the poor man's light, this is not the case in Bristol, where the electricity supply works are of his devising. Mr. Pearson states that Bristol has 60,000 ratepayers, and under 1000 users of the electric light. "The luxury of private lighting to the few is rendered possible by pledging the credit of the many; and why should not the many reap some benefit from the risk they run, to say nothing of the actual loss which attended the early years of our undertaking, which was paid out of the rates levied upon them. I think," he went on to observe, "that Parliament will be wise not to put such restrictions as to profit-making as are shadowed forth by the report of the Telephone Committee. They may well leave the question of the amount of the profit to be settled by the natural law of supply and demand. The moment a municipality charges more for an article than it is worth will be the moment the public will refuse it." It is easy to argue that Mr. Pearson is altogether mistaken in his view of the whole duty of a municipal trader being to make a profit. Obviously, something else besides the consideration of whether a business is profitable has to be considered in determining the question whether it should be municipalized or not. This something is usually designated by the parliamentary word "expediency," which has to be proved before a municipal project receives legislative sanction.

In the special case of electric lighting, as with tramway construction, the general expediency of the supply of electric lighting being undertaken by the local authority is granted. But this is not on the ground that a local authority can depend upon making a profit out of electric lighting, but on the broader ground that a modern town community deserves to have this service, and that on the whole the local authority can expect to supply it to the best advantage. The general interest of Bristol is the master consideration in determining the question of the expediency of the municipal supply of electric lighting—not the comparatively paltry profit to be made out of supplying electricity to 1000 consumers among 60,000 ratepayers. Bristol is just getting the weather-side of its electric light business; but the undertaking is only just paying its way, after all, and depreciation is not yet fully provided for. As a modern city, however, Bristol would be behind the age if it had not an electric lighting undertaking; and which is the greater benefit to the city—a good and cheap electricity supply, or a thousand pounds or so a year of "profit" squeezed out of the city's customers for the benefit of some spending department of the Corporation, in the imaginary interest of the ratepayers, every one of whom gets one-sixty-thousandth share of it?

**An Improved Incandescent Gas-Bulb.**—Messrs. Falk, Stadelmann, and Co., of Farringdon Road, E.C., are introducing an improvement in the "Jena" incandescent gas-bulb, to which specialists who have made tests at Jena, under varying circumstances, ascribe an average increase of 50 per cent. of light over an ordinary chimney used on the "C" incandescent gas-burner. The improvement consists in the air current which ordinarily ascends through the burner and gallery being diverted, and drawn through holes pierced in the lower part of the bulb on a level with the burner. It is claimed—and the claim is supported by a comparison of the light afforded by a burner fitted with the new bulb and one fitted with an ordinary chimney—that by the lateral air supply thus obtained, the intensity of the flame is raised, and the luminosity of the mantle consequently increased. The method adopted to prevent the inflow of air through the burner is by closing the annular space by a small brass cone, which is placed in position by passing it over the burner head, and pushing it down as far as it will go. The protection of the mantle from dust and excessive draughts is another point in favour of these bulbs. Like the original form, the new one may be fitted with the fancy glass screens supplied by the firm.

## WELSBACH'S ELECTRIC LAMP.

RUMOURS concerning the electric lamp invented by Dr. Auer von Welsbach have been rife since the beginning of the present year; and much nonsense about it has appeared in the columns of non-technical and some sections of the technical press. The fact that a certain mixture of two rare earths under the influence of the phenomena which attend the combination of combustible gases with the oxygen of the atmosphere radiates a greater proportion of luminous rays than do other substances under like conditions, led many to the rash conclusion that the same mixture would show a like superiority in the emission of luminous rays when applied under the totally different set of conditions which obtain in the filament of an electric glow lamp. The presence of air in the one case and the absence of it in the other, the occurrence of an intensely vigorous chemical reaction in the one case and an absolute dearth of chemical changes in the other, and the effects of the thermal conductivity of the material in the one case, and of its electrical conductivity in the other, are but a few of the important considerations which were overlooked by those who assumed *a priori* that, because the Welsbach mixture made a good mantle for gas lighting by incandescence, it would also make a superior filament for electric lighting. There seems no real ground, for supposing that Dr. Auer von Welsbach ever favoured assumptions of this nature. No sooner, however, was it announced that he had invented an electric lamp, than little minds drew the conclusion that, because he had found a mixture of two earths a suitable material for gas-light mantles, his new invention must necessarily be the application of the same mixture in the production of electric lamp filaments. In order to denote quite unmistakably the supposed similar nature of the two inventions, many writers spoke of the lamp filament as a mantle, and thus spread the idea that the filament not only consisted of like materials, but had the same form as the Welsbach gas mantle.

From the outset, we protested against the assumptions made in these premature announcements. So long ago as Feb. 22 last—some weeks before the patent specifications were published—we ventured (see p. 397) to predict that the Welsbach mixture of thorium and ceria could not render the same signal service to electric lighting that it has afforded to gas lighting. We then said: "The catalytic action of ceria can avail nothing if the phenomena of combustion are absent, as they are in the electric light;" and as there was good ground for believing that the inherent economy of incandescent gas lighting was due to the catalytic action of ceria in the mantle, we expressed doubt whether the Welsbach mixture of earths could be of special utility to the electrician. The publication of the Austrian patent specification, of which we gave an abstract on April 19 (see p. 879), showed that our predictions were justified; for throughout the claims made by Welsbach there is no mention of ceria or of the Welsbach mantle mixture. Thorium, indeed, is mentioned; but, as we have already pointed out, thorium, *minus* a small quantity of ceria, is of no value as a material for incandescent gas mantles. A mantle of magnesia answers as well as one of thorium; and light cannot be economically obtained by heating either of these in an atmospheric gas-flame. The addition of ceria to the thorium effects a marvellous economy in the production of light from flame, but has no effect on the amount of light emitted when the mantle or material is raised to the temperature of incandescence by means of an electric current. Consequently, the economical advantage of the Welsbach mantle cannot be utilized by electricians; and Welsbach himself appears to have tacitly admitted this fact.

When writing in April last of the Welsbach electric lamp, we said that the materials of the new filaments were extremely costly; and that the manufacture of the lamps must of necessity be very difficult. With a certain amount of diffidence, we then made the remark: "We may perhaps find that Dr. Welsbach has presented the electrical world merely with a luxurious, but extremely expensive, method of illumination by electricity." The remark appears to have been singularly appropriate. We hear less, day by day, as to the revolution in electric lighting which the Welsbach lamp is destined to produce; while even electrical contemporaries hint that the manufacture of the filaments will be difficult, and that the materials are costly.

These views find confirmation in an article, to which are appended the initials of Dr. Wm. H. Wahl, in the "Journal of the Franklin Institute." Dr. Wahl lays special stress on the manufacturing difficulties. Filaments of osmium cannot readily be prepared, because that metal is infusible. The property of infusibility which makes it specially valuable as a material for the filaments, all but precludes their manufacture. The deposition of osmium on a thin platinum wire, by the reduction of the vapour of osmium tetroxide in a reducing atmosphere, is apt to give an uneven deposit; and the process seems to be a very slow and delicate one. An alternative method of obtaining a film of osmium on the platinum wire consists in drawing the wire repeatedly through a solution of an osmium salt, and igniting the wire in a vacuum after contact with the solution. The operation must be repeated at least a hundred times in order to produce a sufficiently thick and uniform deposit of osmium! A more practicable method consists in the impregnation with an osmium salt of vegetable or animal fibre, which is



subsequently ignited. But Dr. Wahl objects also to this method, on the ground that it will yield a filament of osmium and carbon in place of a pure osmium filament, and that the objections to the ordinary carbon filament will apply with equal force to one of carbon mixed with osmium.

The thoria filaments are produced by drawing a very thin platinum wire through a solution of a thorium salt, and then igniting the wire. This operation is repeated many times. It is said that the platinum core of the resulting filament may be melted, and the crust of thoria will remain unaffected. In ordinary use, however, the core will not be melted, but the heat will be transferred from it to the crust, which will thus become incandescent. In all cases, it is a question of producing a very high temperature by the passage of the current, and using materials such as osmium and thoria, which are sufficiently refractory and infusible to withstand the temperature.

Is there anything of practical value in Dr. Welsbach's electric lamp patents? Dr. Wahl, who is one of the foremost American scientists, appears to think there is not. He says: "In view of the great expectations raised by the reports of his (Welsbach's) remarkable laboratory work, it must be confessed that the outcome is a disappointment. While the methods proposed are ingenious, they seem to be altogether too delicate to be capable of being commercially applied; and they are undoubtedly so costly as to place serious competition with the cheap electric glow lamp, with which we are familiar, out of the question." We should not care to confess to unqualified concurrence with this opinion; for the Welsbach gas mantle some years ago seemed equally difficult of production and costly. Dr. Welsbach may yet achieve a triumph in the electrical world; but the time of its practical consummation appears to be remote. And even if the manufacturing difficulties and the high cost of the materials are not insuperable obstacles, and the Welsbach glow lamps are sold at the price of Welsbach gas mantles, the gas industry has little to fear from the competition. The action of the particles of ceria of the mantle *in a flame* gives gas a great initial advantage over the electric current in the transformation of heat energy into light. This is the simple inference from the results of the latest researches on the incandescent gas mantle.

## THE REPORT OF THE PETROLEUM COMMITTEE.

### CONCLUDING NOTICE.

OUR last notice of this report broke off at the point where the advocates of high-flash oil were met by the flat assertion of other parties to the inquiry that this particular property of a burning oil has no connection with its safety in use. The leader on this side was Dr. Dvorkovitz, well known to English gas engineers for his investigations into the gasification of oils. He laid before the Committee tables containing results of experiments showing that the safety of oil depends, not on the flash-point, but on the chemical constituents, on the quantity of light oil in the various kinds of petroleum, and on their heating properties. He also showed that, while the temperature of American oil of 73° flash-point increases slowly, that of Russian oil of 85° test increases more rapidly; and that Scotch oil heats up very quickly until it reaches a very high temperature. The conclusion drawn from these observations is that, with the relative flash-points of 73°, 85°, and 100° of the three different kinds of oils, the measure of safety is about equal. Mr. Berchten, engineer and chemist, supports this testimony, which is also in agreement with the finding of a Home Office report of 1890, by Sir Frederick Abel and Mr. Boverton Redwood. This was to the effect that where a high-flash oil develops more heat in burning than a low-flash oil, the former may be even more dangerous than the latter. Sir F. Abel maintained this contention before the Committee, arguing that the utility of a flash-point test was restricted to the purposes of storage, transport, and handling. It was considered by the Committee impracticable to have one flash-point for stored oil and another for oil to be burnt in lamps. They agreed that the stringent restrictions applied to petroleum spirit, if applied to petroleum under 100° test, would have the effect of preventing the use of such petroleum for domestic purposes.

The next question that arose was as to the probable effect on the price of lamp oil of raising the flash-point to 100°. As the report puts it, "Would the alteration of the dividing line between petroleum spirit and petroleum oil from 73° to 100° Abel close test cause a material rise in the price of petroleum for domestic purposes?" The inclusion of trade purposes in the question would render it more comprehensive. The answer is highly doubtful. The Committee were unable to obtain convincing evidence on this head, in any sense. They admit that the question is complex, and insusceptible of precise solution, because it involves the consideration and weighing of elements which lie almost wholly within the region of speculation. It is registered as an undeniable fact that the difference in price at present between the ordinary oil of 73° test and that of 100° test is from 2d. to 4d. per gallon. It would be a serious thing to put this increase of cost upon all lamp oil, merely to satisfy an opinion that oil of the higher flash would be somewhat safer than that in common use. When the Committee endeavoured to obtain

conclusive testimony as to what would happen if 73° test oil were shut out from the market, they were only bombarded with opinions and arguments, mostly of an interested character. The Scotch oil men vowed there would be no advance of price. Other refiners declared that the effect of legislation in this sense would be to largely decrease the total yield from the present supply of crude petroleum; and it was more than hinted that one result would be to encourage the "doctoring" of burning oil so as to get a poor illuminating but high-flash mixture upon the market.

At present, 78½ per cent. of the total petroleum oil supply of the United Kingdom is below 100° test; and the Committee could not bring themselves to declare that the shutting out of so large a supply, amounting to upwards of 100 million gallons yearly, would have no effect upon the market price of what might get in at a higher test. One of the stock "arguments" that has been used to prejudice public opinion regarding this part of the subject, is the assertion that this country is made the "dumping ground" of the low-flash oil produced by the Standard Oil Company, which would not be permitted to be sold or used anywhere else. An example of argument on this line is to be found in an article in the "Contemporary Review" for August, bearing the suggestive title "The Defeat of the Oil Kings." The writer refers, of course, to the recommendation of the Committee to raise the flash-point to 100°; and he pretends to show "how convenient an outlet this country has proved for the most dangerous kind of oil, which cannot find a ready market in America." The name of this impartial witness is Robert Donald. Against him may be set the deliberate statement of the Committee that, after having "taken a large amount of evidence as to the statements so frequently repeated that this country is made the sole market for oil of such a dangerous character as would not be allowed to be used in the United States or elsewhere," they came "to the conclusion that the statement is unfounded." In fifteen or sixteen States of the American Union "there is no law on the subject at all." . . . In Holland, Belgium, Norway, Sweden, and Italy, 70° to 72° Abel test is found to be in use; while in Germany the legal flash-point is 70° Abel, or 3° lower than in this country. . . . Throughout India the legal flash-point is from 70° to 72° Abel." This positive evidence should demolish the specious contentions of writers like Mr. Donald; but naturally it will do nothing of the kind.

It is time, however, to pass from the consideration of the oil to that of the lamp. Professor Dewar told the Committee that the number of lamp accidents is exceedingly small in proportion to the enormous quantity of lamps in nightly use. Professor Sir Charles Cameron, of Dublin, declared that there are no more accidents attending the use of lamps than there would be in the case of candles. The Committee collected abundant evidence respecting the careless way in which lamp accidents are classified as "explosions," when they are nothing of the kind. The report runs over the tale of lamp accidents, and formulates four conclusions from it. These are to the effect that lamp accidents have not increased in number out of proportion to the vast increase in the number of lamps in use; and that, owing to the volatile nature of petroleum, reasonable care must be exercised in its use, whether the flash-point is 73° or 100°. Complete immunity from accidents is not to be expected with oil at a flash-point of under 120°—which is out of the question, on account of its probable price to the consumer. Consequently, the Committee do not see their way to recommend legislation of this kind. (It is scarcely possible to regard this finding as a victory for the high-flash party.) They do, however, recommend that something should be done to render lamps reasonably safe. They find among the witnesses examined practical agreement upon what should be observed and what avoided in the manufacture of lamps. These principles are few and simple. A familiar "fad"—the abolition of glass reservoirs—disappears, and is replaced by the sensible suggestion that such reservoirs should be made of sufficient strength. The standardizing of wicks and burners is also recommended; and it is advised that steps should be taken to instruct the public in the use and management of petroleum lamps. It is proposed that school children should be instructed "on a subject so vitally affecting the comfort and safety of their homes." The same idea received support at the recent International Chemical Congress.

The report concludes with an account of the proceedings of the Committee; and gives the original draft report prepared by the Chairman (Mr. Jesse Collings), and also that prepared by Mr. Ure. The latter was rejected; but the Committee agreed to read the Chairman's report paragraph by paragraph. The crucial division occurred upon paragraph 73, which proposed to retain the flash-point of 73° as the dividing line between petroleum oil and spirit. Mr. Ure proposed to substitute 100° for 73°; and the amendment was carried by a vote of 8 to 6—the Chairman not voting. Had he done so (as Mr. Ure did), the Committee would have been equally divided; and the Chairman could have carried his point by his casting vote. He did this upon a further amendment by Mr. Ure, explaining why the figure of 100° was adopted for the new flash-point. This amendment professed reliance upon a certain "view" of the subject expressed by Mr. Steuart, which was apparently more than the Chairman could stand. A more independent statement of similar effect, moved by Mr. Compton Rickett, was only rejected by a vote of 6 to 5. Finally, the amended report was



saved for the House by a vote of 5 to 4—less than an absolute majority of the Committee.

It is history that when the report was presented, the Chairman wrote a letter to "The Times" exposing the capture of the Committee by the trade interest. Immediately following upon this event, Mr. Ure and other champions of the high-flash idea brought in a Bill to raise the flash-point to 100° Abel close test; and Dr. Attwood began writing to "The Times" to persuade the public that this was what Parliament meant all along; although curiously enough he agreed in 1870 that the Abel close test of 73° was equivalent to the defective open test of 100°. Meanwhile, nobody has done anything towards clearing up the only question in which users of lamps and the gas industry are really interested—that is to say, what would be the actual effect upon the trade in artificial light of keeping all lamp oils under 100° Abel close test out of the market. The Scottish oil interest have said their last word upon this subject; and no further enlightenment is to be expected from this quarter. But inasmuch as Scotland supplied only one-seventh of the total quantity of oil provided for use in the United Kingdom in 1895, it is not to be assumed that every other interest is to be governed by Scotch "views" of the needs of the trade or the requirements of consumers. There is at the present time an importation of cheap American burning oil amounting to about 150 million gallons per annum. Why does not some independent expert tell us what might be the expected effect of treating the crude oil from which this kerosene is obtained, so that only 100° flash oil should be obtained in its place? It was given in evidence that the simple withdrawal of more naphtha would not effect the desired purpose without the concurrent removal of some of the heavier components of the natural product. Would this operation have the combined result of raising the cost of lamp oil and setting free a larger quantity of heavy residual oils suitable for gas making? If so, it would not be the gas industry that would have most cause to complain.

Next year Parliament will be expected to take action upon the report of the Committee, such as it is; and it can hardly be imagined that legislation will be seriously influenced by review and newspaper articles, representing little else than the play of trade interests upon ignorant susceptibilities. Our contemporary the "Engineer," in its issue for July 29, ruthlessly exposed the hollowness and selfishness of the case for the protection of the Scotch shale oil industry. We cannot add to the completeness of this exposure, and are not solicitous to repeat the riotous terms in which it is expressed. The only subject worth the notice of serious people who are dealers in oil to any extent is the probable consequences of giving statutory effect to the recommendation to increase the flash-point of burning oil; and this, as already observed, is precisely the question which nobody has attempted to answer. Time is slipping away; and unless the desired information should be forthcoming mischief may be done. Meanwhile, advocates of the popularization of gas for lighting and heating in the dwellings of the poor may be recommended to make legitimate use of the uncertainty in which the Committee have left the question of the safety of petroleum lamps and stoves to persuade the public as to the superior advantages of gas for both applications. Whether the blame is due to the oil or to the lamp, lamp accidents have increased, are increasing, and ought to be prevented; and the only reliable way to escape such occurrences is to do away with lamps altogether—a consummation which the prepayment gas-meter has placed within the reach of the humblest householder.

#### OBITUARY.

Mr. JOSIAH GASKELL, J.P., the Chairman of the Gas and Water Committees of the Ashton-in-Makerfield District Council, died recently, at the comparatively early age of 56.

Mr. ROBERT WATT, the Secretary of the Airdrie Gaslight Company, died on the 1st inst., in the 86th year of his age. Mr. Watt held a number of public appointments, among others that of honorary Sheriff-Substitute for the County of Lanark, and Clerk to the Justices of the Peace for the Airdrie district—the latter for about half a century.

Alderman JOHN ASHLEY RANDELL, who has lately died at Devizes, was very largely responsible for the development of the gas and water works of the town, both of which are Corporation property. His energy was more particularly directed to the water-works. From their inception until illness incapacitated him a few months ago, Alderman Randell had practically made himself responsible to the Council for their efficient working. This was no light matter, as quite recently the partial failure of the pumps threatened the possibility of a cessation in the supply; and the work of rectification involved much anxiety and labour on his part.

It is with regret we have to announce the death, on Tuesday last, of Mr. AMBROSE WARDE, late Chairman of the Maidstone Gas Company. Mr. Warde's connection with the concern as a Director had been a long one; and for upwards of 32 years he presided over its interests with conspicuous ability. In consequence, however, of continued ill-health, he was compelled recently to relinquish the office, much to the sorrow of his colleagues, who, in announcing his retirement in their report to

the shareholders in August, acknowledged how much he had done towards raising the undertaking to its present satisfactory position. Many members of the Southern District Association of Gas Engineers and Managers will recollect the kindly welcome extended to them by Mr. Warde when, in May, 1894, they visited their then President (Mr. H. Smythe), the Engineer and Manager of the Company. With what pride Mr. Warde referred to the prosperous condition of the Company, will still be fresh in their memories. In the previous five years, he told them, the price of gas had been 2s. 5d. per 1000 cubic feet; and it was his boast that the history of the Company did not contain an example of a rise in price. Few chairmen of gas companies could say thus much as evidence of good government. The funeral of the deceased gentleman took place on Saturday at West Farleigh.

#### PERSONAL.

From an advertisement appearing in another column to-day, it will be gathered that Mr. A. W. MARKS is vacating his position as Secretary of the Sheppy Gas Company. He intends retiring at the end of this year, we learn with regret, mainly through failing health.

Dr. MICHAEL FOSTER is the President-elect for next year's meeting of the British Association, which will be held at Dover. Professor RÜCKER has just been appointed a Trustee of the Association in place of the late Lord Playfair; and the General Treasurership which has been vacated by Professor Rücker has been confided to Professor G. CAREY FOSTER.

The proceedings at the meeting of the Alliance and Dublin Consumers' Gas Company on the 30th inst. will be of more than ordinary interest; for the shareholders will be asked to bestow upon Mr. W. F. COTTON, the Manager and Secretary, that reward which his devotion to the service of the Company fully entitles him to. Mr. Cotton will tender his resignation, and a proposition will be made that he be granted a retiring allowance. It is not intended, however, that the Company shall lose the benefit of his long experience and splendid business talents. A vacancy exists on the Board; and it is proposed that Mr. Cotton shall take the position, with the title of Managing-Director. Mr. F. T. COTTON, jun., who is at the present time Assistant Secretary and Manager, is to be promoted to the secretaryship. These changes will, it is certain, be readily approved by the shareholders.

**Harcourt's Ten-Candle Lamp Standard.**—At the recent British Association meeting, Mr. A. G. Vernon Harcourt exhibited and described his ten-candle lamp to be used as a standard of light. The paper was mainly on the lines of that read by Mr. Harcourt at the May meeting of the Institution of Gas Engineers. The same author in another paper, "On a Convenient Form of Drying-Tube," exhibited and explained an apparatus to be used for drying gas, and said to have many advantages over the usual appliances.

**The Patent Rights in "Induced Current" Incandescent Burners.**—In their number for the 12th inst., "Progressive Age" (New York) mentions that they have received the following expression of opinion from Mr. C. Knox Harding, of Chicago, which may be of interest in relation to a recent discussion in the "JOURNAL." He says: "Writing of the respective merit and priority of invention of the Bandsept and the Kern burners, the respective dates of the English patents (Bandsept's, Sept. 25, 1895, and Kern's, Jan. 5, 1897) can hardly be near the actual time when such inventions were first produced; and the mention of the English patent to Rudolf Langhans of June 14, 1895 [See "JOURNAL," Vol. LXVIII., p. 74] carries the date less than four months back. Now, the Langhans injector is essentially like the Kern, neither of which is as good as the Bandsept, in which the duplication of the conical frustra increases the injector action and aids the primary mixing. On the other hand, Kern has the best atomizer. Though Bandsept talks a great deal about it, his actual devices offer too much resistance to the upward flow of the mixed air and gas. The Langhans does not show any atomizer, but is based on a theory now known to be wrong—of admitting unmixed air to the centre of the flame. Practically all the gas which is burned except in the immediate zone of the mantle is wasted; although the calcium, zirconium, and common earth mantles largely used by Langhans—in which he uses gallium, indium chrome, and vanadium 'peroxidizers'—are known to the writer to require somewhat different burner arrangements. But an intelligent consideration of the priority of the idea by anyone familiar with the art, could not leave out of account several inventions of very much earlier date. The atmospheric burner, invented by James Lewis, and patented in England more than 14 years ago—viz., January, 1883 (No. 105), seems to be a very general anticipation of almost all that has since followed. He has a most perfect form of compound injectors and mixing cones like the Bandsept and Kern; and, like them, he also tries to patent not only the apparatus but the result. His second claim reads: 'I claim the use and application of gas under pressure to produce an induced current or currents of atmospheric air to mix automatically with the gas in its passage to an incandescent gas-burner.'



## NOTES.

**A New Preservative Silicate Paint.**

Messrs. Lee and Lawtons, of New York, have patented a preservative paint intended to offer greater resistance to rain, frost, and sun than ordinary linseed oil paints, which, as already explained on several occasions in this column, are naturally and incurably hygrometric. By this new process, a water colour paint is produced which becomes insoluble upon drying. Two compositions are required. In the first is some base consisting of a compound of lead, zinc, barium, or other element which is almost insoluble, but will become perfectly so by reaction with an alkaline silicate. Two mixtures are accordingly made, one of them containing the pigment, if any. This is diluted with water to the proper consistency, and is laid on first by the brush or with a spray and allowed to dry. Then the other mixture is applied, with the result that various complex treble or quadruple silicates are formed in the coating, which becomes insoluble and impervious to moisture. If a thick coating is desired, the first mixture is not diluted so much, and the coats are applied in a different order. The effect is the same in either case; and any desired body or tint of this paint can be prepared for use upon structural ironwork or cement.

**The Source of the Illuminating Value of Gas Oils.**

Herr Eisenlohr has been investigating the reasons for the occasionally unsatisfactory gasification of mixed petroleum oils. It had been suggested that every component of a gas oil requires special conditions for its proper gasification. In order to test this assumption, experiments were made with brown coal-tar oils containing paraffin; the illuminating values being calculated by the aid of Helfer's formula. In the first series, oils boiling below 360° C. were chosen; and here it was found that the illuminating power increases concurrently with the percentage of (soft) paraffin present. Similar results were obtained from other oils with varying boiling-points below the prescribed limits, without there being any necessity for altering the temperature of gasification—paraffin, though difficult to gasify when alone, being readily so if dissolved in oil. It was also found that mixed oils, boiling-point below 360° C., gave upon gasification illuminating values corresponding to the mean of those yielded by the various components of the mixtures; the difference between their temperature of gasification being in no case sufficient to influence the result. With oils boiling above 370° C., the illuminating power did not correspond with their paraffin-content. The deficiency was ascertained not to be due to the employment of acid in refining, but to the presence of some high-molecular unsaturated compounds. These were removed by shaking the oil with sulphuric acid, when the illuminating value rose 2½ points. As this result was confirmed in the case of other similar oils, the unsaturated compounds present in the higher fractions are thus revealed as the cause of the unsatisfactory behaviour on gasification of mixtures of light and heavy oils.

**The Use of Spirit for Illuminating Purposes.**

The German manufacturers of spirit from potatoes, &c., have been endeavouring for some years to find an outlet for spirit for illuminating purposes. The development of the Welsbach system of lighting by incandescence afforded hopes that spirit might be used with Welsbach mantles on an extensive scale. The German Spirit Manufacturers' Association undertook a number of researches for the purpose of investigating the cost of illumination by means of spirit; and a report has now been issued in the "Zeitschrift für Spiritus-Industrie." Briefly, the conclusion drawn from the results of the researches is that spirit can barely compete with petroleum at the prevailing low prices of that material. There are, however, several points in the report of special interest to gas managers. Records of trials of spirit as a diluent of many rich hydrocarbons derived from gas-works are given. In particular, a mixture of benzene with spirit of 96 per cent. strength, when consumed in an ordinary small paraffin-oil lamp, was found to give a flame equal in illuminating power to that of petroleum. The most suitable proportions for the mixture were 1 part by weight of benzene to 2 parts by weight of spirit. Weaker spirit, when mixed with benzene, did not give so satisfactory results. But 100 parts of petroleum have, practically, the same illuminating value as 162 parts of the mixture of benzene and spirit; and even if it is granted that benzene will be as cheap as denatured spirit so soon as the coke-oven benzol-recovery plants now in course of erection are in full operation, the mixture could not compete with petroleum for consumption in ordinary lamps. Solutions of naphthalene in spirit afforded a highly luminous flame; but the burner needed modification in order to prevent it smoking. When the lamp was extinguished, naphthalene crystallized out in and around the wick, and burnt with a very smoky flame when the lamp was again lighted. Mixtures of xylene and spirit did not answer so well as the benzene and spirit mixture. In incandescent lamps, however, mixtures of xylene and spirit proved more economical than simple spirit. Thus 73·2 parts of a mixture containing 15 per cent. of xylene, and 81·4 parts of a mixture containing 10 per cent. of xylene, gave the same illuminating power as 100 parts of simple spirit when used with the same mantle.

## TECHNICAL RECORD.

**EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.****Half-Yearly Meeting at Romford.**

The Twentieth General Meeting of the Association was held last Thursday at Romford, under the presidency of Mr. W. D. CHILD, the Engineer and Manager of the local Gas Company. It is a matter for regret that only a small proportion of the members attended; but their absence was counterbalanced by the presence of a number of visitors. The place of assemblage was the gas-works; and there the members received individually a cordial greeting from the Chairman of the Gas Company (Mr. Joseph Smith), his colleagues, and the President. The principal feature of interest on the works is the retort-house, which contains retort-settings heated by the regenerative furnaces which were described to the members in a paper read by Mr. Child in 1894. The construction of these was examined by the visitors, who were also enabled to witness the charging of the retorts by West's manual stoking machinery—the ease and rapidity with which two men performed the operation being freely remarked upon. Having completed their inspection, the visitors partook of luncheon, which had been courteously provided by the Directors; and afterwards they were conveyed by brakes to the District Council-Room, where the business part of the day's proceedings was at once commenced.

The PRESIDENT, on taking the chair, remarked that it was customary for the retiring President to introduce his successor; but he was sorry to say that Mr. J. T. Jolliffe, of Ipswich, who conducted the affairs of the Association so well during the time he was in office, was unable to be present through indisposition.

**CONFIRMATION OF MINUTES.**

The HON. SECRETARY and TREASURER (Mr. J. H. Troughton, of Newmarket) read the minutes of the meeting held at Peterborough in April last, and they were confirmed.

**NEW MEMBERS.**

The PRESIDENT proposed, and Mr. H. WIMHURST (Sleaford) seconded, the election as members of: Mr. Joseph Davis, of Gravesend, and Mr. Frank Clark, of Southend-on-Sea.

The PRESIDENT then delivered the following

**INAUGURAL ADDRESS.**

Gentlemen,—When I call to mind the few years that I have been connected with the Eastern Counties Association of Gas Managers, I fully appreciate the honour that you have done me in selecting me as your President; and I am at the same time impressed with the responsibility imposed upon me to maintain the work of the Association at the standard to which it has been brought by those who have preceded me in office.

I trust it will not be considered out of place if I take this opportunity of thanking the retiring President (Mr. J. T. Jolliffe) for the great interest he has taken in the affairs of the Association during his term of office, for the tact displayed in promoting discussions both interesting and valuable, and for the generally enjoyable character of the meetings. During the past few years, the members of the Association have received most cordial welcome at the towns they have visited—both from Municipal Authorities and from Directors of Companies; and this of itself is most gratifying, and may be taken as an indication that the efforts of the members to effect improvements in manufacture, and to extend the use of gas, are appreciated by those interested in gas undertakings.

At the meeting in Ipswich last autumn, the Chairman of the Gas Company (Mr. Biddell) spoke in terms of high commendation of the useful character of the work done by this and kindred Associations in maintaining the values of gas properties in the face of keen competition from other illuminants; and he said that this had been legitimately accomplished by the introduction of devices for reducing the cost of labour, and the quantity of material used in the production of gas, and by perfecting systems by which the consumers can obtain the highest value from the gas, whether used for lighting or for heating. Such remarks, coming from a gentleman whose life had been passed in the successful management of a large engineering business, are a great encouragement to these organizations to extend their researches and operations.

Some short time ago, a most interesting letter appeared in the "Gas World," advocating the formation of a Junior Gas Engineers' Association. It was at once pointed out how difficult it would be to carry on such a Society, owing to the manner in which gas engineering students are scattered over the length and breadth of the land; and I venture to express the opinion that the number of Gas Associations already in existence render any addition unnecessary. The fact of a student having successfully passed examinations, and obtained Honours from the City and Guilds of London Institute, should qualify him at once for admission to any of the District Gas Associations, and, under certain conditions, to The Gas Institute. Such a course would meet the views of the writer of the letter, by enabling students to attend the meetings of men having a more extended practical and theoretical professional knowledge than themselves, and to take part in their debates. The introduction of such young men,



whose ideas, full of the freshness and vigour of youth, had been directed into proper channels by an intelligent and well-regulated course of study, would be a great benefit. If they would take their part in the work of the Association by providing papers, or even introducing subjects for debate, and would let themselves go—not being content to be mere silent members—they would be distinctly welcome. They might, and probably would, make mistakes. But better that than do nothing; for the correction of such mistakes would prove a valuable education to themselves and their seniors, and if carried out in the kindly spirit and with the courtesy they might reasonably expect to receive, might prove the foundation of many friendships. If at times they experienced a little rough handling in the way of criticism, it would only be a slight foretaste of what they must be prepared to receive later in life when controlling works themselves.

While on this subject, it may be useful to remark upon what has to me always appeared an astonishing peculiarity—viz., that the selection of men to control works for the manufacture of gas (a distinctly chemical operation) should be made from a class who have made mechanics, rather than chemistry, their particular study. The duties of a manager of gas-works are varied, requiring an extended mechanical, as well as chemical and commercial training. But that the proposition I have laid down is correct is, I think, conclusively proved by the character of the papers and discussions at our meetings. Early training will assert itself; and the frequency of papers having a valuable technical engineering character, and the heartiness and thoroughness of debate upon them, can but be contrasted with the scarcity of papers having a distinctly chemical basis, and the hesitating, doubtful manner in which such purely chemical subjects are treated. The modern student, especially trained for the gas profession, has his attention directed as much to one branch of his profession as the other, and becomes a chemical engineer; and I therefore strongly advocate that the Gas Associations now in existence should give every facility for the admission of these young students, whose presence cannot fail to be of assistance and value to all concerned.

The members of this Association were, I am convinced, actuated by good fellowship toward myself, more than by expectation of seeing anything new or remarkable in the works under my charge, when they decided to visit Romford. The works, as you are aware, have only been built a few years—gas making having been commenced in September, 1892. It was an unfortunate thing for the Company that, after the establishment of the old works in 1847 on a site having an area of about one-third of an acre, residential property was gradually built in the neighbourhood, until, as business increased, it proved a great obstacle to enlargement of the works. Everything that was possible was done to put off the inevitable removal. The one-third of an acre ultimately contained all the buildings and plant for manufacture, purification, and storage, in addition to the Manager's residence and the Company's offices; and during the last winter that the works were in use, 170,000 cubic feet of gas were sent out daily, with storage capacity for only 53,000 cubic feet. I am thankful that some modern methods had not at that time been more fully developed, or it is possible that, with a water-gas plant, and purifiers roofed in with a gas-holder tank standing upon brick piers, I might even now be struggling in that cramped site, with unceasing anxiety to myself and discomfort and disadvantage to all concerned. At last it became a necessity to acquire other land, and to build entirely new works. For a small Company, the abandonment of works in running order was a great sacrifice, and likely to prove a heavy burden in the future. It was therefore imperative that no expenditure of capital should take place that was not expected to prove immediately productive; and it would be an injustice to my Directors and myself if I failed to assure you that the design and erection of the new works received most careful consideration, with the desire that on completion they should in all respects be equal to the requirements of both shareholders and consumers. The work that was carried out was all substantial, thoroughly good, and in no way stinted; but nothing was spent upon ornamentation, or in providing plant that was not required for immediate use, or that was not expected to effect saving in labour or material. The leading ideas were to secure and make use of railway communication for the delivery of all material; to adopt the best-known method of handling and carbonizing coal; and to provide plant for the effective purification of the gas, and as much storage as would enable every economy to be practised in manufacture, and furnish an unstinted supply of gas to the consumers of all kinds. The distributing plant was added to, and where requisite rearranged; but so little was done in the principal thoroughfares that, when the works were nearing completion, I was several times asked when, and how, they would be connected to the existing supply. Having a considerable day consumption by gas stoves and engines, we give a minimum initial pressure of 15-16ths. Yet the unaccounted-for gas has been kept within fair limits. The past two years averaged 4.5 per cent.; and during the last half year, with 21 miles of mains for an output of 20 million cubic feet, the loss was only 3.29 per cent.

The retort-house (fully described in a paper I read at our Yarmouth meeting in 1894) contains settings of retorts heated by regenerative furnaces; the charging of the retorts is done by West's manual stoking-machines; and the hydraulic is fitted entirely with anti-dip valves. After some twenty years' continuous

working, my belief in the advantages of the anti-dip system is fully confirmed. So far the arrangements are on modern lines. But on consideration of the varied plans I have seen for effecting condensation—foul mains of large diameter extended in long lines on the walls of the buildings, as far as their size would permit, and condensers, annular and otherwise, so powerful that two-thirds of their capacity had to be shut off—I determined to be more moderate.

The gas is taken by a pipe from each length of hydraulic main, and, crossing the bench, is connected to the foul main, which runs by the most direct route to the condenser—indeed, I may say that the whole of the plant was purposely arranged for the connections to be as short and simple as possible. Rather than run a long length of foul main of large diameter round the building—a method frequently practised—I preferred to spend a portion of the value upon a vertical tube fitted with perforated discs, and subject the gas to a process similar to what the late John Somerville termed "hot frictional condensation." After this the gas is condensed in an annular condenser before being passed through the exhauster. It is then washed with strong liquor in a Livesey washer, scrubbed, and finally washed with water in a Cockey's washer. The dry purification is performed with alternate layers of lime and oxide of iron; the boxes being worked on the rotary system.

Nothing was expended upon buildings to cover either purifiers or oxide of iron in course of revivification. If buildings are erected over purifiers, the work should be done thoroughly—i.e., in such a way that control may be maintained over the temperature of the gas in course of purification. But when (as is most frequently the case) the purifier-house consists of a draughty building, a mere roof covering supported on columns or brick piers, the purifiers themselves being carried some height above the ground on iron girders, with all pipe connections underneath, exposed to cold, cutting draughts, then I would rather save that expenditure and bury my purifiers and pipes as deeply in the ground as possible, and so preserve an equable temperature, and also give support to the boxes, which are at times subjected to heavy strains.

As having some connection with this latter remark, and to show that the point must be taken into consideration, I may say that, during the early part of last winter, I was using some natural bog ore of rather inferior quality; and thinking to improve matters, I purchased some manufactured hydrated oxide of iron. This was mixed with old bog ore and sawdust—an equal bulk of each of the three ingredients—and charged into the purifier in two layers, each 18 inches thick, with a space 6 inches deep between the layers. This mixture absorbed the sulphur from the gas so rapidly as to considerably increase its bulk, with the result that the cast-iron sides of the box were unable to resist the strain, and the plates were broken from top to bottom on each of the four sides. I have nothing to say against the purifying material in question—indeed, I am still using it, but under different conditions. I do think, however, that the vendors were not as careful as they might have been in drafting the directions for use sent out with the material, as I find that my experience was not a solitary one.

Returning to the question of expenditure on purifying plant, I repeat that, having a certain sum to expend for the purpose, it will be found better to utilize it in purchasing the largest purifiers that can be had for the money, than to fritter away a portion of it on buildings that are of no practical good. A purifier-house designed, and sufficiently well constructed, to be of service in regulating temperature, will be found a costly addition; and unless great care is exercised when opening the boxes for the purpose of changing the material, it might easily prove dangerous. The works under my charge are capable of producing about 250,000 cubic feet of gas daily—perhaps slightly more; but I limit my estimate of the productive capacity to this amount because I am of opinion that when plant is worked beyond a fair limit, leaving no portion available for use in case of emergency, wasteful expenditure of labour and material at once begins. The gas-works that are always kept slightly in advance of maximum production can be carried on most economically, even though the capital may thereby be slightly increased. Some managers may experience difficulty in obtaining the sanction of their boards for every expenditure on plant which may not only appear advisable, but which their daily experience tells them is absolutely requisite. The manager may even be reminded that the winter season is passing away, and that troubles caused by some insufficiency of plant will soon be over. But it must not be overlooked that in this country many works manufacture as much gas in the four winter months as in the remaining eight, and that if half the work of the company is carried on in the busy season of the year under adverse conditions, with consequent waste, it cannot be made up by successful working during the period when the plant is capable of dealing properly with the quantity of gas required. Through circumstances beyond the control of my Board, I had ample experience of the difficulties of working with insufficient plant; but I am happy to be able to say that this condition of affairs has passed away. The difficulty experienced during the past two years in finding a ready market for coke, at times made me wish that we were not quite so well provided for, and that I had sufficient cause to justify putting down some plant of another description. The design of these works was such that extensions would be so in reality, and would not necessitate altering or disturbing



work already executed; and nothing beyond the manufacture of coal gas was contemplated.

During the past few years, great progress has been made in this country with the erection and working of plant for making carburetted water gas. The process, worked in conjunction with coal gas manufacture, appears to possess so many advantages that I shall be very pleased when the growth of this Company's business necessitates further additions to plant, and, regardless of the objections that have been raised in some quarters, I shall advocate the adoption of this system of manufacture. I have no doubt before that time arrives the Home Office Committee will have fully considered the allegations that have been made as to the dangerous character of water gas, on the ground of its containing a larger percentage of carbon monoxide than is found in coal gas, and will have determined what restrictions (if any) shall be placed upon the use of carburetted water gas, and the proportions in which it may be combined with coal gas and supplied with safety and advantage to the public. The President of The Gas Institute (Mr. James Stelfox), in his address at Belfast, dealt at considerable length with this phase of the subject; and I think he conclusively showed that the objections raised were more fanciful than real. During the fifty or more years that coal gas has been in common use, the public have learned that it is both disagreeable and dangerous when allowed to escape into their houses; and they therefore take proper precautions to prevent such occurrences. If the compound gas is more dangerous, it is equally disagreeable, and will make its presence known as quickly; and it is therefore likely to receive the same amount of attention that has sufficed for the protection of the users of ordinary coal gas. The advantages of the carburetted water gas system may be summarized as follows:—

- 1.—The small amount of capital required for any stated production (say) beyond 150,000 cubic feet per diem, compared with coal gas.
- 2.—The small space occupied by the plant, thereby reducing the cost of buildings; and its simplicity of construction, resulting in low cost of maintenance.
- 3.—The control given by the use of the plant over the production and sale of coke.
- 4.—The fact that enlargements of carbonizing plant do not necessitate a relative increase of coal storage, but may enable deliveries of coals to be more equal through all seasons of the year.
- 5.—The readiness with which any accidental lowering of illuminating value in the gas may be corrected, and the steadiness with which the gas may be maintained at any desired standard.
- 6.—If gasholder capacity is insufficient for the consumption, then the water-gas system, with its rapid production, may be brought into use during hours of maximum consumption, to assist in keeping the holders full and the supply to the consumers properly maintained.
- 7.—If there is ample storage capacity, then a smaller number of retorts may be kept in action than would otherwise be required—especially during the summer months; and as the gas stock runs down, and becomes reduced as low as may be considered a safe limit, the water-gas plant can at once be put to work, the gasholders be filled up in a short space of time, and the use of the plant then as readily be discontinued until again required. This method of working could be carried on with safety. Indeed one member of this Association who has experience in working the plant assures me that, starting all cold, the apparatus may be prepared and making gas within four hours.
- 8.—The valuable qualities carburetted water gas possesses for clearing away naphthalene obstructions, either from works plant and connections or from mains and services.
- 9.—The greater feeling of security on the labour question, as the number of men required is much smaller, particularly in using plant of large productive capacity; and the class of men employed, being rather superior in training and intelligence to the ordinary stoker, are more subject to control. I have read remarks from some gentlemen deprecating the introduction of a system that would have a tendency to decrease the number of men employed; but personally I have no feeling of sentiment on this score. In this locality, at all events, work is so plentiful that difficulty arises in finding suitable men; and no honest, industrious man need be without employment.

With regard to coke, the value usually appears to be quite local in character, and to decrease as the quantity in stock at the works increases. The sight of a large heap of coke in the yard makes a would-be purchaser utterly indifferent about buying, unless at a ridiculously low figure; and I think that, when stock grows beyond a certain limit, it is wiser to cut the loss by one quick sale at a low price than to attempt to stock the coke in hopes of a better market. During the past two winters, our works became so overstocked with coke that, though possessed of plenty of carbonizing plant for the production of coal gas, I seriously contemplated recommending to my Board the erection of water-gas plant with the object of reducing the output of coke

and turning the stock we had in the yard to better advantage than by selling at the low price we were compelled to accept.

My idea was to put down plant equal to a production of 200,000 cubic feet per 24 hours, and to work it from 8 to 12 hours daily, and so produce about 80,000 cubic feet of water gas. A daily make of 200,000 cubic feet of coal gas would require the carbonization of about 18 to 19 tons of coal, producing (say) 13 tons of coke, of which about 10 tons would be sent into the yard for sale. These figures are only approximate. Now, if 80,000 cubic feet of carburetted water gas were made, leaving only 120,000 cubic feet of coal gas, the result would be that only 11 tons of coal would be used, producing from 7 to 8 tons of coke, of which 5 tons would be available for stock. But this quantity would be further reduced by the 32 cwt. required for the water-gas plant, so that the quantity for daily sale would be only  $3\frac{1}{2}$  tons, instead of 10 tons as in the case of making all coal gas.

The plant required for an installation to manufacture 200,000 cubic feet of carburetted water gas in 24 hours would consist of a generator, superheater and fixing chamber, washer, oil-heater, seal pot, scrubber and condenser, relief-valves, automatic regulator, hot-air valves, and all necessary connections between the apparatus. An elevated iron operating floor and staircase, and a lift for raising the coke for the generator to the operating floor would also be required. The whole of this plant can be conveniently arranged on a floor-space of about 18 ft. by 35 ft.; and, if duplicated, the requisite area would be about 30 ft. by 35 ft. In addition to this, there would be one engine of 18 indicated horse power, with special gas-plant blower, an oil-pump and meter for measuring the oil used, a storage tank and tar-separator and tar-pump, and two boilers of about 30-horse power, which are also available for generating steam for the exhausting plant. The buildings, in the case of my own works, would have cost about £700; and the total cost of the installation so far would have been about £3500.

As the production of the gas is intermittent, and is at times very rapid, it is necessary to provide a relief holder, which receives the gas, and acts simply as a governor to keep steady pressure on the exhauster inlet, and allow the exhauster to be run at a constant speed. This relief holder, if erected specially for the purpose, should be equal to at least one hour's production of gas. Having exhausters and engines in duplicate, and purifiers of ample capacity, I could, with my present plant, have dealt with both descriptions of gas, which would have been mixed together at the outlet of the exhausters, and then passed along through the several stages of purification, and through the station meter to the gasholder.

I have already stated that the cost of the plant, as described, would be about £3500; and this amount represents as nearly as possible the value of a gasholder and tank of 120,000 cubic feet capacity, such as we have in use, and from which about 110,000 cubic feet could be taken to supply the consumers. As the carburetted water-gas plant will easily supply (say) 100,000 cubic feet of gas in twelve hours, and would in emergency supply 200,000 cubic feet per diem, it appears that a gas company of this size, with a growing consumption, may obtain more benefit by an expenditure of £4000 upon water-gas plant than upon storage. The makers of the plant say that 20-candle gas may be made at about the same price as 15-candle coal gas. As I did not require gas of more than 17-candle power, I made inquiries in various directions, and obtained statistics from which I prepared the following estimate:—

*Cost per 1000 cubic feet of making Carburetted Water Gas, continuous working, producing 100,000 cubic feet in twelve hours.*

|                                                                |        |
|----------------------------------------------------------------|--------|
| Coke, used in generator and boiler, 48 lbs., at 12s. per ton   | 3'04d. |
| Oil, allowing '15 gallon per candle power = 2'5 gallon, at 4d. | 9'60   |
| Water . . . . .                                                | 0'50   |
| Purification . . . . .                                         | 0'50   |
| Wear and tear . . . . .                                        | 0'50   |
| Labour, 1 man at 5s., 1 youth at 3s. 4d.                       | 1'00   |
|                                                                | 15'14  |
| Less residual oil . . . . .                                    | 0'14   |

Cost per 1000 cubic feet for 17-candle gas in holder. . . . 15'00

In this estimate, I have placed coke at a price that I should like to realize as an average, and oil also at a high figure per gallon. It is quite possible that the makers of this description of plant may consider that I have not done them justice in allowing such high prices for coke and oil, or in restricting myself to such a low-grade gas as 17-candles, and to so small a daily production as 100,000 cubic feet. But these were the particular requirements in my own case; and I therefore endeavoured to obtain figures that would be realized in practice. In producing gas of the quality named, and up to the stage of manufacture described, I could not put together figures that would show a saving of more than 1d. or 1½d. on the cost of coal gas; but there are other advantages not readily expressed in fractional parts of shillings or pence, that would assuredly result in the saving of pounds.

It would be a difficult matter to show by figures how the cost of producing coal gas was affected by the deficiency or otherwise of storage or gasholder capacity; yet every maker of gas knows that this is one of the principal factors in the case. And it is equally difficult to express in commercial terms all the advantages that may accrue from the judicious use of a carburetted water-gas plant, in conjunction with the ordinary

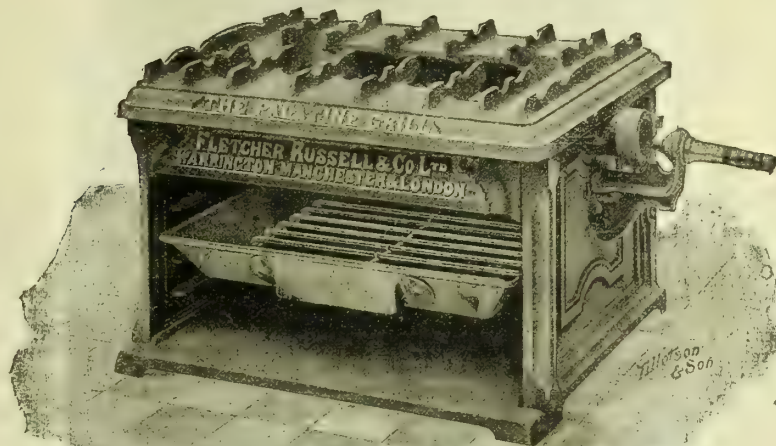


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READY.

Two communications have reached Mr. Gilbert Little (the Chairman and Managing-Director of the New Conveyor Company, Limited, Smethwick) which he is likely to place among his most treasured documents. One is from the Engineer and Manager of the Gas-Works of one of our largest cities, in which the writer states: "I have not seen any automatic retort-houses in Europe equal to your new gas-making plants at Leeds, Nelson, Cambridge, Huddersfield, and Batley;" and the other is from the Engineer-in-Chief of the third largest industrial



undertaking in England, who informs Mr. Little: "I have been all over the United States, and have seen no elevators equal in design or durability to your own; and I have come to the conclusion the Americans surpass us only in electric light work." This Engineer-in-Chief supports his belief in the Smethwick manufactures by recommending his Directors to send the order for one of the largest installations of conveyors and elevators ever placed in this country to the New Conveyor Company, Limited.

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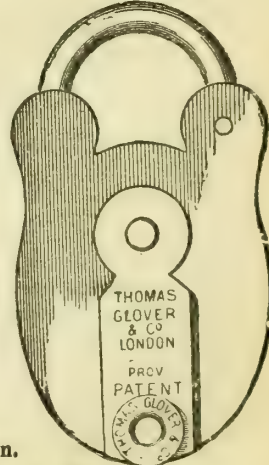
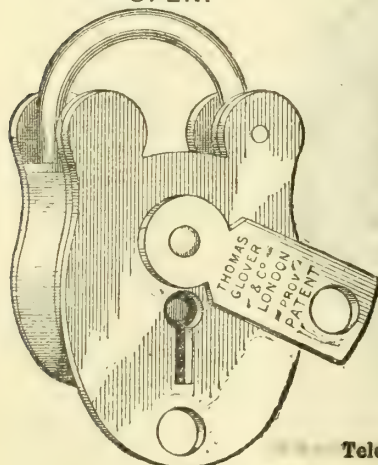
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gas plant, although these advantages are in suitable cases perfectly apparent. In towns which are not adjacent to the coal-fields, the system described will prove of great service in cheapening the production of gas, and so benefit the consumer, and add to the stability of gas companies; and it is to be hoped that the Committee who are engaged in considering this subject will not impose restrictions that will retard the use of this particular gas when mixed with coal gas in reasonable proportion.

I think that the Directors and shareholders of this Company, as well as the gas consumers, have all cause for satisfaction with what has already been done, when it is remembered that since the opening of the works in 1892 three reductions have been made in the price charged for gas, amounting in all to 7d. per 1000 cubic feet. Compared with the price that was current five years ago, this means a saving to the users of gas in the Company's district of nearly £1200 per annum; and if the reductions already made result in a proportionate increase in the Company's business, I shall hope in time to see the price reduced to 3s. 4d. per 1000 cubic feet; and the saving to the town will then amount to not less than £2000 annually.

It may perhaps be thought that the foregoing remarks upon the past and prospective outlay upon the works in question are somewhat irrelevant, as addressed to a body of gas managers; but they serve to show that even a large expenditure of capital is justifiable, when made for purposes that will effect a continued saving in labour, and be productive of improved results in working. The increase of business that I have mentioned as desirable, may fairly be anticipated, for the decreased price multiplies the uses to which gas may be applied for domestic or trade purposes. Engines may be used for sawing wood, turning lathes, pumping water, cutting chaff or sausage meat, or even for driving a dynamo for the production of electric light. It is a matter of indifference to a gas maker whether the gas he produces is used directly for illumination or as the motive power for producing electric light.

As an indication of the increasing use of gas-engines, I may mention an instance that has recently come under my notice. A gentleman was telling me of some work he had in hand in connection with some extensive pumping arrangements for emptying a dock. The object in view was to put down plant that would pump the water out of the dock as quickly as possible, at a reasonable cost, and that would occupy but little space. I suggested the use of gas as the motive power in place of steam; and inquiries put to engineers who have made this class of work a speciality, resulted in the preparation and execution of the following scheme:—

*Specification of Plant for Emptying a Dock 450 feet long, with a mean breadth of 65 feet, and 25 feet depth of water, containing a ship of 4000 tons displacement.*

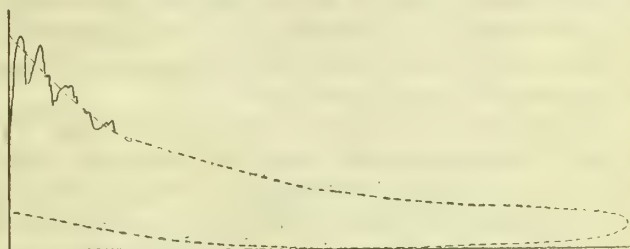
Scheme No. 1 provided for three 50-horse power nominal gas-engines, each coupled direct to a centrifugal pump for 26-inch suction and delivery, and fitted with disc 5 ft. 4 in. diameter, and mounted on mild steel shaft 7 inches diameter at smallest part. These pumps would empty the dock in 1½ hours, with a consumption of 8000 cubic feet of gas. Speed of engines, 120 to 160 revolutions per minute, to suit head of water. Leakage pump 7-inch centrifugal, driven by belt by 7-horse power nominal gas-engine. This was to deal with the water that would percolate through the dock gates, sluices, &c., after the main body of water was pumped out. Water-tank, 50 ft. by 8 ft. by 4 ft. 6 in., to hold 50 tons of water for cooling the cylinders of the engines.

Scheme No. 2 provided for the supply of two gas-engines, each 96 brake horse power, coupled to two centrifugal pumps with 26-inch suction and delivery, with disc 4 ft. 3 in. diameter, running at 200 revolutions per minute. One 10-inch leakage pump, with disc 3 ft. 6 in. diameter, running at 250 revolutions per minute, coupled to a 9-horse power nominal gas-engine. Tank for water, 38 ft. by 7 ft. by 4 ft. The two 26-inch pumps and the 10-inch pumps would empty the dock, as before described, in two hours. Each of the 26-inch pumps would deliver 1760 cubic feet per minute on the average; and the 10-inch pump, 260 cubic feet. The weight of water lifted in two hours would be 12,600 tons; and the consumption of gas for the purpose, as in the former scheme, would be 8000 cubic feet. The size of gas-main required, if not very long, would be 7 inches diameter. The delivery-main from the pumps would be 40 inches diameter. The size of the house required for the engines and pumps was 50 feet long by 28 feet wide. It was suggested to sink this below the level of the ground, so as to reduce the length of the suction-pipe to 16 feet; and, if desired, the space above the house could be utilized for other purposes. The engines ultimately adopted varied somewhat from either specification; but the leading particulars of the engines, the results of the tests to which they were subjected, and the diagrams taken, were as shown.

The matter of cost I do not propose to deal with as it does not affect the value of the information so much as the description of the plant; and to myself it was of interest to find that gas-engines could be successfully applied to such important work. The makers recommended the use of producer gas for general purposes, but not in this particular case. The work being intermittent in character, and time being a special feature of the scheme, they pointed out that the work could be done with town gas, while producer gas was being prepared.

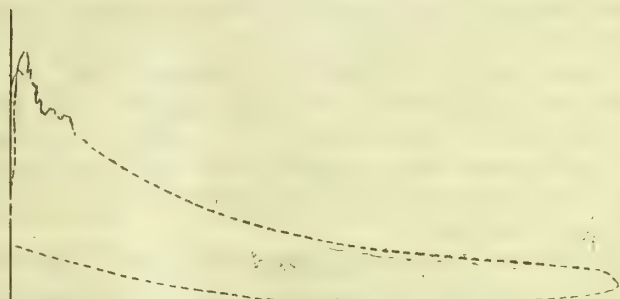
Gas has been proved in the workshop to be most handy and cleanly for brazing and enamelling; for heating irons for tinmen, coppersmiths, tailors, and hatters; for painters' use in removing paint; for coffee roasting; and for numberless other purposes. The intensity of heat that may be obtained—either concentrated or diffused—and the ease with which it may be controlled, make it a most valuable aid to the work of the skilled mechanic or chemist. In such a town as Romford, where factories at present are not predominant, we look more to domestic appliances such as cookers, grillers, bath-heaters, and heating-stoves as a means of increasing our business; and the letting of these several articles on hire, coupled with the extension of the prepayment meter system, has placed them within the reach of every mechanic, and added to the comfort of many homes.

I was not at first impressed with the idea that the prepayment meter system and the free fitting of houses, would prove suitable to this particular district, and only entered upon this class of business at the express request of my Directors. As anticipated by myself, the annual consumption of gas per meter in this town has not averaged so high as in many other places; but the returns are sufficiently good to determine it a successful system. At the outset, we endeavoured to frame regulations as to the number of lights, &c., that should be fitted in any house; and were inclined to limit the supply to about three lights and a boiling-stove. We find, however, that personal inspection of each house, and a study of the requirements of the individual, is better than adopting a hard-and-fast line. If a light is asked for in a particular place, and reason given why it is



40-HORSE POWER (NOMINAL) ENGINE.

Cylinder, 18½ inches diameter,  
24-inch stroke.  
190 Revolutions per Minute.  
Mean Pressure in Cylinder, 89 lbs.  
Indicated Horse Power, 137.



16-HORSE POWER (NOMINAL) ENGINE.

Cylinder, 11½ inches diameter,  
24-inch stroke.  
210 Revolutions per Minute.  
Mean Pressure in Cylinder, 92 lbs.  
Indicated Horse Power, 60·75.

required, then by all means fix it. The service and meter constitute the principal part of the outlay on each house; and the addition of a bracket or pendant means only 2s. or 3s. extra. Even acting liberally in this way, expenditure has been kept within reasonable limits; the average cost of fitting per house being £4 10s.

One other point in this connection. We supply a boiling-burner or griller free; but if a larger cooking-stove is asked for, we require a rental. If we could feel sure that the cooker asked for was required for use, and not in imitation of a neighbour already possessed of a similar appliance, no rental would be necessary; and the best possible proof that it really is wanted for use, is the fact that the gas consumer is ready either to pay a few shillings for fitting, or else a small quarterly rental for the stove.

This subject has been before the Association on several occasions; but I do not think it has yet received sufficient attention. A paper dealing with all the details of obtaining customers, fitting houses, and especially with the best methods of collection and book-keeping, would be of great service. Some companies deal with collection as rapidly as possible—simply putting the contents of each money-box into a separate bag, labelled for identification, and then completing the work in the office. Some even go so far as to ignore any question of shorts or overs; contenting themselves with the idea that one about balances the other, and therefore the company does not suffer. This system is manifestly unfair; and it may be compared, with insufficient attention to the accuracy of measurement, with ordinary meters. Any such irregularities are certain to be discussed between the



consumers, and give rise to dissatisfaction; and therefore they demand the closest attention from companies' officials.

My own system is to have the work done by a competent and trustworthy collector, who reads the meter and prepares the account before the money-box is opened in the presence of the consumer. He says: "You have used so much gas; I require so much money." Any discrepancy between the account and the amount deposited is at once dealt with, and a feeling of confidence established between the consumer and the Company. In two years, we have only had one case in which the consumer declined to pay an amount asked for shortage; and this unfortunately occurred at the first collection of this particular account. As payment was positively refused, the meter was removed, and the account closed. We have only a few consumers on this system; but the statistics may be useful.

|                                                           |           |            |   |          |
|-----------------------------------------------------------|-----------|------------|---|----------|
| Houses supplied with prepayment meters and fittings . . . | 140       |            |   |          |
| " " with prepayment meters only . . .                     | 22        |            |   |          |
| Outlay on meters . . . . .                                | 320       | 5          | 6 | Total    |
| " on fittings . . . . .                                   | 310       | 0          | 7 | £630 6 1 |
| Average outlay per house for meter and fittings . . .     | £4        | 10         | 0 |          |
| " consumption per meter per annum . . .                   | 8650      | cubic feet |   |          |
| Total annual consumption of gas . . . . .                 | 1,210,200 | "          |   |          |
| " collection, including stove-rents . . .                 | £340      |            |   |          |
| Cost of clerical work and collection, six times annually  | £16       | 4          | 0 |          |

I expect improvement in each of these details, for the following reasons: First, that we have certainly a much better class of consumer waiting to be supplied than have yet been dealt with, and from whom we may expect a larger annual consumption; and, secondly, that the work of collection will be carried on at a decreased rate per house as the number of consumers is added to. At present, they are scattered over a wide area; no restrictions having been imposed, nor any attempt made to confine the system to any particular district.

One other benefit to be derived from the use of the prepayment system, is the reduction in the number of bad debts. In the case of new and doubtful customers, I invariably suggest the use of a prepayment meter, and find it easier to obtain the money in this way than by demanding a deposit as security, in addition to which we save the 5 per cent. we are compelled to pay on the amount deposited. Persons of limited means starting in business, who really require all their money as working capital, are in this way enabled to obtain a supply of gas, and are at no time inconvenienced by the presentation of a heavy account for payment.

It may be within your recollection that at one of our recent meetings the Chairman of the Company then visited requested some member of the Association to prepare and read a paper furnishing information relative to the working of the sliding-scale and the apportionment of profits to reducing the price of gas and the raising of dividends above statutory rates. It is a point that cannot be said to come within the range of the engineer, but is distinctly a matter of administration of the company's business by the directors. It is, moreover, a delicate subject to handle without creating offence; and it must therefore be distinctly understood that the remarks made have no application to any particular company, but are merely general expressions of opinion.

The Metropolitan Gas Companies—acting presumably upon the idea that their affairs have been closely scrutinized for the purpose of determining the actual value of gas in the districts supplied, before the initial price was given—have availed themselves of the powers conferred by their Acts of Parliament, and have taken for the shareholders a considerable portion of the increased dividend to which the sliding-scale entitled them. The procedure of most Provincial Companies in this matter has been very guarded, and rightly so.

An examination of the Parliamentary Returns shows that, at all events in the case of provincial undertakings working under Provisional Orders, the Board of Trade usually exercise a fairly liberal spirit in fixing the initial price for companies applying for powers. After due inquiry into the value of material and labour in the particular district, and any special circumstances attached to the company's working, the Board only impose such conditions of price and quality as are likely, with proper care and management, to result in the maintenance of profits up to the amount required for payment of statutory dividends, and leave such a margin as to place the company in a safe position.

Taking this into consideration, it does not appear prudent that any company working under such conditions should avail themselves of the first favourable opportunity of lowering the price of gas to increase the dividends above the statutory rate, especially if the increased profit has been obtained under conditions that did not exist when the initial price was fixed. The directors of such a company should first assure themselves that their works are ample in capacity, and in thorough working order to fulfil all the obligations they have undertaken. If the contrary is the case, and any considerable outlay is required, they may still be able, with advantage to the company, to lower the price of gas without paying a higher rate of dividend, owing to the increased amount of capital. They should feel certain that they are supplying gas at as low a rate as the circumstances of the district will permit, which may be judged to some extent by a comparison with adjoining companies; and also that the price charged for gas will not prove a hindrance to any particular class of business. In order to encourage the use of gas-engines or other trade appliances, it may even be advisable to adopt a

differential rate for gas, in order that the price charged may be sufficiently low to compete with rival methods; though users of motive power are daily recognizing that there are many advantages attending the use of gas beyond what can be discovered by any calculation of the difference in the value of coal when converted into gas or employed for the purpose of raising steam.

Care should be exercised in the case of alteration, replacement, enlargement, or extensions of plant or mains, that the proper amount only is charged to capital account. Plant once provided out of capital must have its representative value. Replacements or renewals may be charged to revenue; and additions, or the actual increase in value due to enlargements, may be placed to capital account. Care should also be taken before raising the rate of dividend that, unless from some unforeseen labour strike, accident, or some other misfortune, no necessity should occur for going backward, or except for some very special reason for making use of any reserve fund to maintain dividends, but that they should be fairly earned in the year's working.

Having safeguarded themselves on these and any further points that may commend themselves to the directors of the undertaking, it appears perfectly legitimate that the shareholders who have placed the conduct of their affairs in the hands of gentlemen possessed of business capacity combined with prudence, should be permitted to participate to a limited extent in the results of their successful business methods.

A company about to raise additional capital for some extraordinary expenditure, may be inclined to raise their rate of dividend in the hope of obtaining a higher price for the shares, and consequent larger amount of premium capital; but this can only be considered bad policy. Shares are constantly changing hands, and may have so high a rate of dividend quoted as to raise dissatisfaction in the mind of every user of gas, and yet yield the investor but a very moderate return on his outlay; and unless the rate of dividend at the time of purchase is maintained, the investor is likely to make as great an outcry as any dissatisfied consumer. The sliding-scale is based upon equitable principles; but it is certain that it requires to be used with caution and judgment, if the effects of its working are to have a lasting value.

It is unusual for any discussion to take place upon the President's Address, though why this should be so I am at a loss to explain. Statements not open to challenge cannot be generally accepted; and therefore under existing conditions presidential addresses can have but little value. Unless the Association is better supplied with papers at our next meeting than on the present occasion, the members are at liberty, if they think it desirable, to discuss any point that I have raised, if they will be good enough to notify their intention to the Secretary. In this way, we may very possibly raise some debate useful alike to the Association and to your President.

At the close of the address,

Mr. J. CARTER (Lincoln) said it was his pleasure and privilege to ask the members to express their appreciation of the service the President had rendered to them by the preparation and reading of his address. It was an unwritten law of their gatherings, as they had been reminded, that the utterances of the President in his address were safe from criticism; and, in this particular instance, it was perhaps as well for the members that they were, because he was not certain that any of them would be guilty of the audacity that was requisite to criticize any statement emanating from the gentleman who now occupied the chair. They all expected of Mr. Child a deliverance that would deal, with care and intelligence, with matters of interest in connection with the manufacture and supply of gas; and he ventured to say that, having listened to his remarks, none of the members were disappointed.

Mr. J. BARTON (Peterborough) seconded the motion. He said the address contained points of interest that would be worth reading again and again.

The PRESIDENT, in reply, said he could only thank the members for listening so attentively to what he had prepared.

Mr. H. WIMHURST then read the following paper on the

#### WORKMEN'S COMPENSATION ACT, 1897.

The Workmen's Compensation Act of 1897, which came into operation on July 1 is of no little moment to gas managers, whether engaged upon large or small works. It will press unduly upon the smaller; they being less able to bear any great and sudden charge upon them which the Act entails. Therefore the question one naturally asks himself is, how best to prevent uncalled-for expense on the revenue of the undertaking. In my opinion, there are only two ways out of the difficulty—either create and maintain an insurance fund by the placing aside of a certain sum annually out of the profits of the undertaking, which sum can be readily ascertained by past experience in this direction, *plus* a percentage for the extra risk entailed under the Act; or (and to my mind much the better and safer plan for small works, with less than an annual wage payment of £6000) to secure oneself with a perfectly good and sound Insurance Company, even if the premium is a few shillings per cent. more than some other and less sound offices are asking.

When we consider the amount of risk the offices run of actions at Common Law, under the Employers' Liability Act, and, lastly, under the Workmen's Compensation Act, 1897, I do not



think the reliable offices are asking too great a premium rate from gas undertakings when it is not more than from 8s. to 10s. per cent. upon the amount of the annual wages paid. We may also consider that the rates as at present fixed are merely experimental, and will in the near future be greatly reduced, when the offices see that the risk entailed upon them by gas-works insurance is much less than they anticipated, though the Act will certainly make workmen much less careful in following their daily occupation.

There is already an indication to amend the Act, at the instance of the Parliamentary Committee of the Trades Union Congress; and a no less authority than Mr. Asquith has indicated his general approval of it in a letter to Mr. S. Woods, M.P. The amendments, as drafted by this body, are: Provision for the payment of the first two weeks' injury; abolishment of the doctrine of common employment; and provision against contracting out. It also abolishes the principle of contributory negligence, and provides for injury to health. Should the Act be thus amended, our expenditure under this head will have a tendency to increase rather than diminish.

I should gladly welcome a federation of the Incorporated Gas Institute and the Institution of Gas Engineers with the District Associations, in order to form an Insurance Corporation for the insurance of gas undertakings under the Workmen's Compensation Act of 1897. With the London offices and staff of the two Institutions, one cannot conceive any great difficulty in this direction, especially if the Councils of the two societies could arrange for an early amalgamation of their bodies. If such an Insurance Corporation could be formed, I have no doubt it would meet with the approval and support of all gas-works officials. Such an united Association could obtain a very low premium rate from the sound Insurance Companies, very much to the benefit of all the insurers.

The North of England Gas Managers' Association, with their efforts in this direction, have been enabled to insure at 9s. 6d. per cent. to the extent of £120,000 annual wage payment, spread over 40 works. If this can be accomplished with 40, what could be obtained by the amalgamating of 400 to 600 works for such a purpose? The answer would probably be, a premium rate of 5s. to 6s. per cent. Surely, then, this needs our active and immediate attention, to bring about such a desirable result.

#### Discussion.

Mr. J. CARTER (Lincoln), called upon to open the discussion, said he was not quite certain that he had any definite opinions on the question dealt with by Mr. Wimhurst. He was almost as much pleased with the omissions of the paper as with the actual statements. He was glad that the author had not given himself over to anything like a wild denunciation of the Workmen's Compensation Act, which had been received with very mixed feelings in all industrial circles. He (Mr. Carter) thought that any legislation that imposed upon employers of labour the utmost care in the conditions under which workmen had to do their daily toil, and which placed upon the employers the full financial responsibility for accidents, ought to be received without any very violent feelings of dissent. It should first of all be their earnest endeavour to carry out what he took to be the primary object of such legislation—that was to say, everything should be so arranged that the liability to accident should be reduced to a minimum. He must confess that it was rather distasteful to him to discuss a subject like this in any way, when looked at from one point of view. He did not like to talk upon the question of workmen's lives and limbs in connection with £ s. d. He did think above everything else their first object should be to preserve their workmen from accident. His own opinion was that a great deal too much had been said about this question. They were, he supposed, now passing through an experimental or transitional state. The Act was quite new; and the insurance companies scarcely knew how high the terms should be which they ought to impose upon insurers. The question of how low they should be, never seemed to have entered their heads at all. He thought they might wait to see the course of events during the next twelve months; and probably by that time rates would be quoted by all the insurance companies which would be far more moderate and reasonable than any they had yet heard of.

Mr. JOHN WEST (Manchester), on the invitation of the President, said the question dealt with in the paper affected a large number of manufacturers perhaps more than it did the proprietors of gas-works. It might be interesting if he explained what the manufacturers had been doing in the Manchester district. They considered the new Act was very oppressive upon the capitalist; and while they desired to protect the lives of every workman, as well as their own (because the employers were as liable to accident as the workmen), they thought they should not be called upon to pay when men, through carelessness, contributed to any accident, as was often the case. Many years ago, the Iron Trades and Engineers' Association in Manchester insured themselves among themselves; and it had been a very fortunate thing for them that they had kept statistics showing upon the average which classes of men were more liable to accident than others. They had gained experience which showed that men might be more liable to accident in one particular branch of engineering than in others; so that, when the new Act was forced upon them, they pretty well knew the position they were

in, with the exception of the unknown quantity—the contributory accidents, which so frequently occurred. The manufacturers considered the course they should take under the new Act; and they decided to assess themselves at the rate of 9s. per cent., and so insure themselves. The accidents had been very small matters. The same office that looked after the other affairs of the Association attended to this insurance business also; and the advantage the manufacturers had secured was this: Instead of paying to an insurance company (who really did not know what they were about, seeing that the matter was, as Mr. Carter had put it, still in an experimental stage), they assessed themselves at a figure which was about double what was necessary. But, at the same time, they made up their minds that they would increase their capital to a very considerable extent, so that they would be prepared to meet any emergency. Therefore, if they had made a mistake in assessing themselves at such a high figure as the 9s. per cent., it would increase their capital, and then, when it reached a certain point (which had been decided upon), they would reduce the rate of payment. The effect of this arrangement, which had been carried out for many years in the Manchester district, was that the whole of the engineers connected with the great Federation that was formed during the strike in the engineering trade had joined the Association. They had discussed whether or not they would ask an insurance office to take part of their risk; but they decided that they were powerful enough to take the entire risk upon themselves. He thought the gas companies might very well follow on the same lines, which he was glad to see was suggested by Mr. Wimhurst. Under the new Act, they found men claiming immediately the least accident occurred to them; and he was sorry to say some of the claims were of a very doubtful character—indeed, a large number of the men were only “on” for a few weeks. There was no doubt the Act had not been well considered; and, while Mr. Woods and Mr. Asquith might have something to say in favour of amending the Act in the way indicated in the paper, he was glad that the Association to which he had referred was strong enough to claim a hearing in connection with any proposal to make a change. It was the desire of all fair-minded employers to meet reasonable demands arising from any legitimate accident that might occur on their works; but he did not think it right that they should be called upon to compensate men for any accident arising from drunkenness, semi-drunkenness, or carelessness, which, he was sorry to say, had already occurred. All employers should have such an amount laid by as would enable them to pay for accidents that occurred legitimately, and the amount should be a tax upon the public by charging more for their wares. He thought the gas industry might with advantage follow the example of the Engineers' Federation. It had been suggested that gas undertakings should insure in insurance offices; and as they had few cases of accidents, perhaps it would be as well. At the same time, he did not see why The Gas Institute should not do as the engineers had done, because the old insurance people were simply protecting themselves by asking exorbitant premiums; they were bound to ask for something large, seeing that they did not know what the Act would bring about. He was decidedly of opinion that gas companies might form an ample insurance fund among themselves.

Mr. J. H. TROUGHTON (Newmarket) said that some six years ago his Company somewhat anticipated the Workmen's Compensation Act by insuring their men against accident under the old Employers' Liability Act, actions at common law, and also for half pay in the event of men being incapacitated through accidents. They paid a premium of 15s. per cent. for these benefits, which they had enjoyed for six years, during which time they had paid about £70 altogether in premiums. In this period, they had only had six very slight accidents; and the amount of compensation received from the insurance company totalled £14, or exactly 3s. per cent. on the wages paid. When the Workmen's Compensation Act came into operation, they wrote to the insurance company to know how much extra would be required for the additional risk. They were quoted a premium of 25s., which, of course, his Directors refused; and they also decided not to insure again for a time, seeing that they had a small insurance fund, upon which they could draw in the event of any claim being made upon them. Since then, the rates of the insurance companies had been very materially reduced; and only the previous day he signed a proposal form to insure the workmen for full benefits under the Act at 9s. per cent. Consequently, instead of paying 15s. under the old Act, they were insuring for less money against additional risks. He did not think that 9s. per cent. on the wages paid was by any means unreasonable. They had simply decided to insure for one year or longer as was thought desirable; but in the event of The Gas Institute formulating a scheme by which gas companies could amalgamate and insure at a cheaper rate, his Company would, of course, join.

Mr. J. W. HELPS (Croydon), invited to take part in the discussion, said his Company anticipated some such legislation as the Workmen's Compensation Act several years ago. Twelve or thirteen years since, they started a fund which they called their Sick and Burial Fund; and among the rules of the fund was one which allowed the Engineer, at his discretion, to pay any man who met with an accident during the discharge of his duties a sum not exceeding two-thirds of his weekly wages at



the time the accident happened. During the twelve years, they had kept a careful record of the amounts expended, especially those under the head of accidents; and when he had to report to his Directors on the subject of insurance, he took the figures out. He found that, during the twelve years, they had paid in wages something like £180,000; while they had only spent £140 in compensating the men who had met with accidents for the time they lost. It might be said that they were not quite so particular under the rules as they would be under the rules imposed upon them by the Workmen's Compensation Act, because, for instance, supposing a man met with an accident within a couple of days before pay-day, he (Mr. Helps) might have said to the person paying the wages: "Pay him his wages for these two or three days; and then, if he is away next week, put him on the sick fund." But that would be more than compensated for by the clause in the Act which did not compel any company to pay the workman for the first fortnight during which he was suffering from an injury. The matter had been frequently discussed by his Directors; and they were still undecided as to what course they would adopt. He might state that the figures he had quoted worked out to something like 1s. 7d. per cent. By their Private Act, they were given power to form an insurance fund, which now amounted to some thousands of pounds; and he had advised his Directors that he thought they would be perfectly within their rights if they used the fund for the purpose of compensation under the new Act. The clause in their Act giving them the right to establish such a fund was something to this effect: The Company have the power to form an insurance fund, and to use it to meet any claim for any accident that may arise, which accident could not have been prevented by due care and forethought on the part of the Company. Therefore he considered that they might fairly use this money to meet any claim made against them under the new Act. If they could not, what was the fund intended for? His Company had wisely insured their boilers against accident; and they had insured the works against fire. Therefore he did not see what accidents could happen there (save those to men) for which they would have to take money out of the fund. He agreed with a previous speaker, that perhaps too much had been made of the large premiums required by the insurance companies, because they had had to quote without experience of what might happen. At the same time, he could not help thinking that the insurance companies, if they had liked, might have obtained information that would have enabled them to ask lower premiums. It would have saved a lot of trouble and discussion on the subject. The whole question had now been placed in the hands of a well-known actuary; and he was going into the matter. They had given him all the particulars in their power; and no doubt he would be able, with the figures at his disposal, to find out what was a fair percentage on the wages to set aside, and devise some scheme that would be satisfactory to the Company he (Mr. Helps) represented at Croydon.

Mr. E. W. SMITH (Chelmsford) said his Company considered the Workmen's Compensation Act imposed a great liability upon them; and they met it the only way they could do, by insuring. It would be difficult for him to believe that the insurance companies could not obtain figures upon which they could have worked in deciding the amount of premium they should charge. Surely, since the passing of the old Employers' Liability Act, some records had been kept of the number of accidents that had happened. His Company insured under that Act; but their experience had differed from that of the Newmarket Company. He believed the amount of compensation they had received during the years they had been insured was about equal to what had been paid in the shape of premiums. However, most, if not all, of the accidents that had happened had been very small, and only kept the men away from the works for one or two weeks. This was a point of great importance to them, as a proposal had been made to amend the Act by providing for payment during the first two weeks' injury. In his opinion, the large employers of labour should try to retain the existing clause as long as possible. He very much admired Mr. Carter's fair-mindedness; but personally he could not help thinking that the new Act imposed upon employers a greater responsibility than they ought to be expected to take, inasmuch as accidents were liable to occur over which the employer could have no control or that could be traced to his carelessness or negligence.

Mr. F. PRENTICE (Ipswich) said that the Company with which he was connected had not had very much experience with the insurance companies, as they preferred to take their own risk, whatever it might be. From the experience they had had for a good many years past with their sick fund, they did not think the risk was a very grave one, or one they need shrink from. They had a workmen's club, to which the men subscribed 3d. each per week, which entitled them to 10s. per week when they were ill. Any deficiency in the fund was made up by the Directors. Sometimes they were called upon to the extent of £50, and at other times the club had money in hand. They had never had any serious disaster such as might lay a number of men low. That perhaps would be rather a serious position to find themselves in. But what he had stated explained the position they were in at present; and, until they saw some reason for altering it, he believed they would continue in the same course—at all events, until the ridiculously high rates of the insurance companies were reduced. The Ipswich Company had been quoted 25s.

per cent., and then 12s. 6d. per cent., which utterly precluded the idea of insuring in the usual way.

Mr. SMITH inquired whether the 9s. per cent. referred to by Mr. Troughton covered accidents during the first two weeks.

Mr. TROUGHTON said he did not think so. The Act provided that the first two weeks should not be paid for. The 9s. covered everything contained in the Act.

Mr. E. W. T. RICHMOND, responding to a call from the President, said the remarks that fell from Mr. Carter were worthy of careful consideration; and he could quite endorse them. They should all look at this question in a broad mind. The working man had only his labour to sell. He had no capital, and no resources; and if accident prevented him following his occupation, he had no means of keeping the wolf from the door. In his opinion, the capitalist should readily undertake all the risks. The heavy rates proposed by the insurance companies throughout the country were greatly to blame for the indignation that had been displayed by the great employers of labour; but the Act had been in operation for three months, and the indignation was now simmering down. He saw by the paper that the North of England Gas Managers' Association had been enabled to insure at 9s. 6d. per cent. to the extent of £120,000 annual wage payment, spread over 40 works. His Company had done better; they had a policy for £30,000 at 7s. 6d. per cent. Of course, they were quoted all sorts of rates at the commencement. The first figure was 25s.; then they were quoted lower; and eventually they got down to 6s. 6d. They, however, decided to pay the extra shilling, as they preferred going to an office which they knew had a substantial capital at its back. Taking 7s. 6d. on the wages paid, it did not by any means handicap production in such a way that it need be held up as a bogey. He himself had no fear as to the results that would follow the working of the Act.

The PRESIDENT said it appeared to him perfectly right that the industries of the country should be burdened with the results of accidents that could be properly described as such; but one point that struck him was that there should be some process of inquiry by which it could be determined whether or not the sufferer from an accident brought it upon himself by a wilful act of his own, or by, as Mr. West plainly put it, drunkenness or semi-drunkenness. A man who so brought about an accident, by which he was himself injured, and perhaps property too, should be debarred from becoming a burden on those who employed him. If an accident was unpreventable, any workman injured by it should be compensated by his employers. A gas company would not be the first to withdraw themselves from such an obligation. He believed they would spend any amount of money to render their plant so safe that their men could carry on their work with perfect impunity.

Mr. WIMHURST, in closing the discussion, said he cordially endorsed the remarks made by Mr. West; and he hoped and believed that a federation of The Gas Institute and Institution of Gas Engineers would take place. Then could follow the insurance, under the amalgamated body, of all the gas-works in the kingdom, at a much cheaper rate than they were asked to pay at the present time.

A vote of thanks was passed to Mr. Wimbhurst for his paper.

#### PLACE OF SPRING MEETING.

A conversation followed as to the place of the spring meeting. According to Mr. Wimbhurst, some of the distant members had complained of the inaccessibility of Peterborough; and therefore, on his motion, it was resolved to visit Cambridge for the next meeting.

#### VOTES OF THANKS.

Resolutions were next passed heartily thanking the District Council for the use of the Council-Room, and the President for the manner in which he had conducted the proceedings.

Following the meeting, the visitors, on the invitation of the President, had a pleasant drive in the surrounding country—passing through some pretty undulating scenery, which must have occasioned surprise to those who had regarded the flatness of Essex as its common characteristic. Shortly after their return to Romford, the members dined together at the White Hart Hotel. The succeeding toasts were interspersed with some well-rendered songs; and altogether the entertainment provided formed a fitting conclusion to a most enjoyable meeting.

**The Examinations in Gas Manufacture.**—The programme of the Technological Examinations of the City and Guilds of London Institute for the session 1898-9 has been published; and, as usual, its pages contain a mass of information which students who intend presenting themselves for examination will find useful for their guidance. In "Gas Manufacture," the examination is fixed for Wednesday, April 26, from 7 to 10 p.m.; and the Examiner will again be Mr. Alfred Colson, M.Inst.C.E., of Leicester. An indication is given of the subjects on which the questions will be based in both the ordinary and honours grade, and also a list of the questions set in this year's examination, as published in the "JOURNAL" for May 10 last. The works of reference recommended will be found on p. 43 of the book; and the names of instructors in "Gas Manufacture" on p. 213. The publishers of the book are Messrs. Whittaker and Co., of Paternoster Square; and the price is 10d. net.



## TRADING BY MUNICIPALITIES.

The question of trading by municipalities is one in which most readers of the "JOURNAL"—occupying as they do positions of various grades in undertakings which are regarded as eminently suitable subjects for municipalization—have more or less a direct personal interest; and therefore three papers which were read before the Economic Science and Statistics Section of the British Association on Monday last week will have some claim on their attention.

The first contribution was by Mr. G. PEARSON, and he dealt with the subject generally under the title of "Municipalities as Traders." Without much preface, the author dropped at once into an exposition of what he considers are modern municipal duties. Drainage was first recognized as a public duty forced on municipalities by the density of the population, to be followed by a public system of cleansing. At a comparatively recent date, a municipal water supply was looked upon as a first step in a downward course leading to the pit of socialism; but few at the present time so regard it. The provision of light at a more recent date stood in the same position; but the advocates of the purchase of gas and electric light undertakings now form a majority in most of the municipal councils. The growth of municipal trading is best shown by the growth of municipal indebtedness, by means of which municipal trading has been rendered financially possible. The loans to municipalities outstanding in the year 1875 amounted to £92,820,100. These outstanding loans had grown by the year 1895 to £235,335,049—an increase of £142,514,949, or at the rate of 153·5 per cent. in the twenty years. The National Debt was in the year 1875 £768,945,757, and had decreased in the year 1895 to £656,998,941, or a decrease of £111,946,816 in the twenty years. It will be seen from these figures that the increase of local indebtedness exceeds the decrease in the national indebtedness by £30,568,133. Mr. Pearson gives a list of the purposes to which the loans representing local indebtedness have been applied. Among the items water-works account for £43,970,490; and gas-works, for £16,931,943. Taking gas, water, and dock works, as three of the largest classes of municipal trading concerns, he finds that the debt now existing (not the sum originally raised, which would, of course, be much larger, the present reduced figures being brought about by the operation of the sinking fund arrangement made in respect of each of these loans) shows the indebtedness at £93,680,425; being about £860,325 more than the total local indebtedness in the year 1875. These figures indicate the great expansion in municipal trading, by showing in some degree the growth of the municipal capital invested in it during the last twenty years; and the totals do not remain stationary. The figures referring to the electric light are very instructive, and show the growth of municipal trading in electric current. Up to the year ending March, 1895, £1,378,818 only had been invested in these undertakings by local authorities; but Mr. Pearson estimates that the capital invested up to the year ending March, 1897, was £4,000,000, and thinks that, by this time, the sum must have grown to nearly £6,000,000.

Having shown the growth of municipal trading as evidenced by the growth of the capital account, Mr. Pearson considers next the extent to which it may be extended to the advantage of the public. He thinks that municipal trading should be confined to the provision of those necessities of civilization which are so large as to be beyond the power of individual effort to supply, and which do not form part of any Government department. The effort of the individual will generally produce more economically than either a company or local authority. But as between a company and a local authority there is, says the author, economically speaking, very little to choose; and corporations can claim to be free from the misappropriations of capital which appear to be incident to the formation of so many of the companies which from time to time come under notice. Thus the cheapness of the price of money when raised on the credit of a local authority as against the dearthness of it when raised by a company must always enable a local authority to trade on a smaller gross profit than a company, and, therefore, requires less to be abstracted from the pockets of the consumers to secure success to the undertaking, whatever it may be. Consequently he is of opinion that the supply of water, gas, electrical energy, and tramways should be in the hands of the local authority. He suggests that, save under exceptional circumstances, all municipal work, such as the erection of buildings and other matters of that kind, should be undertaken by the municipality. Where for any reason whatever there is a lack of outside competition, then these works can generally be carried out more economically and always better by the municipality than by a contractor. There is another point which has to be considered—viz., the formation of "rings" and "trusts," formed with the object of keeping up prices to artificial levels. The only way to meet combinations such as these is for local authorities to face the position and do the work themselves. On the other side, is to be found the question of labour. Local authorities popularly elected are liable to pressure from without, to which the directors of public companies and private individuals are relatively free. Working men have votes, and will use them to serve their own ends precisely to the same extent as other people. But the experience the author has had as a

member of the Sanitary Committee of the Bristol Corporation convinces him that a position of absolute neutrality in respect of all trade combinations, and the acceptance of the services of any competent workman, whether unionist or not, extorts a respect even from those who may be violent partisans either on the one side or the other.

In the final part of the paper, Mr. Pearson asks whether municipalities ought to trade for a profit; and he answers himself in the affirmative. Speaking as a municipal man, he would have very little inducement to trade at all but for the hope of success, with its usual accompaniment, profit. Birmingham, Manchester, and other towns trade at a profit; and he fails to see why they should not—subject only to the condition that they do so on the same lines as ordinary individuals and companies, and that they do not secure a profit by charging at a rate higher than would be charged by a company. As an example, he refers to Bristol, where there are 60,000 ratepayers, and under 1000 users of the electric light. The luxury of private lighting by electricity to the few is rendered possible by pledging the credit of the many; and why, he inquires, should not the many reap some benefit from the risk they run, to say nothing of the actual loss which attended the early years of the undertaking, and which was paid out of the rates levied upon them? He considers Parliament will be wise not to put such restrictions as to profit making as are shadowed forth by the report of the Telephone Committee. They may well leave the question of the amount of the profit to be settled by the natural law of supply and demand. The moment a municipality charges more for an article than it is worth, the public will refuse it.

Reviewing the result of municipal trading, Mr. Pearson thinks its advocates have little to fear. Birmingham, Manchester, Glasgow, and other large towns have shown a very good lead, which it remains for others only to follow. Failures are very seldom reported, for the very good reason that there are few to report. There is one other risk which it is impossible to omit to notice. There may be dishonesty in the official, or, still worse, there may be dishonesty in the Council; but the author thinks the risk is small in each case. So far as officials are concerned, business-like regulations may be made which, if powerless to actually prevent fraud, will most assuredly detect it; and he considers that the personal character and position of the members of the various representative bodies, coupled with the fact that more than one or two must be "in it" in order to secure success, will prevent any serious malpractices by the representatives, even if they were so minded.

Mr. EDWIN CANNAN read the second paper on the question "Ought Municipal Enterprises to Yield a Profit in Aid of Rates?" Such municipal enterprise has, he says, been likened to joint-stock companies; the ratepayers being the shareholders. If the parallel were exact, there could scarcely be any question about the propriety of municipal enterprises yielding a profit, since to make a profit is the object of a joint-stock company. How far then, he asked, did a municipality resemble a joint-stock company? In form the two bodies are very much alike; the management of both being committed to an elected council or directorate, and the ordinary members only interfering on rare occasions directly, though citizens or burgesses exercise far more influence on the decisions of their representatives than shareholders. But the basis of membership is very different. The business of both the company and the municipality is economic work for the benefit of their members; but the company perform services for outsiders and distribute profits in money dividends to the shareholders, while, in performing their ordinary functions, the municipality provide commodities or services for their members directly, and consequently have no opportunity of making profits to be divided among them in money dividends. As far as municipal enterprises are concerned, however, the position of the municipality resembles that of the company much more nearly. Municipal enterprise is distinguished from ordinary municipal work by the fact that the commodities or services which it provides are supposed not to accrue to the citizens approximately in proportion to the rateable value of the property with which they are connected, so that it is considered necessary to charge for them by methods and standards different from those which regulate the levying of rates. By hypothesis, then, the business is no longer a merely "mutual" one, in which each member receives direct benefit in proportion to his share, but a business like that of an ordinary company. The municipality ought to be allowed to make a profit for the same reasons as a company are allowed to do so: (1) In order that they may have some inducement to undertake the enterprise which they would not have if they must take all risk of loss and no chance of gain; (2) in order to secure efficient management; and (3) in order that the economic proportion in the production of different commodities may not be disturbed. The arguments against profit-making in municipal enterprise seem to be founded on an antiquated socialism or on a false analogy, either from co-operative institutions or from ordinary municipal work. That there may be cases in which it is not economically desirable that the highest possible profit shall be made is probable, but these cases are less frequent than is supposed; and since when they do occur the damage must be much greater to the locality than to the country in general, and



also be tolerably obvious, there appears to be no need to restrict the freedom of the locality.

Mr. W. M. ACWORTH read the third paper, on "Rectification of Municipal Frontiers," in which he considered certain recent developments in the life of our great towns tending in the long run to an important readjustment of frontier between private and municipal enterprise. Gas and water supply has, he observes, long been regarded on the ground of their general necessity as natural subjects for municipal ownership. Oddly enough, however, it was reserved for a commercial Company—the South Metropolitan—to make gas really available in the poorest house by the adoption of the penny-in-the-slot system. But with the rapid advance of rival methods of lighting, petroleum, electricity, and now perhaps acetylene, coal gas is much less a general necessary of life than it was. Simultaneously there has been a rapid advance in the use of coal gas as a source of power; and in America they are building gas-engines of 700 and even 1000 horse power. It can hardly be contended that municipal management, with its inevitable rigidity and slowness of method, is better fitted than private enterprise to supply gas power in competition with power derived from other sources. The supply of water few will deny in the abstract to be a natural subject for public ownership. For all that, the question of delimitation of frontier, not between private and municipal ownership, but between the rights of different local authorities, arises in this matter also. For example, the position of the Water Committee of the Birmingham Corporation is, from one point of view, hardly constitutional. They are responsible wholly to the ratepayers of Birmingham, while to the residents 100 miles away in the sequestered Elan Valley they appear in the capacity of universal landlord and sole employer of labour, not to mention sole publichouse-keepers. But it is not by water that the boundaries of municipal enterprise are likely to be undermined. A House of Commons Committee have just reported that competition in telephone service is desirable, and that where the Post Office does not compete with the National Telephone Company licences might reasonably be granted to the local authority. So, as the Corporations of Edinburgh and Glasgow have already applied for telephone licences, municipal telephones will soon probably be tried on a considerable scale. Electric lighting has from the outset been a mixed service, in the hands here of a company, and there of a municipal corporation, subject to this—that the corporation have always been given the refusal before the company were admitted. But in practice the competition has been of companies *inter se*. Last session, however, saw a change. Two local authorities sought, and one of them obtained, statutory power to compete within their district with companies already in possession of the field. But, seeing that the companies possess greater elasticity and adaptability of management, and are not hampered by municipal—which are very often non-natural—boundaries, in some cases the competition will probably be ineffective. In the conclusion of his paper the author submitted that the ever-increasing complication of civilization and the ever-increasing specialization of science, coupled with the ever-increasing interdependence of independently organized local government districts, all tend to a re-adjustment of the boundaries of direct municipal activity.

**"Light v. Illumination."**—The "Holophane" Company have prepared a useful pamphlet setting forth in plain, yet scientific, language the correct principles of the use of high-power lights for interior and street lighting. The pamphlet is beautifully illustrated from photographs, some of the figures showing new and elegant forms of gas-fittings adapted to the "Holophane" system of light-diffusion. Copies of the pamphlet are to be had by gas engineers on application to the office of "Holophane," Limited. This is a little work well worth having, for the sound information it contains respecting practical lighting by the most modern appliances.

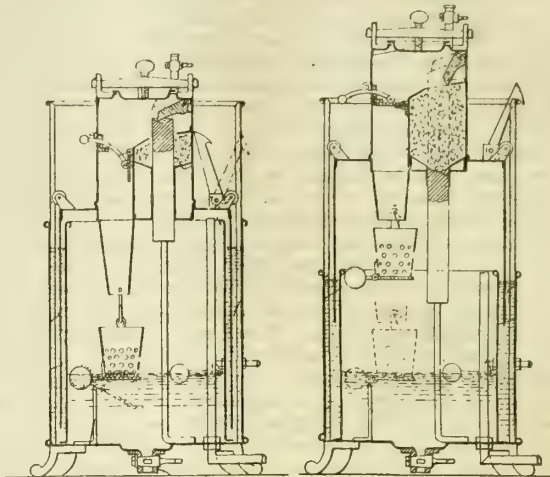
**Manchester Association of Engineers.**—The Committee of this Association have prepared an interesting programme for the forthcoming winter session, which is to be opened on Oct. 8. Several papers dealing with the question of motive power are to be read during the session. Mr. A. R. Bellamy is to contribute a paper on "Gas-Engines as Motive Power in Engineering Works;" Mr. Henry Hodgson will deal with "Modern Steam-Engine Practice;" and Mr. J. S. Raworth will state his views on "The Generation and Electrical Distribution of Motive Power." "Gas Exhausting and Gas Exhausting Plant" is to be the subject of a contribution by Mr. R. Hargreaves, of Blackburn.

**North of England Gas Managers' Association.**—Arrangements have been made for the holding of the forty-third half-yearly meeting of this Association at Sunderland on the 1st prox. The members will assemble at 11.15 at the gas offices, where conveyances will be in readiness to take them for an inspection of the Gas Company's station at Hendon. Returning to the offices, after an absence of about two hours, the members will transact the business of the meeting in the Board-room. The principal items on the agenda are the Inaugural Address of the President (Mr. C. Dru Drury, the Engineer of the Sunderland Gas Company), and a paper by Mr. J. Holliday, of Scarborough, on "The Policy of Discounts." The Chairman and Directors of the Sunderland Gas Company have invited their visitors to dinner at the Palatine Hotel in the afternoon.

## REGISTER OF PATENTS.

**Generating Acetylene.**—Barnard, E., of Christchurch. No. 19,319; Aug. 20, 1897.

The object of the present invention is "to automatically feed the calcium carbide to water in such manner that only a small proportion at a time will be moistened, and that a small quantity will be brought into contact with the water when the volume of gas in the holder becomes exhausted or decreased, and will be instantaneously removed from the water as the volume increases, so that an extremely sensitive apparatus will be obtained, and only a small body of calcium carbide at a time will be dealt with."



In carrying the invention into effect, a generating chamber (as shown) is employed, consisting of an open topped vessel containing a quantity of water automatically supplied. Into this chamber is introduced a cylinder or bell, closed at the upper end and open at the lower end. In an upward extension of the bell (which may be of smaller diameter) is arranged a reservoir of calcium carbide, adapted to be supplied through a hermetically closed door at the upper part of the extension. The reservoir is fitted with a rod, which passes through a hole in the bottom downward to the bottom of the generating chamber, so that, as the bell descends by gravity, the upper part of the rod will push a charge of carbide over the top edge of the reservoir (or actuate any other suitable feed device), and will thus, each time the bell descends, feed a charge of carbide from the reservoir into a shoot discharging into the generating chamber.

Beneath the shoot, and within the generating chamber, is arranged a perforated bucket suspended from the bell, so as to rise and fall with it. This bucket, the normal position of which is at some distance above the water-level, receives a charge of carbide from the shoot when in that position. In this way, as the bell slowly descends, a charge of carbide will be fed from the reservoir into the shoot and fall into the bucket, which in the continued descent of the bell will partly enter the water in the generating chamber. Thereupon gas will be generated—raising the bell; and the bucket, with its small charge, will be lifted clear of the water, so that only a small quantity of gas will be generated from the partially moistened carbide. The apparatus continues to act in this "automatic and sensitive" manner, regulating the supply of carbide according to what gas is required, so long as any carbide remains in the reservoir.

The apparatus is provided with a valve or shutter, adapted to be actuated from the outside of the extension of the bell, so that the shoot may, when the apparatus is not in use, be effectually closed against moist vapour which might rise into the shoot from the generating chamber.

In order to get rid of the residual spent carbide from the bucket, the bottom of it is hinged to it, and normally held closed by means of a counter-weight which, on the descent of the bucket near to the bottom of the generating chamber upon the exhaustion of the gas from the holder, is tripped by a projection so as to discharge the spent matter into a sink formed at the bottom of the generating chamber, and provided with a discharge opening controlled by a valve, through which the matter may be drawn off from time to time.

The illustrations are a vertical transverse section of the plant, showing the holder in its depressed position, and a slightly modified apparatus (the dimensions of the carbide reservoir being increased) with the holder in its raised position.

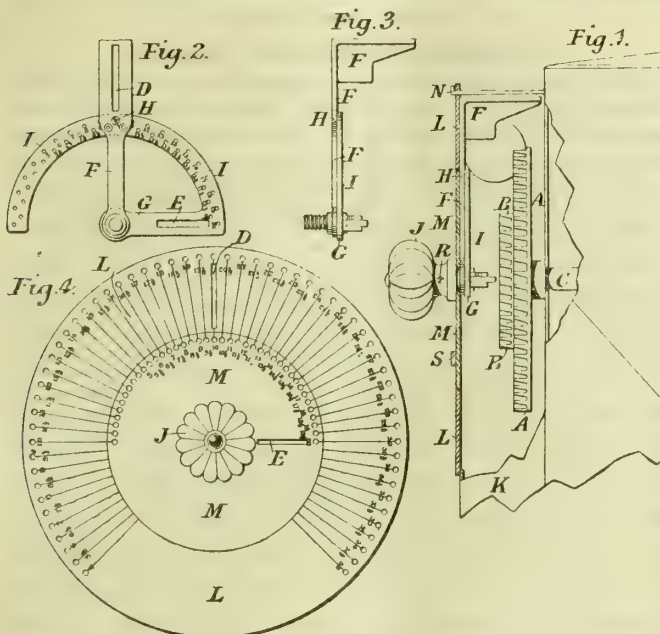
**Coin-Freed Gas-Meters.**—Glover, R. T. & J. G., of St. John Street, Clerkenwell. No. 20,509; Sept. 7, 1897.

This invention has for its object to so arrange the coin-actuated mechanism of a gas-meter, that a consumer may obtain either a penny-worth or a halfpennyworth of gas at will, according to the value of the coin inserted, or any other two coins that may be desired. This is attained by employing two notched discs of different diameters (but preferably having the same number of notches), the larger one so disposed in relation to the coin-slot as to be actuated by pennies only, and the smaller by halfpennies only; the money-pocket in either case being so constructed that a smaller coin will pass through without enabling the consumer to actuate the supply-valve. The halfpenny pocket is adjustable upon the penny pocket (of which it practically forms a part); and there are two price-changer plates of the kind described in patent No. 25,272 of 1894—one in connection with the penny and the other in connection with the halfpenny pocket, and one being for regulating the position of the penny coin-slot and the consequent amount of movement of the mechanism after the insertion of a penny, the other for regulating the position of the halfpenny slot and the consequent movement of the mechanism for a halfpenny, "each plate, as well as the halfpenny pocket, being numerically divided to ensure promptness and accuracy in setting."

Fig. 1 is a part sectional elevation of a gas-meter showing the two



ratchet or notched wheels A B, on the meter-mechanism spindle C, so that the respective notches can receive the predetermined coins when inserted in the slot D or E of a double-pocket appliance F G (shown in face view in fig. 2, and side view in fig. 3), adjustable one part to the other, and affixable by a set-screw H. In the form shown, the smaller pocket portion has a quadrant shaped band or plate I, with a double set of holes, and with full and half numerals as a guide for adjustment according to the desired quantity of gas to be given for the respective coins, preferably a penny and a halfpenny. Either coin alone can be used; and then the handle J can be turned to bring the coin-pocket round to a fixed stop (not shown) for the release of the coin, which then falls into the bottom of the casing K as the till.



In conjunction with the coin-receiving appliance, a ring-plate L is employed, which can be suspended from any one of the holes near the periphery on the hook N of the casing (as described in the earlier patent referred to), which plate, marked with numerals, as indicated in fig. 4, has radial lines coinciding with the holes and numeral markings of the quadrant plate I, and also of the circular plate M. This is a cover plate to the quadrant I and screw H, and presents a flush face to the meter casing; the coin-receiving appliance D E F G H I behind alone moving when the knob J is operated. The back of the ring-plate L has a stop-piece next its slot, to limit the reverse travel of the coin-pockets and locate them for receiving purposes.

Supposing 25 cubic feet of gas have to be supplied for 1d., the plate L would be unshipped from the hook N and be re-hung from the rim-hole having the numeral 25 under it. This would throw the penny slot D and pocket F farther to the left of the vertical centre. The smaller plate M would then be detached and shifted for its numeral 12½ to coincide with the numeral 25 of the plate L, which would bring its slot-pocket E about mid-distance between the penny slot and the fixed stop for allowing a movement being given to the hand-knob J for half the distance that would be necessary if a penny had been placed in the penny slot. The discharge of the coin in either case is effected automatically when the pocket containing the coin strikes against its fixed stop. Thus if 25 cubic feet of gas be allowed for 1d. inserted, or 12½ cubic feet of gas for each ½d. inserted, the knob J would in each case have to be travelled a greater distance than if only 20 or 10 cubic feet respectively had to be allowed. Consequently the gas-valve would be moved to a greater distance in proportion.

Then, again, in districts where gas is sold at 30 cubic feet for 1d., the plate L would be hung from the hole over the numeral 30, which would place the coin-receiving slot D and pocket F further downward to the left of the vertical centre; and the plate M would also be shifted for its numeral 15 to coincide with the numeral 30 of the plate L for the reception of ½d. for 15 cubic feet of gas. The plate M being fixed in a corresponding manner, its numerals will show the consumer that the quantity to be supplied is half that given for 1d. The plate M has the advantage, as a cover plate, to protect the screw H from being surreptitiously tampered with.

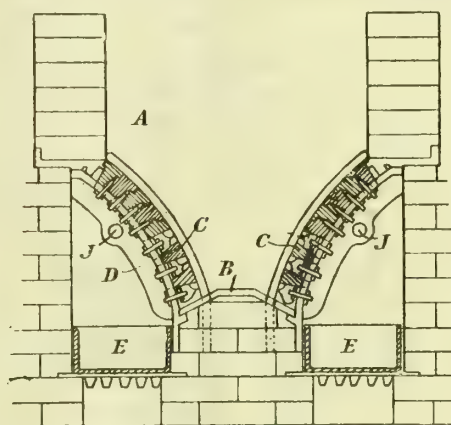
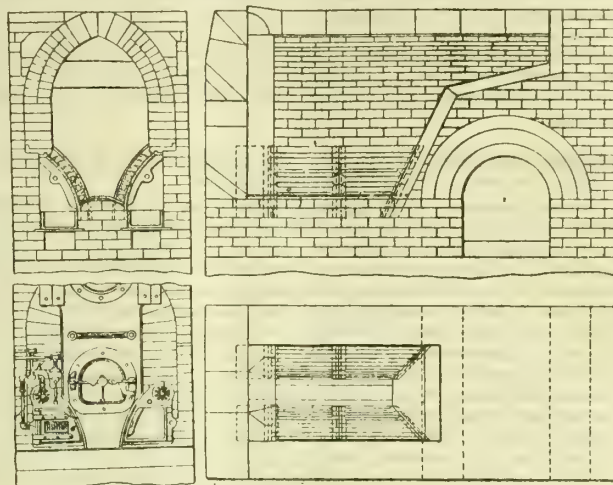
#### Gas-Producers.—Hislop, G. R., of Paisley. No. 22,518; Oct. 1, 1897.

These improvements in gas-producers consist in combining with a solid hearth of reduced width a series of bars or plates resting on bearing-brackets, rising at a suitable angle so as to form inclined gratings on either side of the solid hearth, and extending therefrom to the brickwork sides of the producer at a suitable height above the solid portion of the hearth.

The illustrations show a transverse vertical section, a longitudinal vertical section, a front sectional elevation, and a sectional plan of the producer; also a view to a larger scale of part of the first section.

The producer A is formed with a central solid hearth B of reduced width; and the bottom is formed by combining with this reduced hearth a series of bars or plates C, resting on bearing brackets D, rising at an angle so as to form inclined gratings on either side of the solid hearth B extending upwards to join the brickwork sides of the producer. The bars or plates C (laid in any convenient position horizontally or vertically) are provided with slits or equivalent means for the passage of air and steam to the fuel in the producer—brick lining being dispensed with. The rising sides are either straight or more or less curved inwards to give rigidity to the bearing brackets, and provide a larger area beneath for ash and the water-pan chambers E, which are constructed under the angled base of the producer, and into and through which air and steam

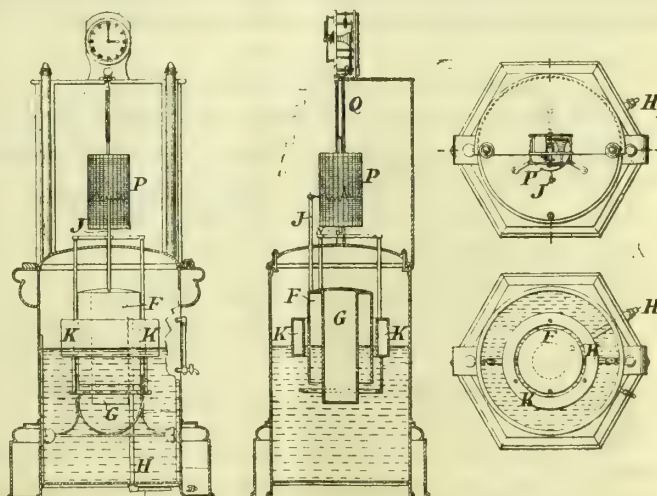
are supplied to the producer—either induced by the draught of the chimney or forced by a jet of steam or an air-blower. For this latter purpose the chambers E are enclosed with air-tight doors, and to which a suitable blowing device is connected by pipes terminating in adjustable discs or grids, for supplying and controlling the amount of air and steam that may be necessary under varying circumstances and for the production of any desired temperature.



The bars forming the inclined gratings on each side of the hearth are preferably divided into two or more lengths, and are secured at their ends in recessed or pocket brackets built into the brickwork, and immediately or at their mid points by removable staples or catches engaging the bearing brackets D, and the projections formed on the under sides of the bars C. The inclined gratings C extend from the hearth B to within some distance of the vertical brick sides of the producer, so as to admit air and steam into the body of the fuel within the producer; but in proximity to the brick walls they are replaced by solid plates or checked bars, which prevent the flow of air up the sides of the brickwork and outside the body of fuel. A water-pipe J extends along the under side of each of the inclined gratings, from which water drips into the ash-chambers E.

#### Pressure Recorders for Gas.—Glover, R. T. & J. G., of St. John Street, Clerkenwell, E.C., and Stagg, W., of Bristol. No. 24,159; Oct. 19, 1897.

This apparatus for registering and recording the pressure of gas in gas-works and other places, is designed to ensure a true register at whatever height the water or other liquid may be in the container, by connecting the recording drum to a float or floats and arranging same in connection



with the revolving and timing mechanism so that it is able to move up and down, and at the same time revolve, and thus be always in register with the marking instrument.

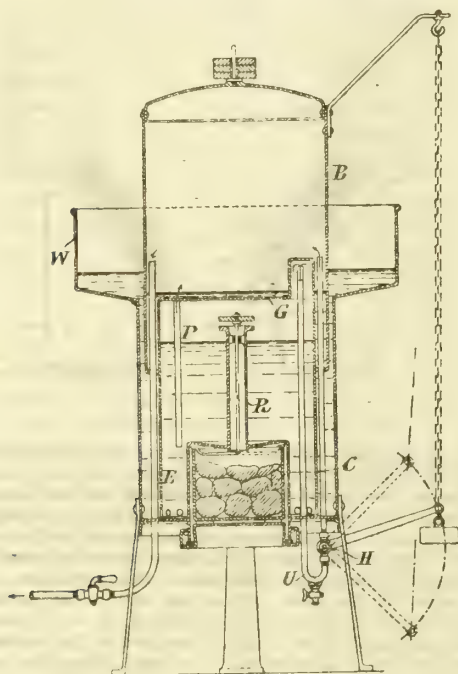
F is the main float, with its open bottom dipping in water, but with



a central drum G to ensure the requisite buoyancy. H is the gas-supply pipe carried up within the float above the water-line, for raising the float by gas-pressure. There is a pencil on the rod J projecting from above the float F, and allowed an up-and-down motion as the pressure of gas varies. K is a band float surrounding the main float F, but free to rise and fall independently of it. The float K is surmounted by rods connected by a cross bar, on which is a stepped pivot carrying a vertical rod with paper-wrapped drum P, the upper end of the rod being free to rise and fall in a slot of the bar Q, the upper end of which carries a bevel wheel operable by the clock to rotate it and the drum P. The paper on the drum is marked with hour divisions and horizontal minute lines, as the recorder of variations of gas pressure and a time recorder as the variations occur.

**Producing Acetylene.**—Ernst, O., and Philips, A., of Hochst-on-the-Main, Germany. No. 12,510; June 3, 1898.

In a water-reservoir W the generator E and gas-collector G (which is open below) are fixed, in such a manner as to leave an open space between the collector and reservoir, for the purpose of introducing a moveable gas-holder B. The generator communicates with the collector by a tube R, provided with a valve arranged in such a manner as to open on the carbide box C being introduced into the generator, and close again on the box being taken out. This object is attained by the following contrivance: To the valve a stem is attached, by which it is raised whenever the box C is introduced. This may be carried out by providing the stem at its lower end with several lateral supports, which rest loosely on the edge of the carbide box as it stands on the under lid. Consequently the valve is only open as long as the carbide box remains in the apparatus. If the box containing the consumed carbide residues be taken out, the valve drops and closes the tube R (and consequently also the apparatus) against any escape of gas or water, until a fresh box is introduced.



The regulation of the apparatus is automatic, and is carried out according to the principle of displacing water; the water being pushed down by the developed gas so as to set free the upper opening in the pipe R from water, until the gas stored is let off.

The gas is conveyed by the pipe U from the upper part of G into a moveable holder, by the rise and fall of which the tap H is regulated automatically. The moveable holder is (as already stated) best introduced into the space between the collector G and the reservoir W. If the tap H be closed, the gas subsequently developed is stored in the collector, and before reaching the lower part of it is likewise conveyed into the moveable holder by a pipe P, specially attached for the purpose.

#### APPLICATIONS FOR LETTERS PATENT.

- 18,926.—BROOKS, F. H. V., "Everlasting incandescent chimney." Sept. 5.  
 18,932.—PERL, J., "Production of continuous and durable platinum gas-lighting pellets for illuminating gas." Sept. 5.  
 18,943.—SÖDERQUIST, R., "Production of acetylene gas." Sept. 5.  
 18,944.—BORCHARDT, H., "Automatic gas-igniter." Sept. 5.  
 18,997.—HAIGH, B., "Carburetted air." Sept. 6.  
 19,061.—LLOYD, G. H., "Gas-engines." Sept. 7.  
 19,064.—CAMPBELL, D., "Gas or oil heater." Sept. 7.  
 19,086.—SUGG, W. T., "Burners for acetylene gas." Sept. 7.  
 19,087.—CRAWLEY, C. W. S., "Illumination photometer." Sept. 7.  
 19,106.—HANSEN, G., and KRAEFFTING, A., "Generator for acetylene gas." Sept. 7.  
 19,130.—BREWIN, J., and RODGERSON, J., "Water-meters." Sept. 8.  
 19,134.—HOLLOWAY, G. T., "Acetylene gas-burner." Sept. 8.  
 19,149.—GOODWIN, J. S., "Acetylene generators." Sept. 8.  
 19,167.—LÉRY, J. B. DE, "Burners for incandescent gas lighting." Sept. 8.  
 19,228.—EVANS, E., and WRIGHT, J. W. B., "Governor for acetylene and other gases." Sept. 9.  
 19,230.—GEDGE, W. F., "Acetylene gas-generators." Sept. 10.  
 19,307.—VIETINGHOFF-SCHEEL, K. VON, "Gas-lighter." Sept. 10.  
 19,323.—PRICE, A. W., "Production of acetylene." Sept. 10.  
 19,331.—BIHELLE, S., "Burners for incandescent gas-lights." Sept. 10.

## LEGAL INTELLIGENCE.

### The Yeaton Gas-Retort Company, Limited.

Mr. Justice Phillimore, sitting as Vacation Judge, has had before him an application, by a debenture holder (Mr. Richardson) in the Yeaton Gas-Retort Company, Limited, for the appointment of a receiver and manager of the Company. It was stated that the plaintiff held £250 worth of debentures. Mr. Frank Russell appeared for the Company, and consented to the appointment of Mr. John Stephen Barrow. His Lordship made the order.

### Gas Exhibition Attendants as "Hawkers."

At the Alresford Petty Sessions on Thursday last, Mr. Sydney Percy Thornton, of Leicester, agent for Messrs. Richmond and Co., gas-stove manufacturers, of Warrington and London, was charged by the Commissioners of Inland Revenue with having traded as a hawker on June 3 last at the Town Hall, Alresford, without having in force a hawker's licence, as required by 51 & 52 Vict., cap. 33, section 2, which enacts that a "hawker" includes any person who travels by any means to any place in which he does not usually reside or carry on business, and there sells or exposes for sale, any goods, wares, or merchandize in or at any house, shop, room, booth, stall, or other place whatever, hired or used by him for that purpose. The defendant pleaded "Guilty." Mr. D. Enright, Supervisor of Inland Revenue at Winchester, prosecuted. He pointed out that, without hawkers' licences being in force, ordinary traders, who pay local rates and taxes on their business premises, would be at a great disadvantage; and considering the importance of the firm represented by defendant, and the extent to which they carried on this kind of business, he pressed for a substantial penalty. Mr. W. W. Horn, officer of the Inland Revenue at Alresford, stated that on the 3rd of June there was an exhibition of gas-stoves at the Town Hall, Alresford. He visited it, and purchased an enamelled iron pan and wire frying basket from a stall on which were other articles exposed for sale. The defendant informed him that, although Messrs. Richmond and Co. were the makers of the gas-stoves, they did not make the other cooking utensils. He further stated that he should have to account to Messrs. Richmond for the sale of the utensils; but he was unable to produce a hawker's licence either in his own name or that of the firm. Defendant also stated that his firm sometimes had about twenty similar exhibitions in one week. Neither defendant nor his firm usually resided in the town. In reply to the Bench, Mr. Enright said a separate hawker's licence would be required for each agent so trading. Defendant, who said he acted in ignorance, as it was a custom of the trade, was fined £5 and costs.

### Plundering Prepayment Gas-Meters.

"It would seem that the penny-in-the-slot gas-meter, rapidly as it has made headway among a certain class of consumers, and satisfactory as it has no doubt proved to the companies, has much to answer for as an encourager of crime." This was the comment of the "Daily Telegraph" on a case which came before Mr. Plowden, at the Marylebone Police Court, on Monday last week. The Gaslight and Coke Company were interested in the matter; and Mr. Humphries, who represented them, stated that, since the introduction of the prepayment meter system, hundreds of robberies had been committed, in many instances by consumers themselves, who, in hard-up times had been tempted to break into the unguarded money-box on the premises; but more often by practised thieves, who, aware that "slot" meters were not infrequently placed in the coal-cellar or pantry in the front area, went in the night, and, burglariously breaking the meters open, despoiled them of the copper coinage they contained. The person charged in the present instance was William Holden, a youth of seventeen; and he was accused of robbing a Mr. Taylor, who keeps a lodging-house in Albany Street. The evidence of the prosecutor was to the effect that he slept in the basement of the premises, and that at about three o'clock one morning he got out of bed; and, thinking that the supply of gas was running short, he went into the area and put two pence in the slot. Before falling asleep again, he heard footsteps in the area, and, going to see who it was, found prisoner and a man there. He seized prisoner and thrust him into the coal-cellar; and, while he was doing so, the man somehow escaped, although the depth of the area to the railings that guarded it was fully 7 feet. Seeing that one of two meters that were there had been broken open and the money-box taken out, he called a constable, and gave the prisoner into custody. The constable testified to having found that the patent padlock had been forced off one of the meters, and the money-holder taken out. It appeared that operations had been commenced on the other meter, for inserted in its padlock was an iron spike, with a piece of rag wrapped round one end of it to afford better holding in using it. The spike and the broken padlock were produced in Court, and a novelty in the way of burglarious implements in the shape of a long pair of leather driving-reins. It was by means of these that the descent was made into the area; one end being buckled to the railings at the top, making it easier for a person to climb down and up again. It appeared probable that the thieves had been successfully at "work" before they invaded Mr. Taylor's premises, since, although according to the prosecutor's calculations there could not have been more than about 4s. in the meter broken open, 8s. 2d. was found on Holden—all in penny pieces, and without a single halfpenny in the collection. Prisoner, who acknowledged his guilt, was remanded in order that the police might make inquiries.

At the Longton Borough Police Court last Saturday week, two boys—Harry Burgess and Frank Bedson, aged eleven and ten respectively—were charged with stealing money from prepayment gas-meters belonging to the Corporation Gas Committee. It was stated that the lads had entered four vacant houses by breaking the kitchen windows; and, having smashed the meters with bricks, robbed them of the money they contained. The accused were said to be beyond the control of their parents; and the Magistrates committed them to an industrial school until they attain the age of sixteen years.



## MISCELLANEOUS NEWS.

## SHEFFIELD UNITED GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held last Tuesday—Sir FREDERICK T. MAPPIN, Bart., M.P., in the chair.

The GENERAL MANAGER and SECRETARY (Mr. Hanbury Thomas) read the notice of meeting; and the report and accounts—summarized in the "JOURNAL" for Aug. 16 (p. 385)—were taken as read.

The CHAIRMAN, in moving their adoption, said they met, as usual, under very satisfactory circumstances, for although a reduction in the price of gas had been in force during the last three months of the half year, the Company had earned more than the customary dividend. The total net revenue was £41,421 14s. 2d.; and after allowing for dividends amounting to £41,395 3s. 6d., there was a balance of £86 10s. 8d. On the last occasion of their meeting, he stated that the reduction of 2d. per 1000 cubic feet which was then about to be made, would make a difference of something like £18,000 or £19,000 per annum; but the very satisfactory working and the increase in the sale of gas during the half year left the Company with a balance of £86 10s. 8d. over the usual dividend, instead of with a deficiency, as he and his colleagues had anticipated. The balance to carry forward for the present half year was £21,992 1s. 7d. During the last three months, the price of gas had been 1s. 6d., 1s. 8d., and 1s. 10d. per 1000 cubic feet. The reserve fund was at its maximum—£86,192 13s. The results of the half-year's working had been somewhat as follows: They had received more for gas by £1165; in the fitting department, £581 more; and sulphate of ammonia had realized £1871 more than during the corresponding half of the year 1897. On the other side, they had expended more for coals by £2099, having paid an advance of something like 4d. per ton on the purchases for the past twelve months; salaries showed an increase of £1439, including the bonus of 10 per cent. which the Company gave to the staff on all occasions when the gas had been lower than it had been supplied at previously. They had received £910 less for tar; and the repairs of mains had cost more by £987. The dividends were more by £1560; and after allowing for all these increases or decreases of payments and receipts, there was, as he had said, a balance of earnings over and above what was required for dividend at the usual rates. The quality of the gas had been fully maintained; and 876 tests showed an average of 17.79-candle power. The gas sold during the last six months had been 1105 million cubic feet, an increase of 50 millions. This was evidence, he thought, that the Board did not decide to build new works at Grimesthorpe before it was time to do so. The leakage had been 44½ millions, equal to 3.87 per cent., which was rather less, perhaps, because the state of some of the meters had been taken a day earlier or later than usual. During the six months 39 additional gas-engines had been fixed; they had sold 357 gas-fires and 393 boiling and other stoves; and 49 additional cooking-stoves had been let on hire. The gas-engines in 1892 consumed 33½ million cubic feet in the year; but in the last twelve months this had increased to 100½ million cubic feet. The growth thus indicated in the use of gas-engines would, he thought, continue, and at a still greater rate as the citizens found out the advantage and economy of using these machines. Gas-engines gave far less trouble, and he believed that for ordinary work they were far more economical, than any other mode of obtaining power. The capital expenditure of the Company had now been £823,814 19s. 2d.; and they had expended during the past half year £31,440 6s. 11d. The large works the Company had been erecting during the last two years at Grimesthorpe were now approaching completion; and the expenditure was very heavy, as the Board had discovered by the cheques they had had to draw that morning. They hoped in a few weeks that they would be making gas at Grimesthorpe; and when this was accomplished any anxiety the Board might have felt as to the coming winter would be removed. It was their duty to be prepared for all weathers, and for any demand that might be made upon them by the inhabitants of Sheffield; and he thought he could say they had fulfilled it. The number of consumers was now 54,757; and of meters fixed, 55,709. They had 426 miles of mains laid, from 2 inches to 4 feet in diameter. During July and August, the gas they had sent out showed an increase of 21,974,000 cubic feet over the quantity for the same months of 1897—an increase equal to 9.9 per cent. Some of the shareholders would no doubt have noticed the incandescent burners now being fixed in the large lamps in the principal streets of the city. Each burner gave a light equal to from 80 to 90 sperm candles, and consumed only 4 cubic feet of gas per hour. The lamps had four burners each, giving a light equal to 350 candles, and consuming 16 cubic feet of gas per hour, which cost only 0.28d.; so that each of these large lamps with four incandescent burners, burning 3½ hours, would cost the Corporation only 1d. After midnight the arrangement was that only one burner was to remain lighted; and for the remainder of the night, accordingly, only one burner was consuming gas, and giving something like 80-candle power light. This one light could burn for 14 hours for 1d. Surely it could not be gainsaid that gas had come to benefit the whole community, when a beautiful light like that he had described could be supplied in the streets of the city for such a small price—a price which he thought nothing in future could excel. No chimneys were necessary for these improved burners; and so far as the Company's experience went, they found that four or five mantles per burner a year were all that were required for these street-lamps with the new burners. The light was increased four-fold; and he thought all who had seen it would agree that he was not exaggerating its advantages in what he had said. A short time ago he saw the following article in one of the Sheffield journals: "Then companies work for dividends, but municipalities have no dividends to consider; they work for the common weal, and they work under vigilant observation. We know of no one instance in which the transference of gas-works from trading companies to the municipal authorities has not been to the marked gain and the unalleged satisfaction of the community in which the change has taken place. If anyone knows of a case to the contrary, we invite him to name it." Well, as Chairman of the Sheffield Gas Company, he thought he was entitled to say something upon this subject. The other day he read

in the "JOURNAL OF GAS LIGHTING" a short extract from the "Birmingham Daily Post;" and it stated that the price of gas was last reduced in Birmingham in 1884, to 2s. 7d., 2s. 5d., and 2s. 3d. per 1000 cubic feet, subject to 5 per cent. discount, and that from July 1 this year a reduction of 1d. per 1000 cubic feet is being made. The quality of the Birmingham gas was last year 17.21 candles, whereas the Sheffield gas was 17.77 candles. Nottingham gas was 18.97 candles—rather more than 1-candle power better than Sheffield. The Corporation of Birmingham purchased the gas undertaking there in 1875; and the Nottingham Corporation purchased theirs in 1874. In the "JOURNAL OF GAS LIGHTING" of Aug. 30, it stated that there had been practically no change in the price of gas at Nottingham since 1882, when it was fixed at 2s. 6d. and 2s. 4d. per 1000 cubic feet, at which figures it still remained. In 1883, the Sheffield Gas Company's charges were 2s. 4d., 2s. 2d., and 2s. per 1000 cubic feet; the prices now charged were 1s. 10d., 1s. 8d., and 1s. 6d.—a reduction of 6d. per 1000 cubic feet to both small and large consumers. Sixpence per 1000 cubic feet, calculated on the present consumption of gas in Sheffield, amounted to £56,000 per annum; but it must be borne in mind that the gas sold in Birmingham was more than double the quantity of that sold in Sheffield. This 6d. per 1000 cubic feet, on the quantity sold in Birmingham in 1897, amounted to £125,446, which was the amount the consumers of gas in that city had to pay in excess of what they would have had to pay had the same reductions been made in Birmingham as in Sheffield. It was true that in 1897 £54,336 was appropriated in aid of the rates; but this sum was a tax which consumers of gas had to pay, in addition to the usual rates and taxes. It was therefore apparent that Sheffield gas consumers had been more fortunate in deriving their gas supply from a company than the consumers in other large towns where the works were in the hands of the corporation. He maintained that cheap gas must certainly be a very considerable advantage to the manufacturers and working classes of the town. He had thought it his duty to say something upon this subject, as continual remarks—and not friendly remarks or fair criticisms—were being made about the Company, and one could not help replying to them when the opportunity occurred. They would all remember that in 1869 the Sheffield Corporation had a Bill in Parliament to purchase the gas undertaking; and the Committee having heard the evidence in favour of the Bill, without asking the Sheffield Gas Company to make any reply, or to put in any evidence to answer the evidence given by the Corporation, rejected the Bill. During the hearing, before the Bill was rejected, the representatives of the Corporation offered to purchase the undertaking of the Company, and guarantee them 9 per cent. At that time the shareholders were receiving 10 per cent., and had continued doing so ever since; and he thought they were likely to get it in the future. It was not likely that the Directors would listen to any such proposal. Had there been liberal-minded men who knew something of the future, and looked to the progress of the city, they would have dealt with the Company in a very different way. Recently, during a short holiday at Folkestone, the weather was very hot; and the rooms he occupied were lighted by electricity. It was often said by the partisans of the electric light that there was no heat in it. His experience at the rooms in Folkestone told him something very different. In the sitting-room there were three electric lights; and the heat from them, in addition to the heat of the atmosphere, made the room unbearable. They had to turn off first one light and then another, and order candles to read by. In the bedroom it was the same; and as the two lights there were worked together, he had to have them both out and substitute candles before the air in the room was anything like bearable. There were gentlemen who spoke very highly of the light for its cleanliness, in which respect they said it was far superior to gas. He did not know that this was quite a correct statement, for even with the electric light they saw that the tops of the ceilings where it was used were blackened pretty much the same as when gas was used. The great thing was to have a better atmosphere. Whether they had gas or electric light, the heat drove the smoke and grime of the atmosphere to the top of the ceiling and on to the walls of the rooms; and they could depend upon it that heat was one great cause of this. At the Sheffield Club in Norfolk Street, it was said, when the electric light was adopted six or seven years ago, that the premises would no longer present the same dirty appearance. Nevertheless the walls had been washed and scraped every year since that time; and in the seventh year it had become necessary to repaint the whole of the premises. He maintained that this necessity had not arisen either because of the electric light or of the gas light, but because of our shockingly dirty atmosphere. In conclusion, he referred to the remarks he made at the previous meeting about the shopkeepers of the city taking advantage of the cheap gas, and not closing up the windows of their places of business on holidays or early days. He still thought it would be a very wise thing for the shopkeepers of all large cities to spend some time and some little money upon the arrangements of their gas apparatus, so as to give a beautiful light and display their goods to advantage. In his opinion, it was as cheap a kind of advertisement as they could have. He did not know that he had anything further to say, except that, as usual, he believed the gas undertaking was as healthy, and, indeed, in as prosperous a condition, as at any time since he had been associated with it.

Mr. EBENEZER HALL seconded the motion, and it was carried without any discussion.

Mr. JOHN WILSON again urged the Board to abolish or materially reduce the rental charged for the meters of small consumers. At the same time he expressed his belief that the Company was "one of the best companies in the universe;" and he styled himself one of the oldest gas consumers in Sheffield, having used it for 57 years. At the beginning of that long period it cost him 8s. 4d. per 1000 cubic feet, and now it was only 1s. 10d.

The CHAIRMAN promised that the Directors would bear Mr. Wilson's advice in mind; but he could make no rash promise that they would accede to his request. Answering an inquiry as to the applicability of the new incandescent burners for household uses, Sir Frederick said the new type of burner would certainly be applicable. The demand for the burners was so great at the present time that the Company had not been able to secure all they wanted, even for the streets. Very shortly he hoped to try the new burners in his own house.

The retiring Directors (Sir Frederick Mappin, Dr. Sorby, and Mr. T. H. Waterhouse) were then re-elected; and a vote of thanks to Sir Frederick for presiding concluded the proceedings.



## THE PRICE OF GAS AT SWANSEA.

## Purchase of the Gas Company's Works Suggested.

A passage from the speech of Sir Frederick Mappin at last week's meeting of the Sheffield Gas Company, in which he referred to the charges for gas in Sheffield and Birmingham, suggested to "The Cambrian" that the consumers of Swansea were paying far too much for their supply; and so in Friday's issue an attempt was made to incite the ratepayers to make "a strong effort to remedy this condition of things." Our contemporary points out the direction in which it considers this could be done, when it asks, Would it not be advisable to purchase the gas-works, so that the public might receive a portion of the large profits now realized? The article then proceeds. "It has occurred to many intelligent and influential burgesses that the Corporation should make an attempt either to secure the gas-works, or effect a reduction in the price of gas. For the purposes of comparison, we give the following table:—

| Population.              | Cost of Gas. | Population.             | Cost of Gas. |
|--------------------------|--------------|-------------------------|--------------|
| Sunderland . . . 142,107 | 1s. 11d.     | Bury . . . 60,000       | 2s. 1d.      |
| York . . . 72,000        | 1 11         | Salford . . . 213,190   | 2 1½         |
| Newcastle . . . 217,222  | 1 7½         | Sheffield . . . 351,848 | 2 0          |
| Plymouth . . . 98,000    | 1 9          | Swansea . . . 100,000   | 3 0          |

What does this statement prove? It proves that gas is sold cheaper in towns which are not so favourably situated as Swansea in regard to the coal-fields. We are almost in the midst of the richest coal-field in the world. Even for oil, which now plays so important a part in the economical manufacture of gas, Swansea also has a distinct advantage. Then how comes it that we have to pay so much for gas? Swansea possesses one of the best works and most capable Managers in the kingdom. It is this knowledge which makes the question the more inexplicable. Now, let us assume for a moment that the gas-works were public property, as at Birmingham. We do not know to what extent £54,000 would relieve the rates of the great Midland city. In Swansea such a sum would relieve the rates to the extent of about 3s. 6d. in the pound. We do not think for a moment that so huge a profit would be secured; but suppose we put it down at £10,000. Now £10,000 would mean a saving to the ratepayers of a 9d. rate! Thus it will be seen that Swansea is losing very considerably every year consequent upon the gas-works being private property. The works are worth buying. They are in good order, and possess a large surplus of gas-making power. The capital is not, we think, excessive. What the Company demand we do not know. Were they to ask that the dividends be capitalized by the 3½ per cent. tables, and for a fair sum as compensation to the Directors and Manager, the Corporation might well enter into negotiations. That was the opinion of Mr. George Livesey in 1885. He also gave it as his opinion that there is no power to compel the Company to sell; that it is not at all likely that such power would be granted by Parliament; and that the longer purchase is delayed the higher will be the price asked. But whether it be deemed advisable to purchase the works or not, we certainly think it the duty of the Corporation to do what is necessary to secure a reduction in the price of gas. What can be done at Plymouth and other places ought to be done at Swansea."

## THE GAS QUESTION AT SOUTHPORT.

## Mr. Corbet Woodall Selected to Investigate the Working.

At the Monthly Meeting of the Southport Town Council last Tuesday, the Gas Committee submitted minutes in which they recommended the appointment of Mr. Corbet Woodall to examine into, and report upon, the working of the gas undertaking. Although the proposal was in compliance with a resolution passed by the Council at the previous meeting, it gave rise to a protracted debate.

The TOWN CLERK (Dr. J. Davies Williams), at the outset, submitted communications from two members of the Gas Committee, Aldermen Fisher and Rimmer, tendering their resignations as members of the Committee.

It was decided that the letters should be deferred until the minutes of the Committee had been considered.

Mr. DIMOND then moved the adoption of the minutes of the Committee. He referred to the fact that they had appointed an expert, and said that the returns showed an increase in the sale of gas of above 10 million cubic feet for the previous four months. Gas had been largely used in gas-cookers, which were becoming very popular in the town; and the Committee were still selling a large number of them.

Mr. RHODES seconded the motion.

Mr. AUSTIN, referring to the clause in the minutes—"That Mr. Corbet Woodall be engaged to report on the gas estate, with instructions to recommend to the Committee any improvements which in his opinion would be likely to result in an increased profit"—thought the Gas Committee had been wise in passing this resolution; but he would like to point out that, if it was adopted by the Council, it would only partially solve the problem of transforming an unsuccessful undertaking into a prosperous business concern. On analyzing the expenditure for the past financial year, he arrived at the following figures. They were not absolutely correct; but for all practical purposes to prove his argument they were as good as correct. The fixed charge was £6687; the working expenses, £19,154; and the cost of materials, £20,497. It was altogether improbable that Mr. Woodall would be able to offer any suggestion to the Committee which would enable them to reduce the fixed charges. What he would be able to do would be to point out how the working expenses might be largely economized. He was astonished to see that, at a meeting of the Council held in August, an Alderman stated that, if he could have his way, there would be twenty-five more men employed at the gas-works, even though he admitted that one means of cheapening the price of gas and increasing the profit was to reduce manual and extend mechanical labour. He also stated that the Committee had never made improvements at the expense of labour, and that, if an expert was called in, and his advice followed, they would have to discharge a lot of men. This was to him (the speaker) most astonishing. No wonder that the price of gas in Southport was so high, and the profit so small. He said

this policy must be reversed. There must be manifold reforms, or they must give up all hope of ever producing results in the gas undertaking which would compare satisfactorily with other well-managed companies and corporations. As to the cost of materials, the expert would not be able to help them one iota. It was a matter which should be undertaken by the Committee. The goods should not be ordered from the Manager's office. They should be bought in the best and cheapest market by public tender. On the Gas Committee, they had the cream of the Council; but judging by the miserable profit of £6716, and judging by the admissions of one of the most eminent supporters of the policy which had obtained in the past, he could not help but think that they had not been acting on the best lines. In selecting a tender, the first thing was to choose a man who could do the work or supply the articles required satisfactorily and well. The tenders need not be confined to Southport. They must not be restricted by wretched parochialism; but the contracts should be given to the people who could best perform them. If the only consideration in view was to look after the general interests of the ratepayers, and not of any particular class, if they would do so careless of Nov. 1, the price of gas would be materially reduced, and the amount of profit would be largely increased.

Mr. HOLLAND agreed with the Committee in recommending the appointment of an expert; but he did not think they had got the right man. He wanted the most practical man they could get, and one who had proved up to the hilt that he was so. He believed Mr. Isaac Carr, of Widnes, was that man. It was insinuated, when Widnes was mentioned a month ago, that there was some by-play going on—that possibly they were turning out an inferior gas for use in the daytime, and a gas of fairly good quality at night, by means of which they were able to sell at 1s. 4d. per 1000 cubic feet. He happened to know that Widnes gas was of 1½-candle power, and very little was supplied in the daytime. The system of buying material, and the mode of procedure, was entirely different from that of Southport. Widnes took the lead of all gas-works in the country, and that was the place where they ought to seek information. A deputation from the Gas Committee had been to Widnes; and he thought he had something to do with them going there. He believed the Manager of the Widnes works would be only too pleased to come and give them information as to gas making, which he had made his hobby. He would come down for a small sum, and put them in the right way. Gas experts generally encouraged a lot of new buildings and other expenditure; but, with Mr. Austin, he believed that a great deal depended upon the articles they purchased, and the way they manipulated them. They had not worked on the best principle in the past; they had gone on with brick retorts instead of clay retorts, such as were used at nine out of every ten works in the country. It was a fallacious argument to say that the remodelling of their works would do away with a certain amount of labour; an increased output would mean increased profit, and increased labour. He would like to see Mr. Austin made Chairman of the Gas Committee. He thought it was no use shirking anything—what they wanted was a new Gas Manager.

The MAYOR: There is nothing on the minutes about that.

Mr. HOLLAND said it was a question of management, and he thought that affected the Manager. If he had a manager who did not succeed in two, three, four, or five years, he would very soon get a fresh one. He would move as an amendment, that the minute as to the appointment of Mr. Corbet Woodall as an expert be referred back to the Committee, and that Mr. Carr be invited to give them the benefit of his experience.

Alderman GRIFFITHS remarked that, at the last Council meeting, there were many disclaimers as to the intention of members to attack the members of the existing Gas Committee. The minutes now before them carried out the resolution of the Council to the letter; and the Committee had resolved that Mr. Woodall should be the expert to be engaged. Mr. Woodall was known as one of the best experts in the gas world; Mr. Carr was not so known. He was known as a Gas Engineer; and if the gentlemen who had already spoken had known what they wanted, they should have embodied the name of Mr. Carr in the resolution previously brought before the Council, and not have again attacked a Committee who were trying to carry out their instructions. He did not think there was another gas-works in the United Kingdom that had adopted Mr. Carr's methods of manufacture and distribution. That being a fact, why should Mr. Carr be employed as a gas expert for the Southport Corporation? Mr. Austin had said that they had an unsuccessful venture. He replied that they had nothing of the kind. There were very few gas-works which were so successful as the Southport. That they could be improved, and improved rapidly, he had no doubt. They had a Gas Manager who made a great mistake in that he had not the faculty of explaining everything to his Committees. That he understood gas making he (Alderman Griffiths) believed, and that he could hold his own with any gas manager who could be brought against him. As to Mr. Austin's remarks, he (the speaker) mentioned at the last meeting that the rates need only have been raised 3d. instead of 5d., and that they might have had an increased profit upon gas which would have saved a twopenny rate. But in consequence of the "pushing" of the electric light, they had to decrease the make of gas; and this resulted in at least twenty-five fewer men being employed. The endeavour of the Committee had been to give gas second to none; and he appealed to the Council, instead of carping at and criticizing the Committee, to support them in their endeavour to do what they could to provide gas of the best quality at as low a rate as possible. He would be in favour of engaging two experts, or even more, if the Council thought it necessary; but in the meantime he appealed to them to back up the Committee in their present efforts.

Mr. THRELFALL said he was prepared to give all the members of the Council credit for not having the slightest desire to adversely affect the position of the gas workers. What he wished to ask was: Would the inquiry by the expert be an independent one, or would the Gas Manager have to instruct the expert? If the latter, he did not believe any good would come of the inquiry. Taking the results of the gas undertaking for a number of years, it was found that, while the amount of gas made was greater, the profits were less. In his opinion, the Manager started wrongly in the matter of retorts. That was, he commenced with brick instead of clay. [Mr. HOLLAND: He changed them.] If the Manager made that mistake, and found that his system was wrong, he should frankly say so. Then he (Mr. Threlfall) would say that no man was infallible, and would have the matter rectified. He left the Gas Committee because he could not get any answers to his questions.



Mr. HULME hoped the Council would support the Gas Committee as far as they could in the matter of the expert.

Dr. WEAVER said, as the original mover of the resolution, he was quite satisfied with the expert who had been chosen. He was pleased the undertaking was now showing a great improvement; and if it was maintained, there would be £3000 or £4000 more profit at the end of the year than there had been in previous years. He considered that the chief loss on the works had been in regard to the management; and they must improve the works in that direction if they wanted to make a profit.

Mr. IRVING supported the minutes of the Committee. They were exercising a considerable amount of care; but there had been laxity in the past, and the Council were anxious to support them in everything they did with a view to improving the working.

After further discussion,

Mr. HESFORD suggested that if the Manager was given a holiday while the expert was in the works, the result would be more satisfactory to the Council.

Mr. DIMOND, replying on the discussion, said it would be for the expert to see he had a free hand; and a gentleman of Mr. Woodall's position would certainly not be unduly influenced one way or another. If the report of the expert was not satisfactory, they would have the power to recommend the appointment of another. He did not think that their works were in a bad condition. They were improving their position. With the exception of two years, when they charged a higher price for gas, the profit made last year on the works was above the average of the last eight years, although it was explained that they had lost considerably through the introduction of electricity. The undertaking, he felt convinced, would give an excellent account of itself by the end of the year.

The minutes were then put and carried.

Alderman GRIFFITHS afterwards moved: "That from the 30th of September next the wages of the employees of the Highway and Gas Departments shall be raised to the rate now obtaining under the Health and Parks Committee." He added that he wanted the wages of the various departments placed on all-fours. It would affect 50 men in the Gas Department.

After a short conversation, it was decided to refer the proposal to the Highways and Gas Committees to report upon.

In last week's issue, a paragraph was published bearing on the matters dealt with in the foregoing report, which paragraph in two respects was not strictly accurate. We learn that the reported improved results were not due to the use of "clay" retorts, as there is not a single one on the works. The fact is that, owing to a retort-furnace devised by Mr. John Booth, the Engineer and Manager, having now been perfected, better carbonizing results have been obtained for nearly twelve months past—not four months, as stated.

### DOVER GASLIGHT COMPANY.

#### The Progress of the Concern.

The report and accounts of the above Company which were noticed in the "JOURNAL" for the 23rd ult. were submitted at the half-yearly meeting of the shareholders by the Chairman (Mr. Willsher Mannering). Commenting upon the favourable character of the statements, he said the revenue for the six months was £16,612; and the expenditure £13,486. After paying the usual dividend, there would remain £426 to be carried forward. He congratulated the shareholders upon the eminently satisfactory increase in the growth of the Company's business, especially in the stove department. The quantity of gas sold was 5 million cubic feet more than in the corresponding half of 1897, or an increase of 5.9 per cent. At the end of June, there were 971 cooking and heating stoves on hire, against 801 at the same time last year. The meters in use were 3008, compared with 2788; and the number of consumers was 2715, against 2530. To meet capital requirements, for extension of the plant and mains, 150 new shares were sold by auction at the end of March, and produced about £2847, or an average of £18 19s. 6d. per £10 share. This good price had enabled them to raise the money at a fraction under 4 per cent. At the previous sale of shares in 1890, the average price was only £16 11s. 2d. The expenditure on capital account had been: £1690 in the completion of the new retort-house; £600 in extensions of mains; £700 in stoves; and £300 in meters. The prosperity of the Company had permitted of a reduction of 1d. per 1000 cubic feet in the price of gas. This would have been 2d. but for the rise in the cost of coal. In the renewal of the coal contracts for the ensuing year, they had had to pay an advance of 1s. per ton; and this would entail an additional charge of about £900. The penny reduction would represent a saving of £750 a year to the consumers. No alteration had been made in the price of gas since 1894, when it was lowered to 2s. 6d. per 1000 cubic feet; and in the first half of the year the output was just under 82 million cubic feet. During the past half year, it was nearly 91 millions. The Directors, too, had not been unmindful of the workmen. The men engaged in the manufacturing department had had their wages increased; and the fitters, mechanics and yardmen now ceased work at an earlier hour on Saturdays. He was pleased to add that the officers, as well as the men, continued to render loyal and efficient service. The report was adopted, and a dividend was declared at the rate of 7½ per cent per annum.

**Water Charges at Halifax.**—Some resolutions passed by the Halifax Corporation Water Committee, and confirmed by the Town Council at their last meeting, are worthy of notice. It has been agreed that, from March 31 next, one water closet and one bath in each dwelling-house shall be supplied with water free of charge. For each additional closet or bath, where the house is under the annual rental of £20, the charge is to be 5s. each; and where the rental is over £20, 7s. 6d. each. No charge is to be made for service-pipes to dwelling-houses; and water for warming apparatus in churches and chapels is to be supplied free.

### THE PRICE OF GAS AT LEEDS.

#### A Reduction to Two Shillings Decided Upon.

The proposal to reduce the price of gas was further considered by the Gas Committee of the Leeds Corporation at their meeting last Thursday. The Chairman (Mr. Lowden) moved that the price be reduced by 2d. to 2s. per 1000 cubic feet; the concession to take effect from Jan. 1 next. He remarked that, when the question of the reduction in price was brought before the Council some time ago, he opposed it for several reasons. The Committee had not then made their coal contracts in their entirety for the year; and there was an apprehension that there might be trouble with the miners in regard to wages. At that time, also, there was uncertainty as to what their income would be from residuals. He then stated that he considered the time was inopportune; but he made a promise that he would take the earliest opportunity of proposing a reduction in price. The views which he then held as to the probable amount of the reduction had been considerably altered by the report for the half year ended June 30 last, which had been placed in his hands by the City Accountant. From it he found that the profits had been unprecedentedly large. They had reached £20,702. Sinking fund charges amounted to £6064; leaving a surplus profit of £14,638. Compared with the corresponding six months of last year, the figures were as follows: Profits, £8059; and sinking fund charges, £6436—leaving a surplus profit of £1623. The price of gas during these two periods had been exactly the same. He pointed out that the first six months formed the worst profit-making half of the year, owing to the fact that the consumption of gas in the second three months was less than in any other quarter of the year. He also alluded to the fact that, during this quiet time, an opportunity had to be taken to make the necessary repairs for the year, the cost of which had to be set against the profits of the half year. One of the causes which had led to the larger profits was the increasing favour shown to gas-cookers, a considerable number of which were in use; and penny-in-the-slot meters had also proved very beneficial to the revenue. Then there had been a great increase in the make of gas per ton of coal carbonized, which resulted in a large addition to the profits. For instance, the gas made during the last month, compared with the corresponding month of last year, had increased by nearly 1000 cubic feet per ton. The contracts for coal had been entered into for the next twelve months at prices which were practically the same as those of the year which had just ended. As regarded the application by the miners for an advance of wages, there was a probability that it would be settled without any friction. The prices obtained for residuals were very much better than those received last year, particularly for ammoniacal liquor and coke. Referring to the new installation of inclined retorts, which would be in operation shortly at the Meadow Lane works, the Chairman stated that this was not for the purpose of supplanting the old hand-stoked retorts, but was to supplement the output of gas, owing to the rapidly increasing demand. The plant would make 2½ million cubic feet of gas per day; and gas would be produced at a price which would yield a larger profit than was obtained from the hand-stoked retorts. One reason why the Committee in the future anticipated an increased demand for gas was that they were taking steps not only to provide mains for districts which hitherto had none, but they were also increasing the capacity of the mains in many districts where, at the present time, they were insufficient. One advantage of the reform in the pipe-laying department was a reduction in the leakage; and though the reform had not existed for any length of time, the leakage for the whole year was found to be ¼ per cent. less than in the previous year, which, of course, also meant additional profit. The proposed reduction of 2d. per 1000 cubic feet would entail a decrease of revenue of £21,000 per annum; but considering that the price would only be 2s. per 1000 cubic feet, that no charge was made for meter-rents, and that 5 per cent. was allowed for prompt payment of accounts, the net price of the gas supplied by the Committee—taking into account its quality, which was more than fully maintained—would perhaps be the cheapest in the kingdom. The resolution was unanimously adopted, and will be brought before the Council for confirmation.

### BRADFORD CORPORATION GAS AND ELECTRICITY SUPPLY.

#### The Half-Yearly Statement of Accounts.

The Meeting last Tuesday of the Bradford City Council afforded an opportunity for the Mayor (Mr. Thomas Speight), in his capacity of Chairman of the Gas and Electricity Supply Committee, to make his usual half-yearly statement as to the accounts of the two departments as they were at June 30.

During the six months, he said, 76,562 tons of coal and cannel were carbonized. The gas produced amounted to 798,170,000 cubic feet (being a decrease of 2.51 per cent. on the corresponding period of 1897), and 31,889 tons of saleable coke, 4863 tons of tar, and 11,026 tons of ammoniacal liquor were made. The average cost per ton of the coal and cannel used was 10s. 0.96d., as against 9s. 11.53d. last year. Coke realized 2s. 6.36d. per ton of coal this year and 2s. 5.98d. in 1897; but owing to the continued fall in the value of tar and its products, which he anticipated last year, the return for tar only amounted to 1s. 3.38d. per ton of coal, instead of 1s. 8.12d., the price obtained last year. The revenue account for the half year showed that coal and cannel cost £39,312, or £599 less than in 1897; purification cost £1251, or £158 less; salaries were £560; stokers' wages amounted to £10,220, or £171 less; repairs and maintenance of works and plant (except retorts) cost £3484, or £1379 less than in the corresponding half of 1897, when new scrubbers and condensers were put in at the Thornton Road works; repairs to retorts cost £2671, or £105 more; and repairs and renewals of street mains and services absorbed £2622, being an increase of £411 this year. After detailing other trifling variations in the items of expenditure between this and last year, he proceeded: On the other side of the accounts the revenue from the sale of gas was £74,932, being a decrease of £1645. This was, of course, due to over 2 per cent. less gas having been sold this year, caused by the mild winter, bad trade, the extension of the system of incandescent gas lighting, and also to some extent by the progress of electricity in the city. He



however, thought that this latter item would be "very slight." The hire of meters realized £316, or £6 less than last year. Coke produced £7973, or £102 less; while tar, which last year brought in £6570, this year had only yielded £4909, or a decrease of £1661, which was entirely caused by the depreciation in the values of tar products already referred to. The revenue from chemicals amounted to £7249, which was an increase of £1320. The total revenue for the half year amounted to £98,426, and the total expenditure to £75,311; leaving a gross profit of £23,333, or £81 more than in the corresponding half of 1897. From this gross profit interest on loans took £8659; bank interest was £218; income-tax was £955, and the sinking fund absorbed £4597. This left a net profit for the half year of £8902, or £414 less, which was very satisfactory, considering the reduction in the quantity of gas sold and the depreciation in tar. In addition to this there was the lighting of the streets, which was done by the Gas Department without charge. On capital account during the half year there had been expended for new mains in new streets a sum of £845; new stoves and cookers, £250; and £101 for land at the Thornton Road works. The total capital expenditure up to June 30 was £632,015, of which £146,671 had now been repaid through the sinking fund.

Turning to the Electricity Department, the Mayor said that heavy expenditure had been incurred; and the proceeds were possibly not quite so large as was at one time anticipated. The total receipts for the half year ended June last were £9565, as compared with a sum in the corresponding period of the previous year of £8726, or an increased income of £839. The total expenditure for the half year, which included interest and sinking fund, was £7907, as against £7061 for the corresponding period. The profit for the half year was therefore £1658, against £1665, being a very slight decrease on the similar period of last year. The number of consumers at present was 720, against 521, or an increase on the corresponding half of 38 per cent. The total units consumed was 480,294, against 443,288, or an increase of 8.33 per cent., irrespective of current supplied for public arc lamps, upon which there was no return. The total profits from the opening of the electricity works in September, 1889, to June, 1898, after paying interest and sinking fund, amounted to £18,391; and the total amount written off for depreciation had been £7307. This left the sum of £11,083 to be appropriated as the Council directed. The trade profit (the profit before charging interest and sinking fund) was £3 4s. 9½d. per cent. for the half year on the capital outlay of £168,506. The net profit (after charging interest and sinking fund) showed 18s. 7d. per cent. for the half year. Taking the June and December half years together, the trade profit was £11,784, representing £7 16s. 7d. per cent. per annum on the capital outlay. Of course it should be taken into consideration that the consumers had been receiving their incandescent lamps free, which practically amounted to a reduction in the price of current. If the desires of some members of the Committee had prevailed, it was certain that, instead of even a small profit of 18s. 7d. per cent., the balance-sheet would positively have shown a loss. The Corporation could scarcely expect to go on spending money at the rate they had been doing and to receive an immediate return; and altogether he thought that if the Council took every circumstance into consideration they would regard the statement as fairly satisfactory.

The minutes were adopted.

### IMPURE GAS AT PORTSMOUTH.

#### Proposed Prosecution of the Portsea Island Gas Company.

We recently referred to the serious trouble in Portsmouth owing to the gas supplied by the above-named Company being charged with an excessive amount of ammonia; and the subject last Tuesday produced a heated debate at the meeting of the Town Council. The Finance Committee reported the communications which had passed between the Committee and the Directors of the Company; and, while the latter fully admitted their liability to penalty, they explained that the trouble arose from the neglect of an employee who had since left their service.

Alderman T. SCOTT FOSTER said the Committee felt it only right to now leave the matter in the hands of the Council. The limit of ammonia allowed in the gas was 4 grains per 100 cubic feet; but the tests by their Inspector gave the following results: Aug. 23, 15.9 grains; 24, 17.44; 25, 19.1; 26, 20.0; 29, 16.85; 30, 16.02; 31, 14.8; Sept. 1, 15.1; 2, 13.9; 3, 13.6; 4, 13.0; 5, 13.55; 6, 12.2; 7, 11.8; 8, 10.3; 9, 11.2; 10, 8.0; 11, 9.4; 12, 10.0. There had been no excess of ammonia in the Portsmouth gas, it was fair to say, for 15 years. The Directors had had an expert down, with the result that some thousands of pounds would have to be expended to remedy defects. As to the injurious effects of excessive ammonia in gas in living rooms, their Medical Officer had reported to them that, unless it was sulphurous ammonia, it would not injure health, but it would stain and tarnish articles of furniture.

Alderman Sir W. PINK moved that, unless the existing excess of ammonia were reduced within a month to its normal condition, a prosecution should ensue.

Mr. BLESSLEY seconded this proposal.

Mr. MURDOUGH said that, if such an adulteration had been found to exist in any other article, a prosecution would have followed *instantly*. They should not, therefore, allow a rich Company like this to impose upon the poor. The Directors had had plenty of time to ensure the supply of pure gas; but they had not done it, though they ought to have let off every foot of the vitiated gas. He moved that a prosecution should be instituted at once.

Mr. EMMETT seconded the amendment; pointing out that they ought to be consistent, for in the very next clause of their report the Committee recommended the prosecution of several poor coal hawkers.

Alderman SCOTT FOSTER said that in one case the cause was accidental; in the other, it was wilful and deliberate.

Alderman Sir W. D. KING (a Director of the Gas Company) offered to explain; but he was stopped by the Mayor under the Standing Orders. Alderman King, however, admitted that the complaint was a just one.

After further discussion, the first proposal was negatived by 18 votes to 12, and the amendment by 25 votes to 11. The report, which was then adopted, leaves the matter *in statu quo*, to watch whether the Company will get the gas to its normal purity.

### CARLISLE CORPORATION GAS SUPPLY.

#### The Annual Accounts.

In the "JOURNAL" for the 23rd ult., we gave a few particulars as to the results of the trading of the Carlisle Corporation Gas Department for the twelve months ended June 30; and further information is now available from the report of the Corporation Gas Committee just presented to the City Council.

From this it appears that the quantity of gas made during the year was 282,278,000 cubic feet, an increase of 6,739,000 cubic feet—equal to 2.4 per cent.—over the preceding year, when the quantity made was 275,539,000 cubic feet. Coal cost £1292 more than in the previous year; and the contracts for the current year show a still further increase. The gross profit for the year amounts to £9089; and after deduction of income-tax and other charges, there remains a sum of £8198 to be paid into the city fund. The payments out of the city fund on account of gas-works loans were: One year's instalments of loans, £1233; and one year's interest, £817—leaving an available balance of £6148. This amount is somewhat larger than the available balance last year—notwithstanding the diminution of gross profit—owing to the repayment of the loan borrowed for the purchase of the works in 1850. Appended to the report is a table showing the amount of profit which the Gas Department has paid into the city fund for the relief of the rates during the five years 1894 to 1898. The gross amount paid into the city fund for the five years respectively (omitting shillings and pence) was £6213, £7325, £8148, £9098, and £8198; the amount of instalments of loans for the different years was £2156, £2459, £2459, £2459, and £1233; while the amount of interest on loans was £1017, £1026, £970, £882, and £817. The total amount payable for principal and interest was £3173, £3485, £3429, £3341, and £2050; the balance available being £3039, £3839, £4718, £5757, and £6147. The Engineer and Manager (Mr. C. B. Newton) reports that the works under his charge have been maintained in efficient condition during the year, and are now in good working order. During the twelve months 26,309 tons of coal and cannel were carbonized, producing 282,278,000 cubic feet of gas, and giving a yield of 10,729 cubic feet per ton. In the preceding year, 26,181 tons of coal and cannel were carbonized; and the quantity of gas produced was 275,539,000 cubic feet. The small increase (2.4 per cent.) is due to the remarkable mildness of the weather during the winter months. The numbers of consumers, based on the number of accounts, are: By ordinary meter, 6172; by prepayment meter, 2461—a total of 8633. In 1897, the figures were: By ordinary meter, 6464; by prepayment meter, 1986—or a total of 8450.

### THE PROPOSED PURCHASE OF OUTLYING DISTRICT GAS-WORKS BY THE BRADFORD CORPORATION.

#### A Settlement of the Question Said to be in Sight.

One of the most startling items of business at last week's meeting of the Bradford Corporation, says the "Bradford Observer," was the decision of the Corporation to give to the Commissioner who is to conduct the inquiry into the extension scheme, and to the Local Government Board, assurances that the Corporation will apply for powers enabling them to compulsorily purchase the various gas-works from which communities intended to be included in the Greater Bradford scheme now obtain their supplies. This means, of course, the expenditure of very large sums of money; for three pretty considerable undertakings, at any rate, would have to be purchased in order to do justice not only to the new citizens, but also to some—such as those at Heaton and Allerton and part of Frizinghall—who have been in the city for years, but have not been of it so far as the matter of gas charges is concerned. Complaints from the small communities added to Bradford in 1882, and subsequently, have been loud and long and frequent; but the Directors of the Gas Companies, knowing a good thing when they saw it, have not been amenable to what the Bradford authorities would consider to be reasonableness, and there has been no mitigation of the trouble. Now the Corporation find that the bitter lament of the enforced customers of the Gas Companies has been heard far and wide among their neighbours immediately across the boundary, who, in response to Bradford's invitation to come into the city, say that if they cannot get a reduction in the price of gas to the Bradford figure a large part of the possible inducement to them disappears.

The justification for the above statement appears in the course of a speech made by Mr. H. B. Ratcliffe, the Chairman of the Finance and General Purposes Committee. The minutes presented by the Committee stated that a resolution had been passed authorizing the Parliamentary Committee to give an assurance to the Local Government Board that, in the event of Shipley being annexed to Bradford (as proposed by the city extension scheme) the Corporation would apply for powers for the compulsory purchase of the undertaking of the Shipley Gas Company, in the event of their being unable to purchase by agreement. Mr. Ratcliffe said that the latter resolution had been altered so as to extend the assurance to the Local Government Board and "to cover all gas companies supplying gas in any district which might be annexed to Bradford." It was necessary for him, he thought, to give a word or two of explanation in regard to this proposed assurance to the Local Government Board. The Extension Sub-Committee, in the course of their negotiations, were met on all hands by the same objection from the outside districts proposed to be included, that if they came into Bradford they would still fail to be in the same position as the inhabitants of Bradford with regard to the price of gas supplied to them. First of all it was intended that the resolution should not be carried any further than as it related to the position of Shipley; but the Sub-Committee were very strongly of opinion that the Corporation must face this question firmly and fearlessly once for all. Their choice was only between tinkering with the matter or dealing with it properly; and he thought there could be no doubt that the proper thing would be to offer assurances equally to all the outlying communities which it was proposed to include in the extended boundary. Those of the inhabitants who were already within the city, but were bound to take their gas from the companies referred to, would, of course, have their claims also met by this arrangement.



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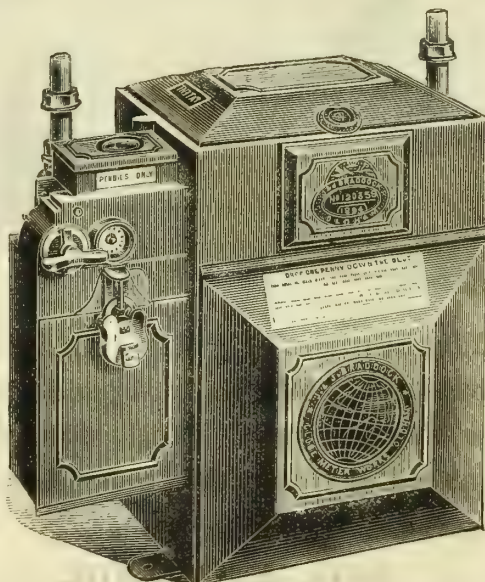
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## A NEW GASHOLDER FOR RAMSGATE.

## A Visit of Inspection.

A new gasholder, which for some time past has been in course of construction at the Ramsgate Corporation Gas-Works, is now all but completed; and in a few days the final tests will be made. In response to an invitation of the Chairman of the Gas and Water Committee (Mr. C. J. Gwyn), there was a formal inspection of the holder last Wednesday by a party consisting of several members of the Corporation and the borough officials.

Some interesting statistics were supplied to the visitors by the Engineer (Mr. W. A. Valon), from which it appeared that in the construction of the tank the ground excavated was equal to 4500 cubic yards; the amount of concrete used being 1500 yards. The thickness of the main wall of the tank is 2 feet, with 4 feet piers under the columns; the wall of the dumpling, 1 foot; and the top of the dumpling, 6 inches. The depth of the tank to the top of the rest stones is 25 ft. 6 in.; the width of the channel 6 feet; and the depth 18 ft. 6 in. The weight of the holder is 200 tons; and that of the guide-framing, 130 tons. The diameter of the holder is 115 feet; and the total height, 75 feet. The structure has a total capacity of 783,400 cubic feet. The work of excavation was carried out by Corporation workmen under the direction of the Engineer; and so true was the circle described that, on being tested later, it was not found to vary above the thirteenth of an inch. The actual work of constructing the holder was put out to tender. The total cost of tank and holder in round figures is £10,000, or about the same as the cost of constructing the last gasholder some years ago, but with a capacity of half as much again.

Light refreshments were served in the gasholder, a brief toast list affording the opportunity for a little seasonal speech-making. Mr. Gwyn, as Chairman of the Committee, in an opening speech, said that, in asking the Corporation to expend money on such an undertaking as the new holder, he thought it was due to the members that they should have an opportunity of seeing exactly what they had got for their money. The Committee had been extremely fortunate in the cost of the construction of the tank, and also in the obtaining of a very favourable estimate for the holder; and he thought the Corporation would agree that the work had been most excellently carried out, and, considering its magnitude, with considerable speed. In concluding, he asked them to drink to the health of their Engineer. Mr. Valon, in reply, said that he had to thank the Chairman for the very kind way in which he had mentioned his name in connection with this rather important work. The Chairman had referred to the necessity of spending large sums of money from time to time, in order that they might keep up with the demands made upon them for gas. It was, of course, impossible without considerable expenditure of money to do so. There was nothing more interesting to note than the progress made in the Gas and Water Department since it had been under the Corporation. In conclusion, he thanked those present for the kind way they had received his health, and said that both he and his son, who would be associated with him in future, would do the utmost they could to earn the approbation of the Corporation. Among other toasts submitted was that of the health of the Chairman of the Committee; the hope being expressed that Mr. Gwyn would be connected with the Corporation as head of the Gas and Water Department for many years to come.

## GAS-WORKS EXTENSIONS AT ROTHERHAM.

## Opening Ceremony.

To cope with the rapidly increasing demands for gas at Rotherham, an extensive scheme of gas-works improvements is in course of being carried out to the instructions of the Corporation Gas Committee. The scheme for augmenting the productive capacity of the works will eventually entail an expenditure of about £30,000. Over a third of this sum has already been spent in the erection of a new retort-house, on the most approved system; and further contracts have been entered into for £14,000. Last winter the maximum daily make of gas was one million cubic feet, a total which the new retort-house as inaugurated last week will increase by 650,000 cubic feet per day. When the other additions have been effected, the total productive capacity of the works will reach some 2 million cubic feet per day. It is only expected that with these additions the gas-works will meet the requirements of the borough for the next eight years; and care has, therefore, been taken to secure a further site on what is known as the Phoenix Land. The present works have been erected on the old fair ground, and the road leading thereto has been enclosed for the purpose. The new house is fitted with inclined retorts and all the latest improvements for the automatic handling of coal and for the economical consumption of coke in the furnaces. After crushing, the coal is lifted by buckets on an endless chain worked by a gas-engine. From the elevator, which is 60 feet high, the coal is conveyed to the bunkers, each of which is capable of holding about 40 tons; and from thence it is dropped through shoots into the retorts. The coal is conveyed to the retorts without being touched by hand in any way; the retorts being set at an angle of 32°. The cost of the retort-house as at present completed ranges up to £14,000; but so far the house is only half-filled. There are six benches of nine retorts in each bench; but the contracts have already been let for the setting of six more benches of nines. The production of gas in the new house will then be 1,300,000 cubic feet per day, and with the old retorts the total capacity of the works will be three millions.

The contractors for the brickwork were Messrs. Chadwick and Co., of Rotherham; and for the ironwork and retort settings, Messrs. R. & J. Dempster, of Manchester. Mr. George Winstanley, of Coventry, is the Consulting Engineer, and Mr. F. A. Winstanley is the Resident Engineer of the works.

The opening ceremony was performed by the Chairman of the Gas Committee (Mr. George Gummer), who—accompanied by Mr. G. Winstanley, Mr. F. A. Winstanley, Mr. J. W. Bellamy (the Secretary of the Gas Department), and some other officials—conducted the aldermen and

councillors and representatives of the Rawmarsh and Greasbro' Urban District Councils, and several ex-members of the Rotherham Town Council, over the works, and explained the various processes which were then in operation, and the improvements carried out and in course of completion.

At a later stage of the proceedings an adjournment was made to the Council Hall, where luncheon was served. Among the invited guests who were unable to attend the function, were the Mayor and Town Clerk. The former wrote expressing regret at his absence, and paying a graceful compliment to Mr. Gummer in respect to the work that had been carried out under his chairmanship. He remarked that Mr. Gummer had mastered all the details of the works in such a way as, in his (the Mayor's) opinion, made him the best and most practical Chairman that the Council had yet had; and he hoped that Mr. Gummer would be long spared to occupy his present position. The Town Clerk also wrote. After expressing appreciation of the necessity for the gas extensions, and his regard for the energy, ability, and tact displayed by the Chairman, he went on to say: "I am aware that some criticism has taken place as to whether these extensions would be necessary on account of the intended electric installation; but experience elsewhere seems to show that the gas undertaking would not be likely to be materially prejudiced by electricity being provided by the borough. Perhaps I may venture shortly to refer to the Bill of the General Power Distributing Company, which has been passed by a Committee of the House of Lords, and will come before a Committee of the House of Commons in the ensuing parliamentary session, and which seeks to obtain powers to supply electricity within a radius of 25 miles of Warsaw, in the county of Nottingham. The Bill is in direct violation of all legislation affecting electric lighting up to the present time, and, further, would curtail and impair the rights and powers of municipalities with respect to roads and other matters. However, I am not expressing my own opinion but that of the best experts of the country when I say that the Company, considering loss on transmission and other matters, even if their Bill became law, could not supply electricity as cheaply as could be done by a local installation. For various reasons, however, which need not be enumerated here, it is essential that the Bill should be stoutly opposed; and I am committing no breach of faith when I say that the opposition in the Commons from municipal public authorities will be a strenuous one."

After luncheon the toast of "Success to the Gas Undertaking" was proposed by Mr. I. Walker, who succeeded the first Chairman of the Gas Committee. In doing so, Mr. Walker took occasion to suggest that in time the price of gas to consumers should be reduced. He had, he said, always been in favour of doing this rather than making large profits for the relief of the rates. It was unfair to the consumers of gas that they should have to contribute towards the rates; and he was backed up in this opinion by a former Lord Justice of Appeal. The Chairman, in responding, pointed out that not only the Corporation and the consumers, but also the ratepayers, were interested in the gas-works, because their money was invested in the concern. Proceeding, he gave a history of the gas-works, and how the Corporation became possessed of them. The works were first established in 1833. The town was then of the size of a large village, with a considerable population; but there were only 101 consumers, and nearly as many public lamps—91. The price of gas was 10s. per 1000 cubic feet. The old Local Board effected what he believed was the first compulsory purchase of a gas-works in the country; and they assumed possession of the works in 1870. The borough was incorporated in 1871, when the Corporation undertook the management; and at that time the number of consumers, including the Rawmarsh district, was 1900. The make of gas was 58 million cubic feet per annum; and the price, 3s. to 3s. 3d. per 1000 cubic feet. He was sorry to say they had not decreased the price in proportion to the increased consumption. Having alluded to the presence of Mr. Goodwin, who had been connected with the gas-works almost since their inception, he mentioned that on the 10th inst. that gentleman completed 50 years of service at the gas-works. His (the Chairman's) first connection with the department was in 1887; and at that time he was struck with the small number of consumers—a little over 3000—as compared with the number of householders (8000) in the borough. He spoke of the changes made to induce householders to become consumers; the result being that they had now 8693 consumers, as compared with 3126 in 1888. In 1888 the make of gas was 135 million cubic feet, and in the present year it was 216 millions. He next dwelt on the necessity for the extensions. The Corporation were spending a considerable sum of money; but it was a wise investment, and the Gas Committee felt sure there would be a profit attaching to what had been done. They anticipated the total cost of the extensions would be over £30,000, for they would have to provide further accommodation for the storage of gas, land for which had been scheduled. Some people were rather afraid of the electric light and acetylene gas becoming popular; but he was of opinion there would still be a demand for coal gas. Wherever the electric light had been adopted, the consumption of coal gas had increased—he supposed because people got so accustomed to the glare of light that they wanted more gas to keep pace with it. Gas engineers were also beginning to show how gas could be used for other purposes than illumination. He expressed his approval of the improvements inaugurated that day, and spoke of the abilities of the Consulting and Resident Engineers, and of Mr. Bellamy, the Secretary of the Department—saying the latter had the true interests of the Corporation and the ratepayers at heart. Personally he (the Chairman) wished to see the price of gas reduced; and he thought some consideration should be next paid to the consumers. It was unfair to ask the users of gas to be taxed for the relief of the rates. The Gas Department had already handed over to the Corporation about £59,630; and in the last ten years, over £27,000. This he regarded as practically taxing the consumers of gas twice over. When responding to the toast of "The Engineers and Contractors," Mr. George Winstanley expressed his conviction that the extensions would result in a saving in the manufacture of gas in a short period, and that there would be better profits and greater illuminating power. He commented on the satisfactory way in which the contracts had been carried out, and thought that any advantage which might arise financially should rather be given to the consumers than distributed among the ratepayers. He advised, however, that care should be observed in maintaining the works in a state of efficiency. Mr. H. Bradford (Messrs. Chadwick and Co.) and Mr. T. E. Priestman (Messrs. R. & J. Dempster) also responded, and the proceedings terminated.



## A PUBLIC LIGHTING DISPUTE AT SETTLE.

## Litigation Threatened.

A little difficulty has arisen between the Settle Gas Company and the Parish Council regarding the terms on which the district shall be lighted during the coming winter. The Lighting Committee of the Council have met several times to discuss the subject; and their final proposals are embodied in the following suggested agreement, as to which, save perhaps in one particular, there seems nothing to which one can seriously take exception: "(1) That all burners and governors be supplied, fixed, repaired, and maintained by the Gas Company, as, and when required by, and to the satisfaction of the Lighting Authority, and at a fair and reasonable cost. (2) That not less than six meters be rented by such Lighting Authority, and attached to such lamps as shall be agreed upon. (3) That the price paid by the Lighting Authority be 4s. 2d. per 1000 cubic feet, subject to a discount of 2d. per 1000 cubic feet if payment be made at the next succeeding meeting of the Parish Council after the account is presented. (4) That the Gas Company repair and maintain all present and future service-pipes, from the mains to the top of each lamp; all such pipes to belong to, and remain the property of, the Company. (5) That all new service-pipes be supplied, laid, and connected by the Company, provided the distance does not exceed 30 feet; beyond that distance to be a matter of arrangement. (6) That the Lighting Authority have power to convert such of the street-lamps into incandescent lights as they think fit, such conversions to be done by the Gas Company at the expense of the Lighting Authority, and that the gas consumed by such lights be paid for by average meter indication; the location of such meters to be an arrangement between the Gas Company and the Lighting Authority." Now the only difference between this agreement and one entered into in 1896 is the addition of clause 6, and the insertion, in clause 1, of the words "and to the satisfaction of the Lighting Authority, and at a fair and reasonable cost." Lighting authorities, gas managers are well aware, are not always composed of "fair and reasonable" men; and this extension of the first clause certainly opens a passage for endless dispute. But to the last clause, there can be little objection. The Gas Company, however, say they will not agree to any addition or alteration of the 1896 agreement. The difficulty was discussed at a meeting of the Council on the 6th inst., when the Chairman, Mr. C. J. Lord, pointed out that they had the choice of three courses: (1) To agree to the Company's terms; (2) to light by oil; or (3) to demand a supply of gas under the Gas-Works Clauses Act, and test the case before two Justices. It was the recommendation of the Lighting Committee that the third course be taken. A long discussion followed. Mr. Harger, one of the Directors of the Company, thought there was nothing at all objectionable in the amended agreement; and he was of opinion that it could never have been fully discussed at a Board meeting, or he was sure the members would have agreed to it. Mr. Graham, another Director, also thought it reasonable enough. A proposition was made that Mr. Harger should again submit the agreement to his colleagues; but an amendment was carried (though several members did not vote) that the Council proceed under the Gas-Works Clauses Act and demand a supply of gas from the Company, and, failing their compliance, to institute a test case before the Magistrates. A further resolution requested the Company to supply gas to the public lamps from the following Saturday.

## ELECTRIC LIGHTING NOTES.

The Wolverhampton Town Council decided on Monday last week to borrow £3200 to be spent immediately on electric plant. This is part of a scheme of extension which is estimated to cost £29,000.

The Newington Vestry last Wednesday adopted a recommendation of the Electric Lighting Committee, that application be made to the London County Council for a loan of £50,000 to enable the Vestry to carry out their electric lighting scheme.

A Local Government Board inquiry was held at Hanley last Wednesday relative to an application by the Corporation for power to borrow a further sum of £4000 for electric lighting purposes. Fresh loans for the undertaking have been raised by the Corporation in quick succession. The first (£21,000) was obtained in 1893; then in 1894, a further £1100 was required; in 1895, two sums of £5000 and £19,000; and in 1897, £14,880. There are 363 private consumers, and these are said to be increasing at a rapid rate.

Electric lighting matters at Leamington are just now attracting a good deal of attention. The Town Council have decided to apply to the Board of Trade for a Provisional Order to light the town with electricity; but meanwhile the Midland Electric Light Company, who already supply numerous private consumers in Leamington, and are in possession of the field, are laying down new mains. The British Electric Traction Company, and the Warwick and Leamington Tramways Company, are agitating at the same time for permission to substitute the overhead electric system for horse traction; but to the new method the local authorities are opposed.

A Local Government Board Inspector has been holding an inquiry at King's Lynn relative to an application by the Town Council for sanction to borrow £30,000 for purposes of electric lighting. Professor Henry Robinson explained at considerable length his plans for the installation; and gave it as his opinion that it would be a commercial success. The only opposition came from Mr. Alderman Pridgeon, who is a Director of the local Gas Company, though he explained that this was not the reason he opposed the scheme; his objection being solely on the ground of expense to the ratepayers, who, he said, were already heavily burdened owing to other necessary public works.

Last Wednesday, Mr. W. A. Ducatt held an inquiry at Brighton, on behalf of the Local Government Board, in regard to a proposal of the Town Council to borrow £56,300 for electric lighting purposes. The Town Clerk explained that the amount applied for practically included the probable expenditure for the present and next year. The debt of the Corporation on the electric lighting account was £206,076; and then there was a sum of £11,426 which had been sanctioned and not yet taken up. Mr. Arthur Wright, the Electrical Engineer, stated that about 450 new

customers were expected during the next two years, and sufficient capital had been provided to supply their wants.

The extension of an estimate by "a few thousand pounds" is regarded with indifference by the Electric Lighting Committee of the Middlesbrough Corporation. They have selected a site for their electric lighting station, and have decided to instruct Mr. Hammond to proceed with the specifications for lighting the compulsory area. They reported to this effect at the meeting of the Council last Tuesday, upon which Mr. Burrows inquired if it was true that the estimate had been raised from £25,000 to £35,000. Alderman Jones replied that the estimate was entirely a tentative matter. They had not bound Mr. Hammond to any amount, although he had said that for a few more thousand pounds he could suggest a more efficient system. Mr. Burrows, still objecting to the previously stipulated amount of £25,000 being exceeded, moved that Mr. Hammond be instructed to have due regard to this sum in providing his scheme. But on being put to the vote, the motion was lost.

The "Hull News" has published an illustrated description of the new electric light station which has been completed for the Corporation within the past few weeks, and for which £40,000 was voted by the City Council, after more than one heated debate. Our contemporary predicts that the new installation will be working up to its full capacity before the end of the year; "an almost phenomenal increase in the number of customers having already to be recorded." In the engine-room, there are four steam dynamos representing a total of 760-horse power. The current is generated at from 2000 to 2500 volts, and is transmitted to two substations, where it is transformed to 220 volts. In the boiler-room, there has been erected one water-tube boiler of 150-horse power, and two Lancashire boilers of 350-horse power each; while besides these there are a storage battery, and electric pumps. An additional nine miles of mains have been laid. Cables are also about to be put down in East Hull; and to meet the contemplated demand in this and other localities, new plant of 750-horse power is about to be ordered. With the latter extension, the city will possess electric mains in most of the leading thoroughfares.

At the meeting of the Bury St. Edmund's Town Council last Tuesday, confirmation was given to the unofficial announcement which was made about a fortnight since that the Local Government Board had refused to sanction the application of the Corporation for a loan for their electric light scheme in its present form, on account of the great opposition which the proposal has aroused in the town. The Board suggested, however, that the scheme might be modified, so as only to embrace the compulsory area described in the Provisional Order, and that lighting the streets should be for the time abandoned. The Board further intimated that, in connection with any modified proposal for private lighting only, a list of applicants for the light should be obtained and forwarded to the Board. Upon receipt of this report, the Electric Lighting Committee held a meeting; and the result of their deliberations was that they adhered to the opinion that their scheme for lighting the town was the best, inasmuch as the inclusion of the public lighting would ensure "an immediate income at a comparatively small outlay, and would also release the £2500 held by the Gas Company." Under the circumstances, however, they pointed out that there were two courses open: (1) To adopt a modified form of private lighting, which is estimated to cost £13,000 for the compulsory area, or £15,000 if certain other streets are included; or (2) to sell the Provisional Order to a company. The Committee felt strongly that it would be very undesirable to adopt the latter course. The Council endorsed this opinion; and the Committee were requested to submit a modified scheme in October.

**Gas-Works Extensions at Widnes.**—The Widnes Town Council have decided to apply to the Local Government Board for sanction to borrow £4200 for alterations and extensions of the gas-works.

**New Joint-Stock Companies.**—Kurtz, Limited, is the title of a Company which has been registered, with a capital of £100,000 in £1 shares, for the purpose of accepting an assignment by Hardman and Holden, Limited, of an agreement, dated Aug. 19 last, and made by Hardman and Holden, Limited, of the one part, with the representatives of Charles Kurtz and Sons, of Liverpool, tar distillers, of the other part, for the use, on terms, of the works in Liverpool of the last-mentioned firm; also for the fulfilment of certain specified contracts and obligations therein contained, to carry on the trade of tar distillers, to manufacture, carbonize, distil, or in other ways manipulate coke, coal, oxides, ammoniacal liquor, acids, or any other chemical substances, or any residual product or products obtainable therefrom, and for several other purposes. The Wellington (Somerset) Gas, Coke, and Light Company, Limited, has been registered with a capital of £14,000, in £10 shares; and the Innerleithen Gaslight Company, with a capital of £3333, in £3 shares.

**Provincial Gas Companies.**—The Rothwell Gas Company, who met on Monday last week, had an available balance of £1317 on the past half-year's working; and the maximum dividend was declared. The shareholders also sanctioned the issuing of 200 additional 7 per cent. £10 shares; the capital being required for a holder which Messrs. Clayton, Son, and Co., Limited, are erecting. The shareholders of the Lewes Gas Company have also held their half-yearly meeting. It was reported that on the revenue account there was a profit of £1520 for the half year; and this gave a disposable balance of £2441 on the net revenue account. After paying dividends of 5 and 3½ per cent. upon the two classes of capital, a balance of £1058 remained. The Directors also announced that they had purchased some property adjoining the Company's premises for £2850, in order to provide accommodation for their increasing business. The remarks of the Chairman (Mr. James Broad) showed that there had been an almost general increase in the consumption of gas. The report and recommendation as to dividend were adopted. The Directors were also authorized to borrow on mortgage £1200 for the general purposes of the Company; and the prudent management of the Directors and the Engineer (Mr. Levi Monk) was duly acknowledged. The Ackworth, Featherstone, and Sharlston Gas Company have, as the result of the past half-year's trading, £1584 available for distribution; and a dividend at the rate of 7 per cent. has been declared. The Directors have been empowered to issue to the shareholders a further £2000 in shares, for the purpose of paying off an overdraft on the bank and on capital account.



### THE DRY WEATHER AND THE SUPPLY OF WATER.

There is little change to report in the position of the water supply question in the East-end of London; and a brief review of what has transpired during the week will suffice. The deputation to Sir Hugh Owen, the Secretary of the Local Government Board, towards the close of the previous week, on the subject of the supply to the schools in the district of the East London Company, resulted on Monday in arrangements being made by the Directors for a constant service to the schools between the hours of 9 a.m. and 5 p.m. The newly-formed body calling themselves the "East London Water Consumers' League," issued, in the early part of the week, a manifesto embodying their views on the situation. The document simply consists of a long string of virulent abuse, and not a single suggestion is offered towards a solution of the immediate problem. At their meeting on Thursday, the Directors of the Company decided to continue the present four hours' supply. It was reported that the amount of water pumped during the previous week averaged 33 million gallons a day, of which half a million came from the Kent Company. The remaining 32½ millions were made up as follows: 20½ millions from the Thames and chalk wells; 6 millions from the Lea; and 6 millions from the reservoirs. The reserve stock remaining in the reservoirs was 170 million gallons. The work of connecting the Southwark and Vauxhall Company's mains with the East London system has proceeded more rapidly than was anticipated; and the actual junction was effected at six o'clock on Sunday morning. The proposal is to utilize the water thus obtained for a district near the Tower, which will be isolated from the rest. Its size will depend on the amount of water which it is found possible to get through the connecting-main. The effect of this arrangement will be to diminish the drain on the other resources to a corresponding extent; but it will not mean a resumption of the constant supply anywhere. The isolated area will be treated exactly like the rest as regards hours of supply; and at night, when the water is shut off, the Southwark contribution will be pumped into the East London general system, so that the reservoirs will get the benefit of it. The resumption of the constant service is quite impossible until the Lea is again in good flow, and the exhausted reservoirs are at least partly replenished. The extraordinary situation caused by the failure of the Lea this year does not seem to be realized yet by those who offer their criticisms and comments on the conduct of the East London Company. An "indignation" meeting of the ratepayers of Shoreditch, convened by the local Vestry, was held on Thursday, at which the Company, and all connected with the concern, were denounced in the most scathing terms. In one resolution the meeting protested against "the long series of water famines in recent years in the district . . . culminating in the dangerous and unprecedented limitation of water this year, due entirely to the Company endeavouring to supply a larger area than its available sources of supply warrant." A second resolution called upon "the Government to pass immediate legislation placing the London Water Supply under municipal control, with power to seek fresh sources of supply sufficient to meet this first necessity of the poor." Another resolution, which is remarkable for its want of courtesy, was passed during the week by the Poplar District Board of Works. It repudiated the allegation contained in the recent circular letter of the Local Government Board as to the wilful waste of water by consumers, and suggested that, when the President of the Board visited East London "to investigate the circumstances of the inconvenience the inhabitants sustain in consequence of an insufficient water supply, he should come as a disinterested inquirer, and not for the purpose of absolving the Water Company."

The Hackney Vestry on Wednesday appointed a Committee to prosecute an application to the Court of the Railway and Canal Commission, under the Metropolitan Water Act of 1897, for a declaration that the East London Company "have failed to use all reasonable and proper measures to perform their statutory duty in supplying a constant supply of pure and wholesome water to every part of their district, and for an order that the said Company do supply pure and wholesome water to every part of their district, and a constant supply of pure and wholesome water sufficient for the domestic purposes of the inhabitants constantly laid on at such pressure as to make such water reach a height of 40 feet above the level of the pavement adjoining, and nearest to the point at which such supply is required, and to give and continue to give such inhabitants a constant supply for domestic purposes in manner prescribed." The full text of the application is too long to reproduce; but it may be stated that the Vestry allege that the Company are in default: "(1) In having allowed their reservoirs to become practically empty before taking precautionary measures; (2) in not taking timely measures to prevent the exhaustion of their supplies of water, or in not taking timely measures to supplement the deficiency of their supplies from other sources; (3) by reason of their neglect to provide against the recurrence of a scarcity, the probability of which was manifested by the deficiency which occurred during the summer of 1895; (4) by reason of their neglect adequately to inspect and examine fittings, and to provide against waste and leakage; and (5) by reason of their neglect to supply a proper force of water to reach a height of 40 feet above the pavement in their district." A conference of members of Local Authorities was held at the Hackney Vestry Hall on the following day, at which a "demand" was made that the Government should introduce a Bill next session to amend the Acts of Parliament affecting the water supply of East London.

We take the following for what it is worth from the "Local Government Journal": "It is stated that, when the autumn Cabinet Councils are held, Mr. Chaplin will submit a proposal from the Local Government Board to deal with the London Water Question on the basis of purchasing the East London Company, and leaving the other Companies in possession of their rights. In the poverty-stricken district served by the East London Water Company there have been three severe famines in three years. It is thought that a forced purchase of the concern would serve as a warning to the other Metropolitan Water Companies, and would remove once and for all a danger that has become scandalous and intolerable. The difficult point to settle is the personality of the purchasing body. Mr. Chaplin favours a Special Board. The London County Council insists upon the recognition of its own interests in the matter."

At Birmingham and Leeds the consumers have been enjoined to exercise economy in the use of water; and from many other parts of the country news is daily being received of inconvenience and distress caused by the

protracted drought. At Plymouth, it has been found necessary to curtail the supply. Some weeks ago the pressure was reduced, with the object of lessening the leakage; but as this did not altogether meet the necessities of the case, the supply has now been cut off between the hours of 8 p.m. and 6 a.m. The rainfall at the Head Weir, where the River Meavy is tapped for the supply of the town, was 22 inches to the end of August, or about 7 inches less than the normal rainfall for the first eight months of the year. In addition to this, Plymouth has since June been supplying East Stonehouse; and the consumption and waste in the district have been largely in excess of the estimate. The reservoirs connected with the Plymouth Water-Works contain only about three days' supply; so that the town is practically dependent upon the daily flow from the river. This week, however, there is promise of local rejoicings over the completion of a storage reservoir at Burrator, which will hold 650 million gallons, and put an end to all fear of a water famine in the borough.

### THE WATER SUPPLY OF LARGE ENGLISH TOWNS.

A correspondent of "The Times" has obtained the daily amount of water per head supplied at the end of August in twenty-five large towns in England and Wales. The figures have been furnished by the Engineers of the various water authorities, and they represent the amount supplied for all purposes in each case. The towns are stated in their order of precedence according to the quantity of water supplied; and for purposes of comparison, the average London supply and that given by each separate Company is inserted in its proper place:—

|                            | Gallons per Head. |                                    | Gallons per Head. |
|----------------------------|-------------------|------------------------------------|-------------------|
| Grand Junction*            | 55½               | Croydon . . . . .                  | 31                |
| Chelsea*                   | 47                | Manchester (average 27)            | 30                |
| Southwark and Vauxhall*    | 45                | Halifax . . . . .                  | 29                |
| Brighton . . . . .         | 43                | Swansea . . . . .                  | 28                |
| Plymouth . . . . .         | 43                | Blackburn . . . . .                | 25                |
| Hull . . . . .             | 43                | Bristol . . . . .                  | 23½               |
| London (average) . . . . . | 41                | Bolton . . . . .                   | 23½               |
| Lambeth*                   | 40                | Birmingham (average) . . . . .     | 23                |
| West Middlesex*            | 39                | Huddersfield . . . . .             | 23                |
| New River*                 | 35½               | Burnley . . . . .                  | 23                |
| Bradford . . . . .         | 35                | Oldham . . . . .                   | 22                |
| Leeds . . . . .            | 35                | Cardiff . . . . .                  | 22                |
| East London*               | 34½               | Sheffield . . . . .                | 21½               |
| Preston . . . . .          | 34                | Nottingham (average 17½) . . . . . | 19                |
| Kent* . . . . .            | 33½               | Birkenhead . . . . .               | 18                |
| Liverpool . . . . .        | 31½               | Leicester . . . . .                | 18                |

\* London Companies.

It will be seen that three of the London Companies head the list; not a single provincial town in England and Wales gives so large a supply. Only three towns give more than the average for all London; and only seven give more than the least generous of the London Companies. The remaining eighteen, including all the largest—Liverpool, Manchester, Birmingham, and Sheffield—give less, and some very much less. No fewer than thirteen towns are at present putting up with less water than the East London restricted supply. Moreover, it is to be observed that in the manufacturing towns the amount required for trade purposes is much larger than in London. For instance, in East London the domestic supply is at present about 18 gallons per head; in Sheffield it is 12·75 gallons; and in Birmingham it is 13·95 gallons for "domestic, fire, and waste."

**The Period for the Repayment of Loans.**—At a meeting of the Water and Sewers Committee of the Swansea Corporation last Tuesday, the Town Clerk (Mr. John Thomas) reported the sanction of a loan by the Local Government Board of £413 for the purposes of water-main extensions, the money to be repayable in thirty years. He pointed out that while the term allowed by Parliament for the repayment of a quarter of a million of money in respect of the Cray water-works scheme was sixty years, the Local Government Board for a loan of £100,000 in respect of water purposes only granted thirty years. He thought the position a monstrous one that would sooner or later have to come before Parliament. Mr. R. Martin considered it would strengthen their position by that time if they protested against it now. The Town Clerk agreed.

**A Fatality at the Grantham Gas-Works** was the subject of an inquest at the Grantham Borough Hospital yesterday week. It appeared from the evidence given by Mr. Robert G. Shadbolt, the Manager of the works, and other witnesses, that the deceased, a man named Kirk, aged 23, was a stoker. Coal for the works is shunted into the yard, and taken on to a set of rails immediately outside the retort-house. These rails are constructed on a decline of one in 78; so that waggons can be run down to any place where they are required. When a waggon stands at one of the doors of the retort-house, the break should be applied, and the outside wheels scotched. On the previous Wednesday night, deceased was found pinned between a waggon and the wall of the retort-house near a door. Mr. Shadbolt and a man named Parker punched the waggon back about three yards and liberated deceased. It seems that Kirk was standing on the left buffer of a waggon of coals which he was going to take to one of the doorways in the retort-house. He could not move the waggon himself; so he took off the break, and Parker went and eased the wheel with a lever and pushed with his shoulder. The waggon went slowly along for eight or ten yards, and then stopped. Parker called out to the deceased asking him if it was far enough, heard him groan, and then found him pinned between the waggon and the wall. Mr. Shadbolt said he had cautioned the men generally, and given individual instructions against riding on trucks. Circumstances pointed to the opinion that deceased had taken the break (which was on the side nearest the wall) right off, instead of allowing it to hang and punching the waggon down. Deceased had no occasion to get on the waggon; and before he died he told the doctor at the hospital that he was riding on the truck, and was trying to put on the break with his foot. He failed to do so, however, and stooped to do it with his hand, when he was crushed. Deceased said it was his own fault. The Jury returned a verdict of "Accidental death," but expressed the opinion that the waggons should all be turned one way, so that the break would be at the rear of each waggon, and thus away from the wall of the retort-house.



## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I have been favoured with a copy of a circular which has been issued by the Welsbach Incandescent Gas-Light Company, Limited, in which is given a comparison of the cost of lighting by the Welsbach new burner and by electricity. The comparison is made with Edinburgh gas, which has been selected, I suppose, because the price—3s. per 1000 cubic feet—admits of easy calculation. The result is more striking than would appear to most people before the figures are presented to them. Gas giving a light of from 25 to 30 candles per cubic foot, if burned for 1000 hours, would cost 3s., which is equal to an average cost of 1d. per candle per 1000 hours. With electricity, a 16-candle lamp in 1000 hours would consume 60 units, which, at 4d. per unit, would amount to 20s., or 15d. per candle per 1000 hours. Ten lights would cost in a year: With gas, £1 10s.; with electricity, £15 12s. 6d. There would thus be a saving with gas of £14 2s. 6d. It will be observed, too, that a third more light would be obtained from the gas than from electricity. This comparison places the relative value of the two lights in so concrete a form that it must arrest attention. It effectually disposes of the claim, which is beginning to be made, that electricity is probably the cheaper of the two lights. Of course, the advantage with gas would be larger were the comparison made with places where the price is less than in Edinburgh.

During the past financial year, the Kilmarnock Corporation Gas Works had a revenue of £14,968, of which £12,752 was received for gas, £1658 for tar, £51 for old lime, and £467 for coke. The expenditure amounted to £14,155, of which £6458 was paid for coal, £383 for lime, and £3438 for wages. The profit on the year's working was £813. To the latter sum there fell to be added a balance brought forward of £12,616, making £13,429. This sum had been largely drawn upon in the course of the year. There had been expended £843 on new sulphate plant, and £6706 on a new gasholder and manager's house; and £700 had been paid into the sinking fund. This is the first payment to the fund; and now the Auditor has taken exception to the action of the Corporation, holding that a payment should have been made last year. The quantity of gas manufactured was 113,191,600 cubic feet—an increase of over 10 million cubic feet, or nearly 10 per cent. There were 11,790 tons of coal carbonized—an increase of 240 tons. The yield of gas per ton was 9600 cubic feet—an increase of 600 cubic feet per ton. Unaccounted-for gas amounted to 10 per cent., as compared with 12½ per cent. The debt upon the undertaking is £21,685; and the profit of £813 is thus equal to 3½ per cent. A carefully prepared appendix is given, along with the accounts, which contains details of the income and expenditure both per ton of coal carbonized and per 1000 cubic feet of gas made. Indeed, the whole accounts are presented, as in former years, with a clearness, precision, and fulness which makes everything perfectly plain.

I have not had long to wait for the fulfilment of my expectation that someone might be found who would object to the Edinburgh and Leith Gas Commissioners sending deputations to England and the Continent. I had Mr. Waterston in my eye when I wrote the remark; and I perceive

that at a meeting last night he is reported to have criticized the spending by the Commission of £878 in deputations. Having put his hand to this plough, Mr. Waterston is not likely to turn back until he has expended some vigorous work upon what, to him, is a rich field; but, so far as the welfare of the Gas Commission is concerned, his labour will be but a veritable ploughing of the sands.

The proposed transfer of the undertaking of the Cupar Gas Company to the Corporation has been abandoned. Last night the Town Council received a report from the Committee which they appointed in June to consider the proposal. The Committee communicated with the Company, but could not get the officials to mention a sum at which they would be prepared to sell. They had ascertained that the capital of the Company is £8900, and that the average profit during the past seven years had been £744. An offer, on very favourable terms, to light up the town by means of electricity had been received from a London company. The Committee had therefore come to the conclusion that it would not be in the interest of the ratepayers that they should acquire the gas undertaking. After some criticism, the Council, by a majority, adopted the report of the Committee.

The Corporation of Falkirk have had the unpleasant experience of differing with the Assessor over the valuation put by that somewhat autocratic functionary upon the gas-works. Formerly, the valuation was £5440; but diminished profits led to a very large reduction. Now the Assessor has raised the valuation to £4800. Against this the Corporation, as Gas Commissioners, appealed to themselves as the Town Council. The hearing came on on Tuesday last. The Assessor defended his valuation on the ground that it was made on the principle upon which all gas-works are valued. No doubt he had made a correct valuation; but the Town Council were unable to regard the matter in the proper light. They looked to Stirling, and found the gas-works there, belonging to a Company, assessed at about one-half the sum at which the Falkirk works are valued. It mattered not to them whether a reason for this state of matters existed or not; they simply wished that their works should not be rated higher than others. The Assessor was obdurate; and it seemed to me that the only false move he made in all the proceedings was in the remark that the Stirling Gas-Works had never been properly assessed, and that the ratepayers there were being robbed of £800. This was a gratuitous sneer, and was altogether out of place. But the Assessor was not all-powerful. He was asked if the calling of the Corporation there was a farce, and whether they had not the power to decide. They had the power; and they reduced the valuation to £4500. It is open to the Assessor to appeal to the Supreme Court; and if he does so it is almost a certainty that he will get his valuation restored. But the probability is that he will not consider it worth his while to appeal. It is appropriate, in connection with these proceedings, to remember that it was an appeal case from Falkirk, in the Supreme Court in 1883, which led to the laying down of the principle that gas-works should be valued upon the rent which a hypothetical tenant would pay for them. Falkirk was instrumental in having the new method of valuation fixed; and now the Corporation of Falkirk reject the method.

Curiously enough, the question of the valuation of the Stirling Gas

## GAS AND WATER COMPANIES STOCK AND SHARE LIST.

Referred to on p. 632.

| Issue.    | Share. | When ex-<br>Dividend. | Dividend<br>or Dividend<br>& Bonus. | NAME.                                              | Closing<br>Prices. | Rise<br>or<br>Fall<br>in<br>Wk. | Yield<br>upon<br>Invest-<br>ment. | Issue.    | Share. | When ex-<br>Dividend. | Dividend<br>or Dividend<br>& Bonus. | NAME.                                    | Closing<br>Prices. | Rise<br>or<br>Fall<br>in<br>Wk. | Yield<br>upon<br>Invest-<br>ment. |
|-----------|--------|-----------------------|-------------------------------------|----------------------------------------------------|--------------------|---------------------------------|-----------------------------------|-----------|--------|-----------------------|-------------------------------------|------------------------------------------|--------------------|---------------------------------|-----------------------------------|
| £         |        |                       | p. c.                               | GAS COMPANIES.                                     |                    |                                 | £ s. d.                           | £         |        |                       | p. c.                               | GAS COMPANIES.                           |                    |                                 | £ s. d.                           |
| 590,000   | 10     | Apr. 15               | 10½                                 | Alliance & Dublin 10 p. c.                         | 22½-23½            | ..                              | 4 9 4                             | 75,000    | 5      | June 29               | 6                                   | Malta & Medn., Ltd.                      | 43-52              | ..                              | 5 14 3                            |
| 100,000   | 10     | "                     | 7½                                  | Do. 7 p. c.                                        | 16½-17½            | ..                              | 4 5 9                             | 541,920   | 20     | June 10               | 5                                   | Monte Video, Ltd.                        | 13½-14½            | ..                              | 6 18 0                            |
| 300,000   | 100    | July 1                | 5                                   | Australian 5 p. c. Db.                             | 105-107            | ..                              | 4 13 6                            | 617,946   | Stk.   | Aug. 31               | 9½                                  | Newcastle & Gateshead Con.               | 230-240            | ..                              | 4 1 3                             |
| 200,000   | 5      | May 26                | 6                                   | Bombay, Ltd.                                       | 6½-7               | ..                              | 4 5 9                             | 252,355   | Stk.   | Jan. 8                | 3½                                  | Do. 3½ p. c. Db. Stk.                    | 113-117            | ..                              | 2 19 10                           |
| 40,000    | 5      | "                     | 6                                   | Do. New, £4 paid.                                  | 4½-5               | ..                              | 4 16 0                            | 150,000   | 5      | May 26                | 8                                   | Oriental, Ltd.                           | 7½-8               | ..                              | 5 0 0                             |
| 880,000   | Stk.   | Aug. 12               | 12                                  | Brentford Consolidated                             | 275-280            | ..                              | 4 5 9                             | 135,000   | 5      | "                     | 8                                   | Do. New, £4 10s. pd.                     | 6½-7               | ..                              | 5 2 11                            |
| 240,000   | "      | "                     | 9                                   | Do. New                                            | 210-215            | ..                              | 4 3 9                             | 15,000    | 5      | "                     | 8                                   | Do. do. 1879, £1 pd.                     | 1½-1½              | ..                              | 4 11 5                            |
| 50,000    | "      | "                     | 5                                   | Do. 5 p. c. Prf.                                   | 140-145            | ..                              | 3 9 0                             | 60,000    | 5      | Mar. 11               | 7                                   | Ottoman, Ltd.                            | 5-6½               | ..                              | 6 6 2                             |
| 159,375   | 4      | June 10               | 4                                   | Do. 4 p. c. Db. Stk.                               | 130-135            | ..                              | 2 19 3                            | 500,000   | 100    | June 1                | 6                                   | People's Gas 2nd M.<br>of Chicago J. Bd. | 108-108            | ..                              | 5 11 1                            |
| 220,000   | Stk.   | Sept. 15              | 11½                                 | Brighton & Hove Orig.                              | 262-267            | ..                              | 4 6 2                             | 848,070   | 10     | May 26                | 6                                   | River Plate Ord.                         | 9½-9½              | ..                              | 6 3 1                             |
| 226,320   | "      | "                     | 8½                                  | Do. A. Ord. Stk.                                   | 190-195            | ..                              | 4 7 2                             | 250,000   | Stk.   | June 29               | 4                                   | Do. 4 p. c. Db. Stk.                     | 99-101             | ..                              | 3 19 3                            |
| 983,500   | Stk.   | Aug. 31               | 5                                   | Bristol 5 p. c. max.                               | 125-130            | ..                              | 3 16 11                           | 250,000   | 10     | Apr. 29               | 10                                  | San Paulo, Ltd.                          | 15-16              | ..                              | 6 5 0                             |
| 420,000   | 20     | Mar. 30               | 10½                                 | British                                            | 51-53              | ..                              | 3 15 6                            | 135,000   | Stk.   | Sept. 15              | 10                                  | Sheffield A.                             | 242-245*           | ..                              | 4 1 8                             |
| 50,000    | 10     | Aug. 12               | 11½                                 | Bromley, Ord. 10 p. c.                             | 25-27              | ..                              | 4 5 2                             | 202,053   | "      | "                     | 10                                  | Do. B.                                   | 242-245*           | ..                              | 4 1 8                             |
| 75,000    | 10     | "                     | 8½                                  | Do. 7 p. c.                                        | 20-22              | ..                              | 3 17 3                            | 447,427   | "      | "                     | 10                                  | Do. C.                                   | 242-245*           | ..                              | 4 1 8                             |
| 600,000   | 10     | Apr. 29               | 6                                   | Buenos Ayres (New) Ltd                             | 9-9½               | ..                              | 6 6 4                             | 5,600,000 | Stk.   | Aug. 12               | 5½                                  | South Metrop. 4 p. c. Ord.               | 140-145            | ..                              | 3 14 7                            |
| 98,122    | Stk.   | June 29               | 4                                   | Do. 4 p. c. Db. Stk.                               | 98-100             | ..                              | 4 0 0                             | 1,460,000 | "      | July 14               | 3                                   | Do. 3 p. c. Db. Stk.                     | 101-104            | ..                              | 2 17 8                            |
| 150,000   | 20     | July 14               | 8½                                  | Cagliari, Ltd.                                     | 29-30              | ..                              | 5 10 0                            | 60,000    | Stk.   | Aug. 31               | 12                                  | Tottenham and A.                         | 280-290            | ..                              | 4 2 9                             |
| 100,000   | 10     | June 10               | 7                                   | Cape Town & Dis., Ltd.                             | 15-16              | ..                              | 4 7 6                             | 60,000    | "      | "                     | 9                                   | Edmonton J. B.                           | 200-210            | ..                              | 4 5 9                             |
| 50,000    | 50     | May 3                 | 6                                   | Do. 6 p. c. 1st Mork.                              | 58-60              | ..                              | 5 0 0                             | 182,380   | 10     | June 10               | 7                                   | Tuscan, Ltd.                             | 10½-11½            | ..                              | 6 1 9                             |
| 550,000   | Stk.   | Apr. 15               | 13½                                 | Commercial Old Stock                               | 315-325            | ..                              | 4 3 1                             | 149,900   | 10     | July 1                | 5                                   | Do. 5 p. c. Dbs. Red.                    | 100-108            | ..                              | 4 17 1                            |
| 200,750   | "      | "                     | 10½                                 | Do. New do.                                        | 252-257            | ..                              | 4 1 8                             |           |        |                       |                                     |                                          |                    |                                 |                                   |
| 800,000   | Stk.   | June 10               | 12                                  | Do. 4½ p. c. Db. ac.                               | 148-153            | ..                              | 2 18 10                           |           |        |                       |                                     |                                          |                    |                                 |                                   |
| 280,000   | "      | "                     | 9                                   | Continental Union, Ltd.                            | 207-212            | ..                              | 5 13 2                            |           |        |                       |                                     |                                          |                    |                                 |                                   |
| 51,600    | Stk.   | Aug. 31               | 14                                  | Do. 7 p. c. Prf.                                   | 197-202            | ..                              | 4 9 1                             |           |        |                       |                                     |                                          |                    |                                 |                                   |
| 168,400   | "      | "                     | 11                                  | Croydon A 10 p. c.                                 | 305-310            | ..                              | 4 10 4                            | 746,164   | Stk.   | June 29               | 10½                                 | Chelsea, Ord.                            | 313-318            | ..                              | 3 6 0                             |
| 555,000   | Stk.   | Aug. 12               | 5½                                  | Do. B 7 p. c.                                      | 255-265            | ..                              | 4 3 0                             | 150,000   | "      | "                     | 5                                   | Do. 5 p. c. Prf.                         | 170-175            | ..                              | 2 17 2                            |
| 60,000    | "      | "                     | 5                                   | Crystal Palace Ord. 5 p. c.                        | 125-130            | ..                              | 4 0 9                             | 160,000   | "      | "                     | 4½                                  | Do. 4½ p. c. Prf. 1875                   | 148-152            | ..                              | 2 19 3                            |
| 486,090   | 10     | July 28               | 11                                  | Do. 5 p. c. Prf.                                   | 140-145            | ..                              | 3 9 0                             | 175,785   | "      | Mar. 30               | 4½                                  | Do. 4½ p. c. Db. Stk.                    | 157-162            | ..                              | 2 15 7                            |
| 354,060   | 10     | "                     | 11                                  | European, Ltd.                                     | 17-18              | ..                              | 4 11 8                            | 1,720,560 | Stk.   | Apr. 15               | 8                                   | East London, Ord.                        | 213-218            | ..                              | 4 3 18 5                          |
| 5,922,290 | Stk.   | Aug. 12               | 12½                                 | Do. £7 10s. paid.                                  | 29-34              | ..                              | 4 11 9                            | 654,740   | "      | June 29               | 4½                                  | Do. 4½ p. c. Db. Stk.                    | 157-160            | ..                              | 2 16 3                            |
| 100,000   | "      | "                     | 10                                  | Gaslight & Coke, A. Ord.                           | 291-296            | ..                              | 4 2 9                             | 390,000   | "      | "                     | 3                                   | Do. 3 p. c. Db. Stk.                     | 103-105            | ..                              | 2 17 2                            |
| 665,000   | "      | "                     | 5                                   | Do. B 4 p. c. max.                                 | 120-125            | ..                              | 3 4 0                             | 700,000   | 50     | June 29               | 7½                                  | G'd Junction, 10 p. c. max.              | 115-118            | ..                              | 3 3 7                             |
| 30,000    | "      | "                     | 7                                   | Do. C, D, E, 10 p. c. Prf.                         | 305-310            | ..                              | 3 4 6                             | 310,000   | Stk.   | Mar. 30               | 4                                   | Do. 4 p. c. Db. Stk.                     | 142-147            | ..                              | 2 14 5                            |
| 60,000    | "      | "                     | 7½                                  | Do. F 5 p. c. Prf.                                 | 152-157            | ..                              | 3 8 8                             | 708,000   | Stk.   | Aug. 12               | 14                                  | Kent                                     | 364-369            | ..                              | 3 15 11                           |
| 1,300,000 | "      | "                     | 10                                  | Do. G 7½ p. c. do.                                 | 230-240            | ..                              | 3 2 6                             | 160,000   | "      | "                     | 7                                   | Do. New, 7 p. c. max.                    | 212-217            | ..                              | 3 4 6                             |
| 463,000   | "      | "                     | 10                                  | Do. H 7 p. c. max.                                 | 195-200            | ..                              | 3 10 0                            | 1,043,500 | 100    | June 29               | 10                                  | Lambeth, 10 p. c. max.                   | 298-303            | ..                              | 3 6 0                             |
| 476,000   | "      | "                     | 6                                   | Do. J 10 p. c. Prf.                                | 305-310            | ..                              | 3 4 6                             | 406,200   | 100    | "                     | 7½                                  | Do. 7½ p. c. max.                        | 227-232            | ..                              | 3 4 8                             |
| 1,061,150 | "      | June 10               | 4                                   | Do. K 6 p. c. Prf.                                 | 182-187            | ..                              | 3 4 2                             | 350,000   | Stk.   | Mar. 30               | 4                                   | Do. 4 p. c. Db. Stk.                     | 140-145            | ..                              | 2 15 2                            |
| 294,850   | "      | "                     | 4½                                  | Do. L 4 p. c. Db. Stk.                             | 131-133            | ..                              | 3 0 2                             | 500,000   | 100    | Aug. 12               | 12½                                 | New River, New Shares                    | 432-457            | ..                              | 3 0 7                             |
| 958,000   | "      | "                     | 6                                   | Do. 4½ p. c. do.                                   | 148-153            | ..                              | 2 18 10                           | 1,019,585 | Stk.   | July 28               | 4                                   | Do. 4 p. c. Db. Stk.                     | 140-145            | ..                              | 2 15 2                            |
| 70,000    | 10     | May 12                | 8                                   | Do. 6 p. c. do.                                    | 198-203            | ..                              | 2 19 1                            | 902,300   | Stk.   | June 29               | 6                                   | Southwark & V'xhall, Ord.                | 166-171            | ..                              | 3 10 2                            |
| 8,800,000 | Stk.   | Aug. 12               | 10                                  | Hongkong & China, Ltd.                             | 14-15              | ..                              | 5 6 8                             | 126,500   | 100    | "                     | 6                                   | Do. do. 7½ p. c. max.                    | 157-162            | ..                              | 3 14 1                            |
| 376,400   | 100    | "                     | 4                                   | Imperial Continental                               | 218-223            | ..                              | 4 9 8                             | 489,200   | Stk.   | "                     | 5                                   | Do. do. 5 p. c. Prf.                     | 168-172            | ..                              | 2 18 2                            |
| 473,600   | Stk.   | Aug. 12               | 3½                                  | Do. 4 p. c. Db. Red.                               | 98-101             | ..                              | 3 19 3                            | 1,155,066 | Stk.   | June 10               | 10                                  | Do. 4 p. c. A. Db. Stk.                  | 141-144            | ..                              | 2 15 7                            |
| 500,000   | 100    | Apr. 1                | 5                                   | Do. 3½ p. c. Db. Stk.                              | 101-104            | ..                              | 3 7 4                             | 200,000   | "      | "                     | 4½                                  | West Middlesex                           | 300-305            | ..                              | 3 5 7                             |
| 250,000   | 100    | "                     | 4½                                  | Met. of Mel-1 5 p. c. Db.<br>bourne J 4½ p. c. Db. | 111-113            | ..                              | 4 8 10                            | 200,000   | "      | Sept. 15              | 3                                   | Do. 4½ p. c. Db. Stk.                    | 162-165            | ..                              | 2 14 7                            |
|           |        |                       |                                     |                                                    | 107-109            | ..                              | 4 2 7                             |           |        |                       |                                     |                                          |                    |                                 |                                   |

† Next dividend will be at this rate.



Company's works had been raised the day before the above proceedings took place. There the Assessor had raised the valuation of the works from £1700 to £2685; and the Company appealed and asked that it should be fixed at £1880. The Town Council heard the appeal. The Assessor complained that he had not been furnished with the necessary details as to the Company's income and expenditure. All he had been given, prior to the Saturday before, was a statement of the income and expenditure; and, having nothing else, he had fixed the valuation at the difference between these two sums. The explanation was that the particulars had not been given because the Treasurer was from home. It was maintained for the Company that they were entitled to certain deductions. An adjournment was granted in order that the Assessor might be furnished with the details he wished; and last night the Town Council adopted the Assessor's valuation, and dismissed the appeal. The question of the allowance or disallowance of these deductions is involved in the case; and the representative of the Company gave notice of an appeal against the decision to the Supreme Court.

The Stirling Police Commission had also before them on Monday the thorny subject of the costs incurred in their fruitless opposition to the Bill of the Gas Company, which they have not yet been able to dispose of. The immediate question under consideration was whether they should print the correspondence which passed between the parties. This correspondence would, of course, reveal the policy of the Corporation Committee and would particularly disclose who it was who first offered a compromise. Possibly the Gas Committee do not wish this made known. At any rate, they proposed to print the minutes of their meetings only, and not the letters. It was contended for the Committee that to expend £15 or £20 upon printing the letters would be a throwing away of public money. On the other hand, it was maintained by some that they could not dispose of the subject of expenses without seeing the correspondence. Provost Forrest ruled that the correspondence must be produced, with the exception of one or two letters which are marked "Private and Confidential." The subject was therefore continued till the prints be received. Perhaps the exception of the private and confidential letters may be sufficient for the purposes of the Committee.

The Dunfermline Gas Commissioners have effected an insurance of their workpeople against liability for accident, at common law, under the Employers' Liability Act, and under the Workmen's Compensation Act. The rate is 9s. per £100 of wages paid.

The Arbroath Gas Corporation have this week resolved to promote a Bill in Parliament for the purpose of conferring upon them additional borrowing powers, and also amending their present statutory powers in several particulars.

On Wednesday, Mr. W. Foulis, of Glasgow, had a meeting with the Perth Gas Commission relative to the plans for the new gas-works which are to be erected for Perth. The Commissioners are anxious that the total cost of the works should not exceed the estimates; and Mr. Foulis was able to point out how the plans which have been prepared by Mr. A. Wilson could be worked out so as to avoid going beyond the estimates. A newspaper report regarding the latest of the so-called irregularities in connection with the gas undertaking states that "at a meeting

of the Gas-Works Committee accounts were submitted from the North British Railway Company and Mr. Hewat, restaurateur, in connection with the annual trip of the employees at the gas-works. It was resolved to refuse to recognize any liability for the expenses of the trip beyond the allowance to each employee sanctioned by the Committee. Councillor Stewart (on Monday) moved the adoption of the minute. He said that a gratuity of 3s. 6d. per man in addition to wages had been an allowance for five years; and that amounted to £11 or £12 in all. An account was presented to the Committee in charge of the last annual excursion, amounting to £35, which the Convener very properly declined to initial on account of the fact that it exceeded the sum voted by 300 per cent. Evidently the account had been passed for the last two years; and the accounts during these years also exceeded the amount voted. This was no justification for the account being passed this year—rather a reason why it should not. It seemed to him an extraordinary thing that those in charge of the excursion should expend more than the sum voted. He did not think it would be legal for them to pay the extra £24. Ex-Bailie Gow seconded. Councillor M'Vicar said his position was one of sympathy with the men. He moved that, in addition to the sum of 3s. 6d., the Commission make a grant. The Lord Provost said the motion was incompetent. If the workmen made a representation, it would be considered; but it was incompetent meantime. The matter at this point dropped: the Committee's minute being agreed to."

The Buckie Police Commissioners on Monday last week had a discussion as to the introduction of acetylene gas for lighting Buckpool. The Bon Accord Acetylene Gas Company, of Aberdeen, offered to supply acetylene gas plant free of expense in the first instance. The Company proposed to work it until May 1, 1899, and to supply the gas at 5s. per 1000 cubic feet, provided that, at the end of the period named, the Commissioners would take over the scheme for £564 (including 3 miles of piping, and 60 lamps), and provided also that the scheme was successful. After a good deal of discussion, it was agreed to make full inquiry with a view to adopting the light.

The Police Commissioners of the Burgh of Bathgate, West Lothian, have resolved to take over the works of the Bathgate Gas Company. The Company have been earning a handsome dividend; and the price charged for gas, 4s. 2d. per 1000 cubic feet, is held to be too high.

The recommendation of the Glasgow Corporation Water Committee regarding the pipe contract was before the Town Council on Thursday. Mr. Osborne, in moving that the tender of Messrs. Maclaren and Co., of Glasgow, be accepted, as recommended, stated that while the tender by the Philadelphia firm was the lowest, there fell to be added to the price quoted 3s. per ton—or £150 in all—for testing the pipes; and that when this was taken into account, Messrs. Maclaren and Co.'s offer was £82 less than that of the American firm. It was moved on the other side that the contract should be divided—the American firm to supply the pipes of from 7 to 12 inches in diameter, and the Glasgow firm those of 6 inches diameter and less. A somewhat acrimonious discussion ensued, from which it was apparent that many members of the Corporation have been alarmed by rumours of the formation of a ring of pipe-makers in Glasgow; and they evidently desired, by giving the contract to

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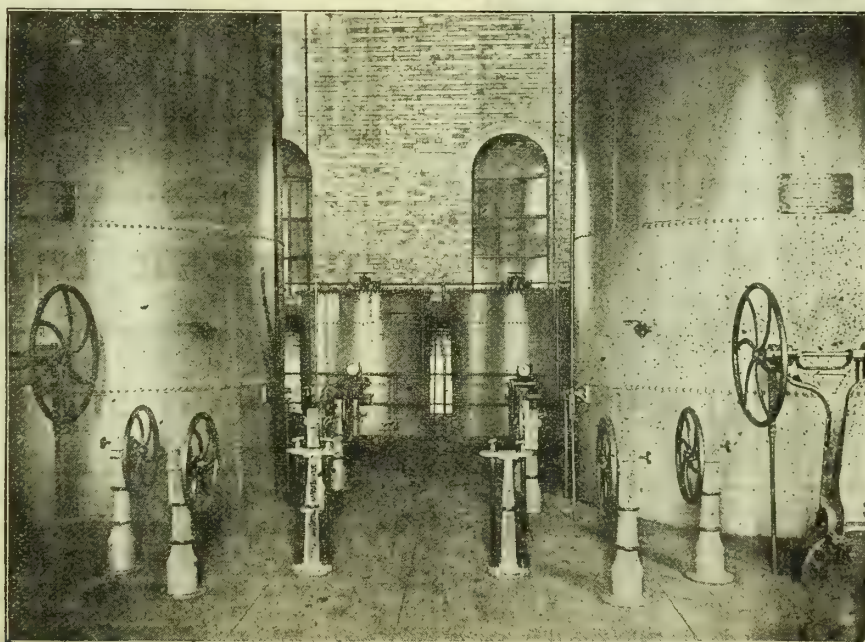
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the American firm, to break down the ring. The feeling seemed strong, for the proposal to divide the contract was carried by 39 to 21 votes.

The Edinburgh and District Water Trust on Thursday fixed their assessments for the current year. The estimates of the Treasurer (Mr. W. Anderson) were that for supplies by meter and special supplies, a revenue of £51,993 would be derived. The estimated expenditure was £105,419, of which £27,191 was for interest, £24,012 upon annuities, and £13,308 contribution to sinking fund. There was a sum of £53,425 left to be provided out of rates. In moving the adoption of the Finance Committee's report, ex-Provost Wood, of Portobello, said that they had met to fix the amount of the rates for the year. A statement had been prepared by the Treasurer, which went into all the details of the probable income and expenditure; and it would not be necessary for him to go into the details, as they were not called upon to reduce the estimated expenditure in order to save a rise in the water-rates for this year. An important outcome of the statement was that the Finance Committee were able to recommend the adoption of the low rates which had prevailed for the last two years. This was very gratifying; and it was indicative of the prosperity of the Trust, which meant of the city and district. But notwithstanding there was an estimated expenditure upon the new works, amounting to £470,000, and the consequent increase of interest and exceptional expenditure for the year, no addition to the rates was found necessary. The estimated expenditure for the year was £105,419, and the estimated receipts £103,864—an excess of expenditure over income of £1555. But as there was an accumulated surplus in favour of revenue of £26,890, there was an ample margin to meet this excess of expenditure. He moved that the report of the Committee be adopted, and that the rates be fixed upon dwelling-houses, not exceeding £9 rent, at 4s. per annum; that the domestic rate upon houses above £9, be 5d. per pound; the rate upon shops, 2d. per pound; and the public rate, 1d. per pound. The Chairman (Baillie Sloan, of Edinburgh) seconded the motion, which was adopted.

#### CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Sept. 17.

**Sulphate of Ammonia.**—In the early part of the week, the market was quiet; and sales of second-hand parcels are reported to have been made at under £10 per ton. Within the past few days, however, there has been more inquiry, resulting in an improved tone; and the closing quotations are £10 to £10 2s. 6d. per ton, delivered f.o.b. at the ports. The entire available supply has not been large; and there has been no urgency on the part of makers to sell. But consumers have been encouraged to leave prompt stuff alone by lower quotations for October delivery, while speculators have been quietly availing themselves of the weak market, in order to cover their September requirements. In the forward position, speculative offering has been freer. But buyers are shy even at a substantial discount on spot prices; and business actually done has been comparatively small. Makers remain firm at last week's quotations.

**Nitrate of Soda.**—There has been no change in this commodity; the spot quotation for fine quality being 7s. 7½d. per cwt.

LONDON, Sept. 17.

**Tar Products.**—The demand for creosote and other tar oils continues good; though there is no important improvement in their prices. Naphthalene is again more inquired after in all its states. It is rumoured that a new outlet for this salt has been found. The low price of anthracene so far has not tempted buyers; and no business, excepting a little of a speculative character, has been done for some time. This is remarkable, as the alizarine trade is reported to be busier, with a satisfactory outlook for the autumn and spring. Pitch maintains its improved value, and, with the settlement of the Welsh strike, should strengthen. Low prices are being taken for benzols; and a large line of crude Scotch naphtha has changed hands at a price which would only net the seller 3d. a gallon.

Average values may be taken as: Tar, 13s. 6d. to 17s. 6d. Pitch, east coast, 24s. 9d.; west coast, 22s. 6d. Benzols, 90's and 50's, 9d. Toluol, 1s. 2d. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 1½d. Crude, 30 per cent., naphtha, 4d. Creosote, 2½d. Heavy oils, 45s. Carbolic acid, 60's, 2s. Naphthalene, 57s. 6d.; salts, 32s. 6d. Anthracene, nominal, "A," 4d.; "B," 3d.

**Sulphate of Ammonia.**—Very little business is being done; and this is not remarkable, seeing that the make is just now at its minimum, and producers have no stocks. Indeed, in two notable instances, makers are oversold; and the end of the month may see a squeeze for deliveries. A few parcels have changed hands at prices, according to position, from £9 17s. 6d. to £10 per ton, less 3½ per cent.

#### COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—A good deal of apprehension has prevailed throughout the coal trade of this district during the past week, with regard to the possibility of another dispute between the coalowners and the Miners' Federation on the wages question; but there is very little probability of any serious trouble occurring, as the conference held on Friday in London between the representatives of both sides has practically resulted in again referring the question for further consideration. There is little doubt that an amicable settlement will be arrived at. Neither side desires a conflict; and though apparently differences may exist respecting the advance in wages to be immediately granted, mutual concessions will probably bring about an understanding. With regard to the general position of trade, now that collieries have got through the arrear of orders which accumulated at the close of last month, owing to the extra buying in anticipation of the advance in prices, there is somewhat of a lull; and though pits are generally on full time, the output is not in all cases moving away. The market has also been somewhat unsettled owing to the advance in prices having been followed in other districts; but as a rule at the Lancashire collieries the advanced rates are being well maintained. The falling off in the demand has been chiefly in the better qualities suitable for house-fire purposes. Steam and forge coals are in fairly active request; and prices are readily maintained at 7s. 6d. to 8s. per ton at the pit. For engine classes of fuel there is a



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steady inquiry, which is generally taking away the present output, though the position varies at different collieries. Generally throughout Lancashire, slight advances on August rates are being secured. Common slack averages 3s. 6d. to 3s. 9d. per ton at the pit; medium, 4s. 3d. to 4s. 6d.; and best sorts, 4s. 9d. to 5s. 3d. There is still a fairly active shipping demand; but the pressure is not so great as recently, and prices have eased down somewhat. Ordinary steam coal now averages about 9s. 6d. per ton, though 10s. is still being obtained in special cases.

**Northern Coal Trade.**—There has been further weakness in the coal trade of this district in the last few days, more especially in steam coal and household fuel. The resumption of supplies from South Wales is affecting the demand here; and though the collieries are working fully, orders ahead are not so numerous as they were. Best Northumbrian steam coals are now down to 11s. per ton f.o.b.; and steam smalls to about 5s. 6d. Manufacturing coals are steady. In gas coals, the demand increases, as there is a considerable quantity yet to be delivered on old contracts; and the supplies on the newer deliveries at better prices are becoming heavier. About 10s. 6d. per ton f.o.b. is the current quotation for best gas coal, when not under contract; but only occasional cargoes seem to be sold at such prices. Prices of gas coke are firm, but are not locally altered this week.

**Scotch Coal Trade.**—Trade is good, and is likely to be so for some time. The Fifeshire miners have, by ballot, resolved to accept the masters' offer of an advance of 5 per cent. in wages; and there is thus a prospect of peaceable working. Stocks are greatly depleted by the demand for coal to take the place of that which should have been sent out from Wales. This makes it probable that work will be plentiful, and that, with the good demand, prices are likely to keep up better than might have been expected. This view explains the willingness of coal-owners to give the advances they have agreed to recently. Prices have receded a little, and may go down further. The quotations are: Main, 9s. 6d. per ton f.o.b. Glasgow; ell, 10s. 3d. to 10s. 6d.; and splint, 10s. 3d. The shipments for the week amounted to 235,365 tons—a decrease of 9267 tons upon the previous week (nearly all of which was due to the smaller shipments from Fife ports), but an increase of 49,100 tons on the corresponding week of last year. For the year to date, the total shipments have been 6,812,500 tons—an increase upon the same period of last year of 1,272,198 tons.

**Horsforth Water Supply.**—At a meeting of the Horsforth District Council yesterday week, the Water Committee reported on their further negotiations with regard to the proposed purchase of the water-works. It was decided to inform the Solicitors to the Company that the Council cannot bring the matter before the ratepayers until the consent of the shareholders to sell the undertaking has been obtained. It was proposed that the Council should request the Water Committee to lay before them, in full and definite form, a statement of what has been done, and how the negotiations stand. But thereupon an amendment that the Committee do not report to the Council until they have something definite to bring forward, was carried.

**Wages and Hours of Labour at the Leeds Gas-Works.**—The men employed at the Leeds Corporation Gas-Works have recently been holding meetings to consider the conditions under which they work, the hours of labour, and the wages paid. It is understood that, as the result, it is proposed to make an application to the Gas Committee for an advance of wages on behalf of the stokers, firemen, yardmen, purifying hands, and cinder throwers, and for an eight-hour day on behalf of the meter-fixers, meter-makers, and pipe-layers, who now work 52 hours per week.

**Skipton Gas-Works Purchase Question.**—At the meeting of the Skipton District Council last Thursday, the principal business was the proposed purchase of the gas-works. At the previous ordinary meeting, it was stated that the Council's offer of £30,000 for the works had been refused by the Company; and it was decided to have a special meeting of the Council to go into the whole matter. This had been done, with the result that a resolution was passed that the necessary steps be taken with a view to promoting an application in the next session of Parliament for an Act giving to the Council compulsory power to purchase the works. The Council now ratified this resolution; and it was decided to call a ratepayers' meeting to discuss the matter. So far as the Gas Company are concerned, they have nothing to say at present, except that they are unwilling sellers.

**Stoking and Conveying Machinery for the Warrington Gas-Works.**—It was announced by Mr. Heaton, at the last monthly meeting of the Warrington Town Council, that the Gas Committee had decided to adopt a tender of West's Gas Improvement Company for the supply of stoking machinery. He added that the agreement with the Company also provided for the supply of coal storage hoppers, and the laying out of the works so that the Committee could change to power-stoking machinery at a later date if the increased production of gas justified the outlay. The cost of hand stoking as at present carried on at the Longford works, is above 2s. per ton of coal carbonized; while the cost of working the manual-stoking machines would be about 1s. 6d. per ton. The interest, sinking fund, and repairs did not exceed 2d. per ton in any of the towns from which the Committee had obtained information. The proceedings of the Committee were confirmed.

**Halesowen in Darkness.**—The inhabitants of Halesowen and district have recently been experiencing great annoyance each night owing to the streets and main roads being in darkness, the lighting of the gas-lamps having been abandoned. This has naturally caused great indignation in many quarters of the town, especially among the tradesmen. It seems that about six weeks ago a deputation from the Halesowen District Council waited upon the Directors of the Gas Company, and urged a reduction in the charges for public lighting. Subsequently the Directors conceded a substantial reduction, and also made arrangements for the large lamps to be supplied with incandescent lights. All the conditions, including the price, were accepted by the District Council, except the term of lighting; and the only matter remaining in dispute is the length of the agreement. The Directors of the Company consider they have conceded a handsome reduction, and are willing to light the lamps as soon as ever the Council enter into an agreement on the terms offered.

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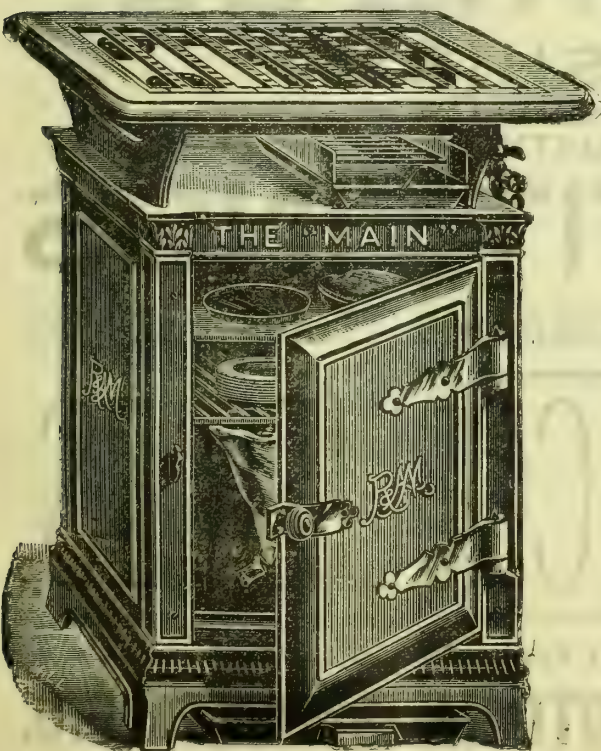
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**Bolton Corporation Water Supply.**—From a recently issued statement it appears that the Bolton Corporation water-works capital account now stands at £819,488; large sums having been spent the last year or two in acquiring land and farms within the gathering ground on the Darwen side. The income during the past year for water supplied amounted to £60,830, as against £60,020 in 1897, and £56,522 in 1896. The Borough Treasurer was enabled to effect a saving by securing loans at lower interest, the amount being £25,937, against £26,499. The profit transferred in aid of rates was £13,848; and it is of interest to note that on no previous occasion has the sum exceeded £12,000.

**Fatality through an Accident to a Gas-Engine.**—Last Saturday night an accident of an extraordinary character occurred at the works of the Scottish Cold Storage and Ice Company, Glasgow. It is said that the valve of a gas-engine got out of order, and caused an explosion, which set free an immense quantity of ammonia gas. There were eight men on the premises, including Mr. Henry Carphin, the Manager of the works; and they were all overtaken with dense vapour. Several of them were unable to make their way to the street and were soon out of danger; others were unable to leave the building immediately, and were rendered unconscious by the powerful fumes. With the exception of the Manager, they were rescued alive, and are likely to recover. Mr. Carphin succumbed to the deadly vapour. Owing to the poisonous condition of the atmosphere for a considerable distance on all sides, it was impossible to get near the building.

**Sale of Stocks and Shares.**—The following stocks and shares have lately been disposed of by auction by Messrs. Kidwell and Son, of Chatham: Four £50 "A" shares in the Rochester, Chatham, and Strood Gaslight Company, at £128 each; four at £129 each; and one for £130. Eleven "B" shares of £12 10s. were disposed of at £22 10s. apiece. Five "C" shares of £3 6s. 8d. were sold at £6 10s. per share; and five similar shares at £6 15s. For eight "D" shares of £8 10s., £24 per share was paid. A similar price per share was given for fifteen £10 "B" shares in the Sheppy Gas Company; while five £10 "C" shares produced £17 each. In the Gravesend and Milton Gas Company, £48 per share was paid for five £20 shares (old issue); and six similar shares of the new issue went for £37 each. Eight £20 shares in the Sittingbourne Gas Company found purchasers at £35 per share; and for seven others, £34 was paid. A lot of £33 6s. 8d. 7 per cent. Maidstone gas stock found a purchaser at £87; and £21 3 per cent. perpetual debenture stock was sold for £23. For £102 of consolidated "B" stock in the Canterbury Gas and Water Company, £237 was paid.

**The Lighting of the Streets of Plymouth.**—On the recommendation of the Works Committee the Plymouth Town Council decided yesterday week to complete the agreement for the purchase of the lamp columns, brackets, and lanterns from the Gas Company, and to employ their own staff for the lighting and cleaning of the lamps. It was also decided to light one or two streets with incandescent burners, on the system recommended by Mr. Bellamy, of Liverpool, in the report which has already appeared in the "JOURNAL." Alderman Phillips said that Mr. Bellamy's report on the system of incandescent lighting was exceedingly

good; but the Committee thought it better to try it experimentally, rather than at once adopt the experience of another town where the circumstances might be very different from their own. Mr. Debnam, the Chairman of the Electric Lighting Committee, hoped the experiment would be made in a district where the lighting was bad, and not where it was good, so that they might really be able to test how far incandescent burners could economically and usefully supplant the lights already in use. Alderman Phillips said the Committee would take care that the experiment was carried out in a proper manner.

**Public Lighting of Lowestoft.**—A tender for the public lighting of Lowestoft during the period ending June 24 next was submitted by the Gas Company at the meeting of the Town Council last Tuesday; and it was accepted, although, according to the Surveyor, the new terms will represent an additional charge of £100 per annum. The Company are to supply the ordinary lamps with 4 cubic feet of gas per hour for 2250 hours, for £1 11s. 6d. per lamp, and provide the necessary fittings and clean, light, extinguish, and repair the lamps for 18s. each per annum. Any extra quantity of gas consumed by lamps lighted over the time specified is to be charged at 3s. 6d. per 1000 cubic feet. The Sugg lamps, with duplex incandescent burners supplied by meter, are to be charged at 50s. a year each, and 4s. meter-rent; the gas consumed being charged at 3s. 6d. per 1000 cubic feet. The Company are also willing to supply incandescent lights in the existing lanterns, and maintain them to the best of their ability to June 24, and light them in accordance with the authorized times for 2250 hours, and the pilot light for 6510 hours for £3 per lamp, all expenses and gas included. In connection with this subject, it may be mentioned that Mr. W. C. C. Hawtayne has been appointed to draw up a detailed scheme, with plans and specifications, for lighting the borough by electricity.

**The Proposed Purchase of the Devonport Water-Works.**—Strong opposition is likely to be raised to the scheme of the Devonport Corporation for the purchase of the water undertaking. Last week a private meeting of opponents of the scheme was held for the purpose of organizing opposition; and among those who attended were several members of the Town Council. A strong point with these and other gentlemen present at the meeting was that the information furnished to the Council was so scanty as to be almost worthless. It was decided to present a requisition to the Mayor to call a public meeting of ratepayers to discuss the question. Such a meeting seems, however, to have been decided upon independently of the requisition; and it will be held this week. In the meantime Mr. Whitfield, the Chairman of the Water Committee, promises that the information which was not given at the Council meeting shall be tendered at the meeting of ratepayers. In his opinion it will "wholly dispel the sensational figures that have been so precipitately flourished" by the opponents of the scheme. It is perhaps worthy of note that Devonport is receiving its full supply of water, while in the neighbouring borough of Plymouth (where the works are under municipal control) the supply has been curtailed. Mr. H. Frances, the Engineer of the Devonport Water Company, is reported to have said that there is no immediate danger of the supply running short.

# JOSEPH AIRD

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## TO CORRESPONDENTS.

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Telegraphic Address: "GASKING LONDON."

Telephone Number: Holborn 121.

## EDITORIAL NOTES.

## Threatened Trouble in the Yorkshire Coalfield.

It is with a feeling more than slightly akin to despair that one is forced to recognize the existence of yet another labour "crisis" in the coal-mining industry. This time it is the English coalfield over which the Miners' Federation holds sway that threatens trouble, unless the divergent views of employers and employed can be reconciled; and the constant outbreaking of discontent among coal miners, now here, now there, is as wearisome to record as it is distressing to contemplate. No sooner has the South Wales strike ended with the utter discomfiture of the men, than Yorkshire in its turn appears anxious to stop producing coal. Last week the men's officials sent round a circular, which began with the ominous words: "We are now face "to face with a great crisis in the history of the coal trade." Once more! The occasion is soon described. The men belonging to the Yorkshire Miners' Association took it into their heads some time ago that they ought to have a 10 per cent. advance of wages. In the "JOURNAL" for July 12 we mentioned the holding of a conference respecting this demand, between the Associated Employers and the men's Committee, which resulted in an agreement regarded at the time as mutually satisfactory. Unfortunately, however, the men afterwards repudiated the action of their representatives on this occasion; and another meeting had to be called early in the present month, at which the men's "leaders" were fain to confess that their constituents had broken away, and stood firmly by the original demand. The meeting was of a very amicable character, considering all the circumstances. The employers were quite willing to treat the question of higher wages simply as a matter of business, to be settled upon a financial basis by a Conciliation Board. There was no suggestion at all of difficulty about control, or a minimum wage, or any other point of principle, to embitter the situation. It was solely a disagreement as to the rate of coal miners' wages which the circumstances of the trade permitted to be paid.

The employers are organized, and so are the men; and if ever organization might be held competent to shorten a controversy of this nature, this should be the occasion. Yet there is said to be a "great crisis." Why? Because the members of the Trade Unions will not trust their paid leaders to decide for them in a question of wages. The officials, to do them justice, are standing by their July agreement with the employers. They declare that in their judgment the terms then accepted by them were the best that could be had; and they conclude their recent circular in the following words, which are not without pathos in the circumstances: "We have no desire to "thrust anything down the throats of our members; but "if our advice is worth anything, we trust on this occasion "it will be taken." The circular also reminds those to whom it is addressed that, if they want anything else, it can only be had "by fighting for it on the old lines, and "not only for this, but for all other alterations in wages." In plain English, the miners are told that the method of peaceable negotiation between masters and men on the subject of rates of wages is at stake. Of course, the men can strike if they will; but if they proceed to this extreme against the advice of their own leaders, what becomes of the vaunted value of "strong Unions" as a means for the peaceful settlement of all trade disputes not involving matters of principle?

The emergency is a real one. The officials who are thus staking the future of the Yorkshire Miners' Association and the Miners' Federation of Great Britain, for any other use than that of a fighting-machine, upon the issue of their present appeal to the members, are Messrs. Pickard, Cowey, and their principal associates. History shows that these are not the men to shun a fight when they see a chance of winning, or cannot find any other way out of a deadlock. If, despite their advice, the Yorkshire miners elect for a strike, such a revolt will be a greater blow to the cause of Trade Unionism than the heaviest defeat in the ordinary course; for it will remove the operation of striking from the category of rational actions, and relegate it to that of the blind play of natural forces. The South Wales strike was something like this; but there the men had no organization, nor any leaders worthy of the name. The Yorkshire miners have everything in this way that the most ardent Trade Unionist



could desire; and if they now throw all these supposed advantages to the winds, the friends of Trade Unionism will be put to it to say what is the real good of this kind of organization.

Just before going to press, we learn that the question in dispute will be answered to-morrow. On Saturday, a special conference of the Lancashire and Cheshire Miners' Association was held in Manchester, to receive the result of the ballot on the wages question. As in the case of the Yorkshire contingent of the Federation, the men had three courses submitted to their vote—the coalowners' proposal of July for a  $2\frac{1}{2}$  per cent. advance from October 1; the second proposal by the coalowners to refer the question of wages to arbitration; and the handing in of 14 days' notices to demand a 10 per cent. advance. Mr. S. Woods presided, and 92 delegates were in attendance, representing nearly all the collieries in the two counties. The returns presented showed a large majority voting in favour of demanding the 10 per cent. advance. The Yorkshiremen were to meet yesterday to give their final decision on their leaders' letter. The Midland men have already decided to accept the employers' terms. Hence Yorkshire holds the balance between peace or war. To-morrow the coalowners and miners' representatives meet in London to receive the final report of the latter on the situation. At the present moment, it is uncertain what the issue will be, supposing the men to insist upon the 10 per cent. advance. A sinister rumour published in yesterday's "Times" introduces a disturbing element into the calculation of probabilities. It is to the effect that the application for a 10 per cent. advance "was really made at the suggestion of some of the employers, with the view of assisting the men in South Wales and Monmouthshire to do away with the sliding-scale, and so prevent the keen competition of the two districts." If this statement is true, the employers might as well drop the face of union, and let the men walk over their scattered remains. In July the associated coalowners took up a very determined attitude; asserting that the condition of trade in England and Scotland did not warrant any such advance, and giving statistics in support of this contention.

Whatever considerations are taken into account, however, the emergency is undoubtedly serious. It is possible to raise an ulterior point, with regard to the expediency of the method of determining questions of this kind by balloting the men. On the face of it, a ballot seems the most direct and reliable way of ascertaining the sentiment of any body of men; but there is more in a proceeding of this kind than meets the eye. However this may be, the professional leaders of the Miners' Federation appear to be bound on the present occasion to give effect to the members' votes; and there is only too much reason to fear that the majority will be against a peaceful settlement of the difficulty. Even so, the employers have the opportunity of saying another word. It was in July that they declared the state of trade unpropitious for an advance that would satisfy the men; and their refusal was ostensibly based on statistics stopping short at the quarter ending with March. A good deal has happened since then. Coal prices have gone up a little, though not so much as the men expected would be the case. The market is not in a strong condition; but the men might get a little more money without anybody being hurt in consequence. Gas undertakings, at any rate, have had to pay dearer for their supplies—a circumstance which the coalowners cannot venture to deny. On the whole, therefore, grave as the situation is, we cannot think it means a general strike over the Federation area just now.

#### The Workmen's Compensation Act in the Courts.

THE first of the crop of litigation under the Workmen's Compensation Act has been gathered; and it is of the utmost importance that the course of every such case should be marked. One never knows how an Act will work until it is tested in Court with regard to particular cases. Only too often months of debate in Parliament leave an Act so incompletely framed, or so badly worded, that the Courts have the greatest difficulty in divining what its language means. In the two instances of proceedings under the Act that have come under our notice already, there are indications that the new statute is not so clear as could be desired. Yet in the main it came out well from the test; substantial justice being done in both instances. At the Liverpool County Court, the widow of

a brakesman who had lost his life in the service of the London and North-Western Railway Company brought an action against the Company for compensation. The amount had been agreed upon before the case came into Court; the plaintiff consenting to accept £200 on behalf of herself and her five children. There were no lawyers engaged on either side; and for this reason possibly the learned Judge straightway fell into a legal error himself. "His Honour explained that under the Act the plaintiff would have to take out letters of administration, and adjourned the case for the purpose." There is nothing about this in the Act, so that the Judge must have decided in this sense out of respect to general principles. Mr. John Aird, however, fortunately happens to be in a position to supply particular information on the point. From his place in the House of Commons on June 9, Mr. Aird asked the Chancellor of the Exchequer whether compensation awarded to the dependents of fatally-injured workmen would be liable to estate duty, and necessitate probate or letters of administration being taken out. The reply was that the Board of Inland Revenue did not regard such money as property passing on the death for the purposes of estate duty. "So far as they are concerned, it will not be necessary that probate or letters of administration should be taken out where the deceased has left no other property." Every publicity should be given to this statement. In the case in point, the Company acted as best they could to save the claimant trouble and expense. The claim was for an amount equal to the deceased's earnings for three years preceding the death; and £15 for each child, to be invested in the Post Office Savings Bank. The balance was to be handed to the widow. The claim was fully met by the Railway Company, who also allowed the widow £10 as living expenses immediately after the accident. Under the old insurance fund of the Company, the widow would only have been entitled to £100. The Act has therefore been a distinct boon to this poor woman and her family.

In the other case, which was brought in the Perth Sheriff Court, Sheriff Grahame had to determine a question which it has been foreseen would often give trouble. The claimant was a planing-machine minder; and he injured his hand while planing a mallet for an apprentice in the same employ. The defence of the employers was that the injury was not due to an "accident arising out of, and in the course of, the employment," as specified in the Act, inasmuch as the work was not done for the employer, but at the request of the apprentice. Not only was it outside the man's employment, but there was evidence that it was done against the shop rules, which forbade the making of tools during working hours. Consequently, the Sheriff could do no other than he did, which was to give judgment for the defendants. He said, with reason, that the Act is altogether in favour of the employee, and increases very largely the responsibility of the employer. The fact of employment is the foundation of liability; and this has to be established before a claim under the Act can be made out. Mr. Willis, in his little book upon the Act, points out this necessity; remarking that the extent of the operation of the Act will be greatly affected by the construction which the Courts put on the words "arising out of, and in the course of, the employment." The same authority lays stress upon the use of the word "and" in this section; observing that it has a limiting effect, which is doubtless true. Once more, therefore, we have to direct our readers' attention to the literal wording of the Act, if they wish to know what it means. The putting of imaginary cases is to be deprecated, because the facts seldom exactly fulfil expectations of what may happen. It is to be observed that in the case in point the sufferer might perhaps have been said to have put himself outside the Act by "serious and wilful misconduct" in breaking a shop rule; but it is doubtful if a Court would have allowed such a defence. As it was, the defence was perfect; and it accordingly prevailed.

#### Municipal Trading at a Profit.

THE case for municipal trading at a profit was argued before the British Association by Mr. G. Pearson and Mr. E. Cannan. The former is a Bristol town councillor; and he defended his views by referring to local circumstances in a way that enabled us to deal with the point in our "Electric Lighting Memoranda" in the last issue. Mr. Cannan's paper was of a more general, and therefore



less pointed, character. He treated the proposition "in the abstract;" averring that a municipality "ought to be allowed to make a profit for the same reasons as a company are allowed to do so: (1) In order that they may have some inducement to undertake the enterprise which they would not have if they must take all risk of loss and no chance of gain; (2) in order to secure efficient management; and (3) in order that the economic proportion in the production of different commodities may not be disturbed." The author genially supposed that "the arguments against profit-making in municipal enterprise seem to be founded on an antiquated Socialism, or on a false analogy, either from co-operative institutions or from ordinary municipal work." At the same time, even Mr. Cannan was fain to admit that the highest possible profit should not be made in all cases. It is convenient to have this argument stated afresh. The practice of municipal trading at a profit is common enough in England to warrant anybody who approves of it in giving his reasons before a meeting of economists. Moreover, where it is followed to any extent, there is not much prospect of its being abandoned so long as any respectable excuse can be found for keeping up the system. It must be a source of satisfaction to the opponents of the system to learn how few and poor are the grounds upon which it is defended, even at a British Association meeting.

Take Mr. Cannan's first point—the supposed "inducement" of the profit. Such a plea could never be urged save by those by whom the fundamental distinction between a municipality and a trading company or individual is completely ignored. Profit-making is the only proper motive of a commercial organization. What is the office of a municipality? Certainly not the same. Local authorities have to do all sorts of things, as their first duties, not only without thinking of making a profit, but at a positive charge to their localities. These things they must do. There are other things which they may do, if Parliament can be satisfied of the expediency of the undertaking. It is wearying to repeat the statement so often; but it is apparently necessary to observe once more that Parliament, acting in the spirit of the Constitution, has never regarded "profitable" and "expedient" as convertible terms in this connection. Mr. Cannan apparently has no idea of the bearing of the monopolistic character of a local enterprise upon the question of its suitability for municipalization. Where there is monopoly, the making of a profit is not controlled by commercial or by economical considerations, such as avail to protect the user or consumer of a marketable commodity. It is a matter of ruling and prescription. The municipalization of a monopoly can only be advocated logically in the public interest, which means getting the service performed at the cheapest rate. It is a small and mean view that there must be the inducement of profit-making to recommend an undertaking to a municipality. From this point of view, the members of the municipality ought to have a definite share of the profits, just like directors of trading companies, in order to keep them up to the mark in doing their duty to the community. Again, it is worse than a blunder—it is a positive insult—to suggest that there will be no good management of any municipal undertaking unless there are "profits."

Mr. Cannan's third reason is not a particularly clear one. He seems to imply that without profits there will be underselling; but here again he forgets the consideration of the monopoly involved in all municipal trading operations, and does not discuss the price of the service in the light of an indirect taxation. To put in a nutshell the whole case against municipal trading at a profit—the idea sets back the clock of public service to the days of turnpikes and the *ante* penny post period. Naturally, in the slow and painful process of the development of civilization, many things were done, at first, for the inducement of profit. Every public service was expected to be profitable to the doers of it, from the administration of justice downwards. Step by step, little by little, the work of the community came to be done with a view to the general good. This is the right way of it, whatever Mr. Pearson and Mr. Cannan may say, and a few reactionary municipalities still practise. A municipal department has certainly no more right to tax those whom it serves, than a member of a town council has to pocket a fee for doing his work honestly, and as well as he knows how, for the common good.

## WATER AND SANITARY AFFAIRS.

A SELF-REPRESENTATIVE deputation, consisting of four members of Parliament, one of whom was from Bradford and one from Romford, waited upon the President of the Local Government Board last Friday, for the purpose of holding what is called a conference on the subject of the scarcity of water in the East-end of London. These four gentlemen urged that the Department presided over by Mr. Chaplin should use its influence to induce the East London Company to make purchases of water from the other Companies "upon an adequate scale to meet the present shortage." As we shall have occasion to remark farther on, there was no need to call upon the Local Government Board to make any such effort; the East London Water Company being busily occupied with the necessary arrangements for enlarging their resources in the manner proposed, some of the work being already done. Mr. Chaplin was also able to show this quaternion of advisers that his Board had been moving in the matter as far back as the month of May, and with good effect. In fact, the President said he had exhausted the powers of the Board, if indeed he had not gone a little beyond that point. Having already done so much, Mr. Chaplin went on to give "an emphatic assurance" that he would not fail in the future. He was even reported to have promised to obtain for the consumers "all possible compensation for the distress and inconvenience they had experienced;" this being in response to a request that the Board should represent to the Company the justice of foregoing a claim for rates in respect of water which had not been supplied. Any such promise is repudiated by Mr. Chaplin; the question being one which rests with the Railway Commissioners. The claim for such a deduction from the water-rates is certainly not very encouraging for the Company. They are spending enormous sums of money in seeking to augment the supply, and are called upon to go on spending without stint, while at the same time they are to be penalized for not having done that which it was out of their power to do. When the account comes to be made up, we expect it will be found that to the Company the drought has been a very costly affair. Moreover, this suggested reduction of the water-rate would not be likely to benefit the real sufferers, but would serve as a gift to the landlords, who in most cases have not suffered at all. So far as the Progressive members of the County Council are concerned, they do not seem, as a rule, very partial to landlords. But, of course, the prevalent idea is to "hit" the Company, classed as among the "Water Lords"—an elegant phrase which, we believe, originated with the "Daily Chronicle."

On Saturday Mr. Chaplin received another dubious kind of deputation, professedly representing the East-end Local Authorities, but more distinctly apparent as having been organized by the Social Democratic Federation. Happily the occasion served to give the President of the Local Government Board an excellent opportunity of explaining the situation more fully. Particulars were given by Mr. Chaplin concerning the actual operations for connecting the mains of certain of the Metropolitan Water Companies, the effect of which will be to assist the East London supply to the extent of 12 million gallons per day, with the possibility of bringing up the quantity in aid to 16½ million gallons; thereby more than compensating for the previous falling off, estimated at 15 million gallons. The fear of a recurring deficiency may thus be dismissed. Mr. Chaplin declares himself decidedly of opinion that it is desirable to connect the mains of all the Water Companies in London; and he directs attention to the fact that this was one of the matters referred to the Royal Commission. It is interesting to learn—and it is a matter of no small importance—that, at Mr. Chaplin's instance, there is the prospect of an early interim report on this subject from the Commission. Respecting the policy of purchase, it is rather curious that the deputation failed to specify any particular body to whom the undertakings of the Water Companies should be transferred. No doubt the County Council is in view, and to that contingency Mr. Chaplin directed his remarks. He showed the difficulty of including the outer areas, and adverted to the physical obstacles in the way of a severance of the existing works. The wisdom of having made this one of the matters to be reported upon by the Royal Commission was evident. On all points, including the



charge of inaction on the part of the Government, the contentions of the deputation were well met; and Mr. Chaplin's reply will stand as a very able and impartial exposition of the important subject of the Metropolitan Water Supply. The question is one which cannot be precipitated, pending the report of the Royal Commission; and the present duty is to carry out those arrangements already in hand which will protect East London from the effects of another dry season. The proposed autumn session for dealing with the Metropolitan Water Question was shown to be a useless expedient. In reality, it was an absurd proposal, congenial to the extreme notions of the Social Democrats.

While progress is thus being made to restore the full water supply of East London, there is an attempt to show that the water sent out by the East London Company is peculiarly deficient in quality. "The Times" having stated that the returns for "last month"—that is August—showed that the East London supply, so far from being the worst in the Metropolis, was rather the best, the "Daily Chronicle," followed by "London," undertook to prove the contrary by referring to the reports for July—asserting these to be "the last." If our contemporaries will avail themselves of the reports for August, issued before their remarks were made, they will find ample justification for the statement in "The Times." But, of course, they rely on General Scott's report, which is always somewhat (doubtless unavoidably) late—that for July appearing on Sept. 7. Yet these very astute gentlemen, who undertake to correct the correspondent of "The Times," might be expected to consult the almanack sufficiently to know that July is not the month that comes immediately before September, and might be supposed to understand that July data do not necessarily correspond to those of August.

The Hackney Vestry, after inveighing against the East London Water Company and invoking the powers of the Railway and Canal Commission under Mr. Chaplin's Act of last year, were found on Friday last so unprepared with their case as to be unable to submit to the fixing of a date when it should be heard. The Company, represented at the sitting of the Commission by Mr. Cripps, Q.C., were ready, and were anxious that a hearing should take place early in October. But the Commissioners were not disposed to move out of their ordinary course unless it were for the public good, and in order to deal with some really urgent matter. All they could see was that the East London Company were, as Mr. Justice Wright intimated, anxious to have the matter settled, in order "so to speak" to "clear their character." The Local Authorities were not in a position to require prompt hearing; and there was nothing to show that the interference of the Commission would result in immediate advantage to the inhabitants of the district. The Company were pressing, and not the Authorities. Accordingly the Commissioners resolved to let the matter stand over. This incident, among others, serves to show the utter unreality of the agitation which has been raised in Hackney and other East-end parishes in respect to the water supply. The wire-pullers are at work, seeking to promote a purpose in which the County Council comes first, while the consumer stands a long way second. Mr. Beachcroft puts the case well, in the course of the controversy going on in "The Times," when he says that the real question for consideration is how the failure of the water supply may be rendered impossible in the future; whereas Mr. Stuart is, on the other hand, considering how to utilize the failure for the discomfiture of the Water Companies.

Plymouth, we may presume, is now at the end of its troubles with regard to its water supply. In 1894, the leat, associated with the memory of Sir Francis Drake, was superseded by a pipe-line; and on Wednesday last the completion of a large storage reservoir, situated a dozen miles from the town, was duly celebrated. The open watercourse which for generations brought the waters of the River Meavy to Plymouth, was apt to be blocked by frost and snow; and more recently the supply was affected by drought. At a cost of £175,000, Plymouth will now have the benefit of a big reservoir, nearly a mile and a half long, and half a mile across at the widest part. A dam rising 77 feet above the bed of the river now intercepts the flow of the Meavy, and will store 650 million gallons of water—a sufficient supply for about 130 days. At the quaint ceremony observed on Wednesday—ancient in its

origin, and now at an end—after drinking in water to the pious memory of Sir Francis Drake, the Mayor and Corporation drank in wine the second toast of the annual fishing feast—"May the descendants of him who brought 'us water never want for wine.'" We trust neither reservoir nor pipe-line will fail, and that Plymouth will never want for water.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 709.)

THERE is still no improvement to be noted in the tone of the Stock Markets, but rather the reverse. Last week certainly gave a little promise of amendment at the opening; but it soon came to naught. This was owing largely to the apprehension created by the Pekin *coup d'état*, cumulated upon the already disturbed condition of foreign affairs, and to the increasing drain upon our gold reserve. So things fell very flat; and they continued thus to the close, with the result that prices in all the chief departments show a moderate drop. On Thursday, the Bank Directors raised the rate from  $2\frac{1}{2}$  per cent. (fixed on June 30) to 3 per cent. This was not universally expected—indeed, up to Wednesday night, many thought that a rise would not be necessary. In the Gas Market, business scarcely maintained the level of activity which it had reached the preceding week, though that was nothing extraordinary; but there was no sign of shrinkage in value for lack of support, and the general tendency was steady. Changes in quotation were very few and unimportant. In Gaslights, the "A" was moderately active, and, despite the prevailing torpor, advanced a point. Actual prices realized were quite level from day to day, never varying more than a point or so above or below 294. The secured issues were moderately dealt in, and were steady, but without any promise of an advance. A small amount of business was done in South Metropolitan; but prices were no better than moderate. Commercials were not touched, intending sellers probably waiting until after the Company's meeting next week. There was a shade more doing among the Suburban and Provincial Companies; and prices for the most part were very good, though quotations did not move. The Continental undertakings were very quiet. The only one to move was Union, the preference shares of which had a fall. Among the minor undertakings in the remoter world, there was nothing to call for remark. Business in the Water Companies was of the most limited proportions; and movements in value were as slight and unimportant. The most noteworthy feature was that East London, after dropping down to 212 $\frac{1}{2}$ , had a rally, and recovered a couple of points of its loss.

The daily operations were: Business in Gas on the opening day was fairly brisk—perhaps more active than on any other day later in the week, and prices were favourable. Gaslight "A" advanced 1. Transactions on Tuesday were extremely limited; and quotations did not move. In Water, East London fell 3. Wednesday's operations showed that good steady prices were obtainable; but still the figures did not advance. The characteristics of Thursday were much the same—steady prices, but no rise in them. In Water, East London recovered 2. On Friday, business in Gas continued at about the same level, and figures remained about the same; but Continental Union preference fell 2. In Water, Southwark ordinary was 2 lower. Saturday's business was brisker than usual; but no change was apparent beyond a further fall of 2 in Union preference.

### ELECTRIC LIGHTING MEMORANDA.

Electricity at the British Association—Electrical Plant Culture—Electrical Power Transmission.

ELECTRICAL subjects bulked largely at the British Association meeting. There was a special joint conference during the meeting, of an international character, to discuss the still unsolved problem of how to prevent the strong currents employed in tramway and railway working, and for power transmission, from doing mischief outside. The subject is dealt with at greater length in another column; but it was agreed that even the Board of Trade regulations have not removed the risk of electrolysis from gas and water mains and services in localities where these currents exist. Many other topics of an electrical nature were brought before the British Association, chiefly in Section A; and it is again proposed that a new section should be formed to take up this branch of physics. The chief objection to the proposal is mentioned and admitted by the "Electrician." This is the poor quality of many electrical papers sent to the British Association. If there were an electrical section, there is more than a probability of its being a desert for the greater part of the week. The electricians who are in the habit of attending the meeting would never make an audience for one another. They know each other too well. With the present arrangement, an electrician can reasonably hope to catch the



ear of somebody besides the chairman of the section—at any rate, to begin with. Lest it should be thought that jealousy inspires our remarks upon this head, we will repeat what the "Electrician" has to say of the electrical papers read before Section G. "It has been the excellent custom for some years past to set apart Monday for these papers; but the average quality of the communications on such occasions is decidedly disappointing. Now and again a real advance in engineering science is marked by the reading of a thoughtful and suggestive paper; but not uncommonly the contributions are a miserable re-hash of antiquated platitudes, an oft-told tale that bores the electrical engineer and affords no practical information to engineers of a different sort." This is very sad.

The Presidential Address of Sir W. Crookes having dwelt upon the prospect that nothing but electrically produced nitrate of soda will avail to preserve the world from starvation in the not-distant future, there was a certain appropriateness to the general question in the papers of Herr Lemström and Dr. E. H. Cook on the influence of electricity on growing plants. This is a subject that greatly occupied the attention of the late Sir W. Siemens. The electrical production of a fertilizer to be applied to the earth in the humdrum way of ordinary farming, is a comparatively tame idea to that of growing crops directly by electricity. Herr Lemström says that by his electrical treatment "there has been in general an increase in the seeds of at least 40 per cent.; in the roots, from 25 to 75 per cent., depending on the kind of plant and on the nature of the soil; beans, 75 per cent.; and strawberries and raspberries, as high as 75 per cent., and the time for their ripening shortened at least one-third." It can only be said of this story that it is too good. Dr. Cook stated that electrification appeared to accelerate the germination of seeds; but low-power currents had no effect upon the plants afterwards. High-voltage currents seemed to act much better upon growing plants. After hearing both these papers, however, the President of the Section (Professor Ayrton) said he had not made up his mind that plants materially benefited by electrical treatment. Lord Kelvin followed on the same side; freely avowing his fear "that the chance of agriculture really benefiting was very remote." All the same, there must be allowed to be something in Lemström and Cook's results which calls for further investigation. The British Association ought to appoint a committee to look into the matter. Meanwhile, such of our readers as have gardens may like to try for themselves the arrangement described by Dr. Cook as a French invention for the application of atmospheric electricity to plant growing. It is called the "Géomagnétique," and is practically a lightning conductor set up in the middle of a field, and connected below with a series of cross wires running under the soil near the roots of the plants. Dr. Cook vouches for the fact that in a kitchen garden on Clifton Hill this year, one of these arrangements produced a distinctly beneficial effect upon the crops. Are nitrate of soda and sulphate of ammonia to be disestablished by direct electrical action?

It is remarked by an electrical contemporary that much bitterness was imported into the debate at the British Association upon certain papers on electrical power transmission. Mr. Alexander Siemens gave a temperately worded account of the actual position of this branch of electrical engineering. He believes that electricity will, in the near future, supersede steam, horse, and cable traction for tramways. He admitted that it would be advantageous if alternating electric currents could be employed for tramway working, by reason of the ease of transmitting the power from a distance and the simplicity of the transformers. But there is as yet no reliable alternate-current motor available. Such motors certainly exist; but unfortunately up to now they refuse to start without being first synchronized by external means, they are liable to stop abruptly when overloaded, and their speed cannot be varied. A great step towards the solution of the problem was made when the three-phase system was hit upon; but, on the other hand, a continuous-current system is decidedly simpler, and consequently cheaper in first cost and maintenance. There is such a plant at the Charlton works of Messrs. Siemens Bros. and Co., which gives satisfaction, although the motive power costs 2d. per unit. This is rather dear; and the "Electrical Review" draws from the statement the comfortable inference that public electricity supply undertakings may hope to do a good business of this kind, even with large engineering works. Mr. Gibbings, the Electrical Engineer to the Bradford Corporation, read an instructive paper recounting how the use of electric motors is being encouraged in this town; and then, it appears, Professor Silvanus Thompson fell upon the meeting and the "direct-current" men with a root-and-branch condemnation of their methods, and declared that the three-phase alternating system is going to supersede everything else of the kind. This declaration did not command the assent of all the other learned and eminent professors who had foregathered at Bristol. Professor Thompson appears to have posed at the meeting on more than one occasion as a prophet of the three-phase system; but he did not succeed in convincing everybody that all direct-current plant should be relegated to the scrap-heap. Hence the "bitterness" spoken of by our electrical contemporary as poisoning the air of the Section of Mechanical Science. Your electrical prophet does not like a sceptical audience; and electricians, when not prophesying on their own account, are apt to be impatient of their fellows who so enjoy themselves.

## THE BRITISH ASSOCIATION AND ELECTROLYSIS OF GAS AND WATER PIPES.

BRITISH gas engineers and gas-works proprietors are not troubling themselves over the prospect of a great expansion of electric traction in populous places which is unquestionably opening before the people of this country. Home readers of the "JOURNAL" know, in a general sort of way, that gas undertakings in America are sometimes afflicted with a disease of their distributing system called electrolysis, traceable to the action of electric traction currents; and there was a brief time, when electric tramways were first started in England, when there existed some disquietude on this account. The Board of Trade, however, intervened with a model set of regulations; and the threatened owners of buried property in the shape of gas and water mains straightway composed themselves to rest in security behind the great department. It therefore came as an unpleasant surprise, when Professor A. W. Rücker, presiding during the meeting of the British Association over a conference on Terrestrial Magnetism and Atmospheric Electricity, stated that the problem of the wandering currents of electrical traction systems is still open. "The science of terrestrial magnetism, which, on the one hand, is forging another link to connect the sun and earth, and, on the other, is penetrating within the surface of the globe to depths beyond the ken of the geologist, is threatened by the artificial earth currents of the electric railway." So far, serious as the crisis may be, it is not a matter for anybody but magneticians to agitate about. They are not disposed to be selfish, and will certainly not be so foolish as to set themselves against the extension of electrical railways, which will confer vast benefits upon the community at large. The trouble, however, though they are the first to discover it by reason of the delicacy of their instruments of research, will not be confined to them; but what upsets a magnetic observation to-day, may perforate a gas or water pipe in the course of time.

Professor Rücker declares that "we are now at the beginning of another industrial epoch which may, indeed, if power is transmitted from a distance on a large scale, brighten our skies, but which threatens to saturate the earth beneath us with electric currents. That these may interfere with the general comfort, is evident from the injury which has been done to underground pipes at Washington and elsewhere." The subject was subsequently discussed at a joint meeting of physicists, engineers, and magneticians. It appeared, from what was stated on this occasion, that magnetic observatories succumb to electric railways within three miles. In the case of a proposed electric railway at Kew, the magnetic observatory is to be protected by complete insulation throughout the district, and the two conductors are not to be separated by one-hundredth of the distance of either of them from the observatory. Mr. W. H. Preece spoke of the need for making electric lighting and traction currents, as the latest comers in the land, subservient to regulation in the interest of the safety of older public service appliances. Taking the case of the City and South London Railway, upon which a very close watch has been kept, Mr. Preece said that the whole of London had been found disturbed by the currents of this railway. There seems to be considerable leakage "due to the use of the earth, and also to the fact that the third rail, from which the current was picked up, was badly insulated." He called special attention to the fact that "in no single instance was the disturbance such as could not be remedied by taking simple and ordinary precautions." This is reassuring; but the question remains as to what is likely to happen if these precautions fail. At Bristol, Major Cardew's suggestions and Mr. Parshall's improvements on the service methods of the electric tramway have had a very beneficial effect, "reducing the maximum disturbance to slightly exceeding one volt." If ever the Metropolitan Railway is worked electrically, it will be necessary to make it a complete metallic circuit. "The use of the earth is a vested interest for the whole nation;" and electric tramways and railways must not monopolize it.

Unfortunately, when electrical traction was thus called upon to show cause why it should not be bound over to keep the peace towards other services, the electricians and engineers who might have undertaken the defence of the accused were not present. This is greatly to be deplored, more especially as Dr. J. A. Fleming had a paper on the subject of the electrolytic corrosion of water and gas pipes by the return currents of electric tramways, the conclusion of which was "that even working under Board of Trade regulations, it must not be assumed that the danger does not exist." This is a grave statement. Dr. Fleming's paper is not suitable for complete reproduction in our columns; but we can give a summary of its contents. Referring to the sixth regulation of the Board of Trade Order, under which electric traction is actually carried on in the United Kingdom, the author explains it to mean that where a pipe is found to be negative to the rail the potential difference is not to exceed 4·5 volts, or if the pipe is positive to the rail the potential difference must not exceed 1·5 volts. Generally speaking, the danger areas are those in which the pipes are positive to the rails, and where a resulting current flows out of the pipe into adjacent electrolyzable soil. Assuming that the Board of Trade regulations are obeyed, the next question of practical moment is as to their sufficiency for the



prevention of mischief. Dr. Fleming accordingly tested the conductivity of some London clay, taken from a street opening made for main laying. He also tested in the same way some damp sand, and cement concrete—all common road-making materials. He found from his observations that a continuous flow of electricity, not exceeding 1·5 volts, may amount to something very considerable in the course of time between metallic surfaces of large area buried in the soil. Moreover, a large proportion, perhaps the whole, of this flow must be carried by electrolytic conduction. In such circumstances, a pipe would be electrolytically attacked. If the surrounding soil is of a nature to favour electrolysis—that is, if moisture and salts are present in it—a far less difference of potential than the maximum of 1½ volts permitted by the Board of Trade can produce rapid corrosion of iron. Several experiments were described by Dr. Fleming as proving that “quite small potential differences—much less than a single volt—between iron surfaces buried in damp soils, especially if soluble chlorides are present, may bring about considerable electrolytic erosion in no great periods of time; and that there is no absolute security in the limit of 1½ volts imposed by the Board of Trade regulations.”

It was felt desirable to test the matter with actual water-pipes, on a somewhat large scale. Accordingly at Dr. Fleming's suggestion an experiment on 5-inch water-mains was arranged at the Bristol Water-Works, by Mr. H. W. Pearson, the Engineer of the Water Company. The arrangement was as follows: Three exactly similar 36 feet lengths of the piping, jointed and laid as for a water-main, were buried side by side in a non-acid sandy clay soil. One row of pipes was neutral, and was intended for the basis of comparison. Between the other two lines of pipes a difference of potential of 1 volt was kept up day and night for six months, after which period all the pipes were dug up and examined. The pipe which had been connected to the negative pole of the battery was of a clean, grey colour, with hardly a trace of oxidation. “The pipe length which had been connected to the positive pole of the cell was uniformly covered with a layer of orange-yellow oxide of hydroxide of iron, in some places of quite sensible thickness and easily detached. . . . The appearance of the pipes clearly indicated that electrolytic action had taken place.” If the action, instead of being general over the surface of the pipe, had been concentrated upon one spot, the damage would have been more serious.

If a pipe-line were homogeneous throughout its length, it would be a good conductor—much better, at least, than the ground which surrounds it. The resistance offered by bad or oxidized contacts at the joints, or by films of moisture, paint, or preservative compound, may altogether outweigh the resistance of the mere run of pipe material. The resistance could not be estimated. It is probable that, whereas in some cases the conductivity of long lengths of water and gas pipes may be fairly small, in others oxidized or electrically bad joints will introduce great resistance. “We have, however, to regard the subterranean pipes of all kinds as forming a network of conductors, interrupted more or less at places by junctions of high resistance, but, on the whole, most probably forming an irregular conductor system of greater conductivity than the soil or earth actually displaced by it, or which would occupy the same space if the pipes were not there.”

Dr. Fleming then proceeded to discuss the conditions likely to prevail in the vicinity of an electric tramway on the trolley-wire system. Where such a system of tramway is worked on the rail return principle, it is inevitable that there will be some flow of current through the earth, however carefully the rails may be bonded. It is practically impossible to foretell what may happen in the case of an actual tramway in regard to this vagrant current. The best contemporary American practice has given up reasoning about it, and is content to deal with mischief when it shows itself. The trouble is that the current will in some places leave the rails and go to the pipes, and in others will quit the pipes for the rails. Local conditions, such as the dampness or salinity of the soil, may largely influence the effect, which may prove out of all proportions to the theoretical expectation based on the measured loss of current. Even if actual perforation does not occur, the life of the pipes may be shortened by the action brought to bear upon them. Lastly, “as the conditions determining possible pipe corrosion are numerous, and not all easily predetermined, it is important in the case of every electric traction system with uninsulated earth returns, that an electrical survey should be made at intervals, setting down on a plan showing rails and pipes, the potential differences between them at various places. Within the danger area a close watch can then be kept, when the ground is opened up for any purpose, for evidence of destructive electrolytic action on buried pipes.” This is by no means a reassuring prospect. It seems to be the latest word of science on the subject. When continuous currents are abolished, and railways are worked by three-phase alternating currents in insulated conductors, there will be no danger of electrolytic action. This relief is not yet to hand. In the meantime, it is acknowledged by the “Electrician” that adequate provision will have to be made for the protection of scientific research and of actual property in the vicinity of the lines, the security of which might otherwise be menaced by the magnetic and electrolytic effects of the traction currents. Such protection, it is considered, is best to be found in the adoption of “an insulated return conductor placed in such a

position relatively to the supply conductor” as will reduce outside effects to real insignificance. This is a point to be borne in mind in connection with future Electric Railway Bills. Electric traction is certain to come, and will probably have a great future in this country. But there is no good reason why its progress should be at the expense of gas and water distributing plant, to say nothing of telegraphs, telephones, and the case of magnetic observatories. Much interest will attach to the experience collected with respect to the working of the pioneer lines in Bristol and Leeds.

#### INCLINED RETORTS ON THE CONTINENT.

THE report of the Commission of the Association of German Gas and Water Engineers appointed to collect all available information on the use of inclined retorts was presented by Herr Reissner, of Berlin, to the general meeting of the Association, and was briefly referred to in our notice of the proceedings at that meeting (*ante*, p. 201).

The striking extension of the inclined retort system on the Continent, which is indicated by the fact that settings for 2655 of these retorts are in course of erection, while only 1393 such retorts are already in use, calls for further comment. As a matter of fact, the bare statement of the totals is misleading, owing to the present curious position of the gas industry in Vienna. The Imperial Continental Gas Association have had for some few years 108 inclined retorts at their works in the city; and had they been assured of the continuance of the use of these works, more slopers would doubtless have replaced horizontal retorts as opportunity arose. But under the prevailing circumstances, the Imperial Continental Gas Association have refrained from introducing new settings of inclined retorts at their Vienna works. The authorities of the city, however, have taken in hand the construction of settings for 1620 inclined retorts at the new municipal works now in course of erection. This gigantic installation, when completed, will remove all ground for the belief of some few gas engineers that inclined retorts are still only found in one or two experimental benches in works in which the bulk of the carbonizing continues to be carried out in horizontal retorts.

When the 1620 retorts which are about to be set in Vienna are taken from the grand total of 2655 inclined retorts in course of erection on the Continent, only about a thousand remain to represent the contemplated increase in the use of the system in other Continental towns. This number, however, is nearly equal to the number at present in use, and therefore indicates a very rapid extension of the system. In most cases an addition to the number of existing settings of slopers is being made; but in a few towns they are about to be adopted for the first time. For instance, at Zürich, settings for 144 inclined retorts are being erected as a first instalment; and both at Malmö, in Sweden, and at Frankfort-on-the-Maine settings for 72 retorts will serve to introduce the system. On the other hand, the number of inclined retorts at the municipal gas-works at Berlin is being increased from 54 to 315; and at Milan an addition of 144 to the existing 72 is being made. The Cassel installation of 108 retorts has already formed the subject of an interesting report;\* and it is pleasing to notice that the number is being increased to 153.

The report presented to this year's meeting of the Association was supplementary to the exhaustive one made by the Commission of the Association last year.† No detailed descriptions of the settings are given in the present report. The Commission had been requested at last year's meeting to consider the question of the validity of the patent rights for inclined retorts in Germany,‡ and to express an opinion as to what would constitute infringement. This request had been made on the motion of Herr Grahn, of Hanover. The Commission unanimously decided to advise the Association not to take up the consideration of questions of patent rights, as they did not appear to come within the legitimate sphere of action of the Association, and might conceivably involve them in a large expenditure. This attitude of the Commission called forth adverse comment from Herr Grahn; and the discussion on the strictly technical portion of the report was thus thrown into the background.

#### RODDA'S "NOTES ON WATER SUPPLY."

A FEW years ago, a series of articles and notes on the subject of water supply were contributed to the “JOURNAL” by Mr. J. T. Rodda, of Eastbourne; and their publication gave rise to an instructive discussion on the various points brought forward. The author has reprinted them in book form,§ accompanied by a number of useful tables, memoranda, and illustrated descriptions of appliances, tools, and materials required on a

\* See “JOURNAL,” Vol. LXIX., p. 1500.

† *Ibid.*, Vol. LXX., p. 795.

‡ *Ibid.*, Vol. LXX., p. 164.

§ “Notes on Water Supply, containing References, Tables, Notes, Memoranda, and Detailed Advertisements in Relation to Water-Works Engineering; also Illustrated Descriptions and Prices of Apparatus, Appliances, Tools, and Material required on a Water-Works.” By J. T. Rodda.



water-works. The book has no pretensions to being a treatise; the object being rather to point out the specialists from whom valuable information may be obtained, and to indicate as far as possible the best water-works appliances in the market, with notes thereon. The distribution of water on the most modern systems is of vital importance, and demands the serious attention of all those who are entrusted with the care of a public supply. It is not to be expected that all the details of design and construction of the most recent plant and appliances can be acquired without close application and research; and therefore it is imperatively necessary that a competent hydraulic engineer should be consulted—one who has acquired his special knowledge from many years of study and experience.

Mr. Rodda gives a number of new and very useful tables, formulæ, and rules, which have been worked out by him specially for this book; and they will be found of the greatest value to all engaged in carrying out water-works. One of the tables may be mentioned. It gives the approximate relative discharging powers of full smooth pipes from 2 to 50 inches in diameter. This will facilitate the proper proportioning of pipes for distribution—a work which is often done by rule-of-thumb. Other tables relate to the delivery of water in pipes, the loss of head through friction, the pressure of water in pounds per square inch and feet head, weights of pipes and specification therefor, and modern rules and regulations. The abolition of cisterns in dwellings at the East-end of London—a matter which is now engaging a considerable amount of attention—is dealt with in an article entitled "Cisterns a Necessity." There are some practical notes on the Worthington pumping-engine, meters, and most of the machinery and appliances used in water-works, including patent stopcock boxes, &c. The descriptive advertisements of the manufacturers selected being printed on the left-hand pages, opposite the notes referring to their specialities, illustrate the text as fully as possible, and direct the attention of the reader to reliable manufacturers or specialists for the particular work described.

The index is a unique feature. All the manufacturers' names, with their leading specialities as advertised, as well as notes, are indexed; and sufficient space is left for the addition of notes, memoranda, and formulæ. This will help to make the book a standard work of reference, and cause it to be in constant requisition by the office staff.

#### PERSONAL.

On the nomination of Mr. G. H. Hill, Mr. M. R. BARNETT has been appointed Resident Engineer for the Cray Water-Works of the Swansea Corporation, at a salary of £450 per annum.

Mr. F. G. PULLINGER has resigned the secretaryship of the Edenbridge Gas Company, having taken a business at Seven-oaks. Last Tuesday evening the Directors appointed Mr. C. CHEAL as his successor.

Mr. W. WYVER, who has for several years held the position of General Foreman at the works of the Whitstable Gas and Coke Company, Limited, has now been appointed Working Manager for the Company, and also for the Water Company.

#### OBITUARY.

Mr. C. H. DUDLEY, who for some time was Chairman of the Stafford Corporation Gas Committee, died yesterday week. For many years he had taken a prominent part in the public work of the town. He became a member of the Town Council in 1880; and the following year saw him in possession of the highest office his colleagues could confer upon him.

The death is announced of Mr. GEORGE MATHER, who was connected for many years with the Stockport District Water-Works Company in various capacities, ultimately filling that of Secretary, which position he held until his retirement a few years ago. Mr. Mather was 77 years of age. Since he gave up active work, he has resided at Buxton, where he died on Monday last week.

We regret to record the death, on the 16th inst., after a short illness, of Mr. JOSEPH PHELPS, Engineer and Secretary of the Marlborough Gas Company. Mr. Phelps was a native of Marlborough, and for 34 years held the above-named positions, as well as many important offices in the town, in which he had an ironmonger's and gas-fitting business, which his Directors allowed him to carry on—thereby showing their great confidence in him. He was elected a member of the British Association of Gas Managers in 1867, and was a regular attendant at the meetings of that body and subsequently of The Gas Institute—only missing the last through a slight ailment. His death took place at his brother's residence at Brixton; and he was buried in the family vault in Marlborough Cemetery. The funeral was attended by a large number of his fellow-townsmen, as well as by the whole of the Church officials and Sunday-school teachers—Mr. Phelps having been Honorary Organist and Superintendent for 35 years; and general testimony to his worth was shown by the closing of business places at the time of the ceremony. Deceased was a Freemason; and two of his brethren in the gas profession (Mr. F. C. Taylor, of Shanklin, and Mr. J. J. Jervis, of Swindon) followed his remains to their last resting-place. Mr. Phelps was 68 years of age; and he leaves a widow.

#### NOTES.

##### Exposure of the Jacques Carbon-Battery.

An exhaustive test of the Jacques carbon-battery, in which, as claimed by the inventor, coal or coke is converted directly into electricity, has been made by Messrs. Rosewater and Oldham, as reported in the "Journal of the Franklin Institute." The patentee claims for the cell an efficiency of 32 per cent., instead of the present duty of 6 or 8 per cent. The apparatus consists of a closed furnace, which heats an iron pot 6 inches in diameter and 2 feet deep, filled with caustic potash or soda kept in the molten state. In the alkali bath is suspended a carbon rod, which forms one electrode of the battery and is the consumable element. Air is at the same time blown through the bath, to keep it in constant agitation, and help to supply oxygen. These cells undoubtedly supply current; but in stating its efficiency, the inventor used to leave out the weight of fuel consumed in keeping the pots hot. Jacques asserted that the generation of current was due to the chemical combination of the oxygen of the air with the coke in the electrodes; but this statement was disputed. The latest experiments show that the cause of the current is thermo-electric, and not chemical or galvanic. When coal gas was blown into the alkali bath instead of air, the current came off just the same; and the substitution of copper or iron for coke as the consumable electrode, made no difference to the voltage. Hence it was concluded that the cause of the direct conversion of carbon into electricity had not been materially advanced by the Jacques battery.

##### The Protection of Lead Water-Pipes.

In a recent number of the "Zeitschrift für angewandte Chemie," M. Liebrich published an account of the causes of the action of water on lead pipes, and the means of its prevention. After showing how the opinions of different authors vary on this question, he states that his experiments, made with water characterized by the absence of carbonates and by a relatively large proportion of organic substances and nitrates, enabled him to establish the following points: The essential causes of the attack on lead are due to the action of oxidizing substances (air) and acid (carbonic acid). The presence simultaneously of two agents, oxygen and carbonic acid, is requisite; for, removing the oxygen with sulphite of soda, excess even of carbonic acid does not dissolve the lead. On the other hand, the dissolving action of oxygen also disappears by the removal of carbonic acid. According to the author, distilled water laden with air and carbonic acid acts powerfully as a lead solvent—a fact which demonstrates that if salts of drinking water have any action at all, it is at least a very limited one. Presence of bicarbonate of lime in water checks the dissolving action, as it seems to exclude the formation of lead and zinc carbonates. There are cases where, air and carbonic acid being present, even very hard water attacks pipes; but the action is then relatively slighter. M. Liebrich found that the addition of carbonate of lime decreases, it is true, the dissolving action on the metal, but does not arrest it completely. By adding carbonate of soda in just the necessary quantity to fix the carbonic acid without rendering the water really alkaline, the author succeeded in preventing all dissolving action on lead. He admits that if during the day, when the water flows relatively quickly, the amount of metal in solution is very slight, it is not so in the morning after the night's repose. He concludes by recommending the use of carbonate of soda.

##### The Purification of Drinking Water.

In such seasons as that with which this country has been visited for three years, much interest attaches to the subject of a recent leading article in the "Engineer," which dealt with the question of the foulness of water supply that usually accompanies diminution of volume. The worst feature of a severe drought is that what water there is generally becomes exceedingly impure, for a variety of reasons. The question therefore arises of how this dirty water should be treated, when the usual method of filtration on a large scale fails. The most obvious remedy is boiling the water intended for drinking, in order to destroy the germs it may contain; but the expedient is not to be relied upon, and the result is to render the water distasteful. The other extreme of treatment—freezing—is hygienically worthless. The common domestic filter has long been discredited. Porous filters of porcelain or asbestos give much trouble; and there is great risk of cracking, and so rendering them useless, in the process of cleaning. Chemical processes of water purification are open to many objections. The iron system is good, where it is applicable; but it is not superior to the lime and iron disulphide method. Alum is of ancient repute as a purifier of water; but even when combined with lime, it is slow in action and of limited efficacy. All the processes depending upon the employment of permanganates are marked by serious disadvantages. Besides, they tint the water, leave deposits, are costly, and the water so treated is very unpleasant to drink. The writer falls back upon a suggestion of M. Henri Bergé to the Société des Ingénieurs et des Industriels. After studying the whole question of the sterilization of water, this author observes that a little-known gaseous compound, peroxide of chlorine, possesses powers exceeding those of ozone in this regard. The peroxide will keep well in pure water, so long as it is not exposed to light and the temperature is low; and



if there is organic matter in the water, it will destroy it. The action is so intense that  $\frac{1}{200}$ th of a grain will sterilize  $1\frac{1}{2}$  pints of water. The compound is prepared by decomposing potassium chlorate at an ordinary temperature and at  $64^{\circ}$  Beaumé. This gas, so destructive to microbes, is stated to be perfectly harmless to human beings and animals.

#### The Coal Supply of the United Kingdom.

The probable duration of the coal deposits of the United Kingdom formed the subject of a paper read by Mr. T. Forster Brown before the Mechanical Science Section of the British Association. In it the author pointed out that, though our coal resources extend over wide areas, it is the most available and the most valuable seams which are first attacked and exhausted. These are the veins workable by free drainage levels, without pumping or winding; and this was the main source of our coal supply up to about the middle of the present century. Next follow the best of the thick seams at a moderate depth, which will for a considerable time be the principal source of the existing supply. There remain the thin and inferior seams existing at shallow depths, and all seams at 2000 feet or so, down to the extreme limit of workable depth. These larger resources are still practically intact. The author contended that it is not the amplitude of our total coal resources which gives the limit, in time, of our commercial supremacy; but it is probably the duration of the best and cheapest deposits only that is the true measure of the national prosperity. The author accordingly estimates that a total of 66,683 million tons exists in the region of best coal. He further estimates that  $\frac{1}{15}$ ths of our best resources will be exhausted about the year 1950, when the whole annual output will be made up in rapidly increasing proportion of deep, thin, or inferior coals. There will then remain coal workable at a gradually increasing cost sufficient for the supply of the nation for a period of upwards of 250 years. The suggestion is that in the meantime the capital cost of railways and other undertakings dependent upon a good and cheap coal supply should be redeemed. "On the other hand, if the nation will do nothing to guard against the danger of commercial collapse, which will take place upon the exhaustion of our cheaply-worked coal, we shall be in the position of being saddled with the large amount of capital invested in railways, docks, and public works, amounting at the present to 1500 millions sterling; the cost of manufacture will rise; and Great Britain must gradually sink into the position of a secondary power." Among other vanished benefits, it is to be supposed that coal gas of 16-candle power and upwards will be included; to say nothing of sliding-scale dividends.

## COMMUNICATED ARTICLE.

### A FEW HINTS ON CARBONIZATION.

By S. CARPENTER, of East Ham.

In offering to students and young gas managers who have just entered the gas profession, a few hints on carbonization, the writer's advice first would be this: Look well to the heats of the retorts, and keep them at a bright red. Do not have them at a too high heat, as it will be detrimental to the illuminating power of the gas, and stop up the ascension-pipes. The retorts must be kept at a bright red heat, so as to well carbonize the coal, and keep sufficient vacuum on the hydraulic main, to take away the gas as quickly as possible, so that there may not be any undue pressure on the retorts, as this would cause them to scurf, and obstruct the ascension-pipes. Have pressure-gauges on all the outlets of all the apparatus through which the gas passes; and if possible, bring them all into a room, fix them side by side, and keep them in good working order, as they are the key of the works. If at any time there should be a stoppage, the gauges will indicate its locality.

For the benefit of those who may not have had an opportunity of testing coal for the quantity and quality of the gas distilled from it, the writer ventures to offer a few remarks. Those who have analyzed coal know well what it is composed of; but the writer has often been asked the question. Coal is often spoken of very slightly; but it is a very important factor in manufacture in general. It is composed of the following ingredients: Carbon, hydrogen, nitrogen, oxygen, sulphur, and iron. By putting the coal into a retort at a bright red heat, its normal condition will be disturbed. During its distillation, the coal yields coke, carburetted hydrogen, hydrogen, ammonia, bisulphuret of iron, and various basic hydrocarbons, photosulphuret of iron, tar, and water. Casting a glance at the composition of coal, we shall see at once the origin of the various products obtained by distillation at a bright red heat. Thus we are able, in a tabular form, to observe the original and subsequent order of arrangement which takes place on disturbing the normal condition of the coal. After all the volatile matter has been driven out of the coal in the retort, the excess of carbon remains as coke, which holds the protosulphuret of iron driven off from the decomposition of the bisulphuret contained in the coal. Part of the hydrogen remains free; part combines with carbon, giving rise to various kinds of hydrocarbon, such as gas, naphtha, and tar; while another part

combines with some of the sulphur of the bisulphuret of iron and any free sulphur present in the coals to form sulphuretted hydrogen. The rest unites with oxygen to form water, or with nitrogen to produce ammonia; the remainder of the oxygen being taken up by part of the carbon, generating carbonic oxide and carbonic acid.

It has been said that the formation of bisulphide of carbon is altogether a secondary action. But the writer has not found it so. It is produced in the first hours of the distillation of the charge of coal, but in very small quantity. It is in the last hours when the generation of volatile matter begins to lessen, and the coke commences to form, that the bisulphide of carbon increases. At this stage of the distillation the bisulphide of carbon is given off from the newly-formed coke, which holds the protosulphuret of iron derived from the decomposition of the bisulphide. After expelling the volatile constituents of the coal, if the heat is still made to act upon the residual coke, the bisulphide of carbon makes its appearance very freely. If the original dip-pipes are used, and a good tar seal is kept up in the hydraulic main, a portion of the bisulphide of carbon will be retained in the tar. Bisulphide of carbon is a sulphur acid, and as much of it as possible should be removed from the gas. As coal gas is so generally used for illuminating purposes, it should be made as pure as possible.

The impurities which are present in crude gas, and require removal, are ammonia ( $\text{NH}_3$ ), carbonic acid ( $\text{CO}_2$ ), sulphuretted hydrogen ( $\text{SH}_2$ ), and bisulphide of carbon ( $\text{CS}_2$ ). They are not only useless but injurious; and it is very important that they should be taken out of the gas. Carbonic acid is incapable of supporting combustion or life. Hence it is not only useless, but exceedingly deleterious to the illuminating power of gas, and very hurtful to animal life, even when largely diluted with air. Bisulphide of carbon is a sulphur acid. The sulphur in gas is a pernicious thing, because it forms sulphurous acid by taking oxygen from the air when burning. It is therefore necessary to use lime for eliminating all the carbonic acid and part of the bisulphide of carbon. As to the sulphur compounds in the so-called bisulphide of carbon, their entire removal is undoubtedly one of the most important problems in connection with the purification of coal gas; and though considerable progress has been made in this respect during the past few years, there is not anything known at present that will take it out entirely. It is a sulphur acid, and hydrogenated sulphide of calcium is the only agent that will remove a part of it. This material is produced in the following way: There should be two purifiers charged with hydrate of lime. When the crude gas is turned into the lime purifiers, the material in the first vessel will eliminate from the gas all the carbonic acid, and part of the sulphuretted hydrogen, and the remainder will pass on to the second purifier, where the lime is converted into what the writer terms hydrogenated sulphide of calcium, which at the present time is the best known agent for absorbing bisulphide of carbon. There must be sufficient sulphuretted hydrogen left in the gas which passes on to the second lime purifier to keep the lime in this particular condition.

In the management of retorts, whether they are of iron or clay, it is of the utmost importance that the interior should be kept as free as possible from carbon incrustation, as, in addition to occupying space that should be available for the coal, it presents a non-conducting substance, which obstructs the passage of the heat from the furnace to the coals undergoing carbonization. This not only increases the expense of the fuel for the furnace and for labour, but offers great facilities for the destruction of the retorts. The gas should be drawn from the hydraulic main as quickly as possible, so as not to subject it to back-pressure, which brings about a deposit of carbon to the same extent as would a very high temperature without pressure. The back-pressure on high heats would cause the splitting up of condensable hydrocarbons into non-illuminants, which would have the effect of not only reducing the quantity of gas obtained, but also of lowering the illuminating power of the gas, causing a deposit of carbon on the interior surface of the retort, and obstructing the ascension-pipes. It is equally necessary that the light-giving power of the gas should not be destroyed by using too high heats, or the quantity of the gas reduced by slow distillation. In the carbonization of coal, the greatest care should be taken not to have the heats either too high or too low. The former would require the use of cannel to compensate for the loss of luminosity in the gas; with the latter there would be more tar and less gas, as well as soft coke, which is not profitable. The retorts should be kept at a bright red heat during the carbonization of the coals. For the greater part of the time the charge of coal is burning off, it remains without any elevation of temperature. Shortly after the coal is put into the retort and the lid closed, it commences to intumesce, and, delivering the gas, carries off the heat communicated from the furnace to the retort and then to the coal. The action is very similar to that of an ordinary kettle when the water is boiling. It delivers the heat absorbed by the water in the form of steam, which issues from the spout. Thus it is only when nearly all the volatile constituents or useful gases are passed off from the coal that the temperature of the mass of carbon increases. After the coke begins to form, and all the little pores which have served as passages for the egress of the gas during the carbonization process close, then the heat rises.

In the carbonization of coal, care should be taken that the



retorts are not overcharged. If they are filled too full, there will not be sufficient room for the coal to swell. If it touches the crown of the retort, it causes incrustation. A dense black fluid is formed at the moment of placing the lid of the retort on, which is nothing more than the volatile properties of the coal passing off as gas, tar, and other products—such as ammonia, hydrocarbons, and other constituents. Another precaution to be observed is to draw the coke as soon as it becomes incandescent. By retaining it in the retort after all the useful gas is given off, other gases are delivered, though in small quantities, which deteriorate materially that first obtained; and from these arise the sulphur compounds other than sulphuretted hydrogen which cause so much trouble. Bisulphide of carbon is generated principally in this way. If the heat is allowed to act upon the residual coke, the bisulphide will be given off, as the coke holds the protosulphuret of iron resulting from the decomposition of the bisulphide in the coal. The sulphur from the coke combines with sufficient carbon to form bisulphide of carbon.

By storing or passing through cold pipes, gas loses in illuminating power, owing, no doubt, to the condensation of naphthalene ( $C_{10}H_8$ ), benzol ( $C_6H_6$ ), and allied or derived substances. Moreover, as olefiant gas ( $C_2H_4$ ) is soluble in water, this constituent, which is very serviceable for lighting purposes, is also diminished by storing the gas. It will now be understood why the gas has to be of higher illuminating power in the winter than in the summer. The relative proportions of permanent gas and condensable solids and liquids, as well as the chemical nature of these products, depend on the temperature employed in carbonizing the coal, and the length of time the material is exposed to the action of heat. The lower the temperature, and the more quickly the operation is carried out, the greater is the proportion of solid and liquid products, and *vice versa*. The reason for this is that more complex substances generally split up into simpler ones on exposure to heat; and the higher the temperature, the simpler the product. Thus, olefiant gas ( $C_2H_4$ ) will split up into light carburetted hydrogen; and the coke will give off sulphur, which will combine with carbon and give rise to bisulphide of carbon. Though it is the chief object of the distillation of coal to get a large yield of permanent gas, it is equally necessary that the illuminating value of that gas should not be destroyed by using too high a heat, and that an undue proportion of tar should not be produced by employing too slow a distillation, which is not profitable.

In carbonizing coal, do not separate the gas from the tar in the hydraulic main. Let both pass together to the condensers; and in the passage to and through these vessels the tar will take out of the gas some of its impurities before it reaches the scrubbers and purifiers. Good condensation helps greatly in the purification of coal gas. Anti-dips are scarcely of any good to a gas manager, and for this reason: The gas as it is made is passed directly away, without mixing with the tar when it is of high temperature in the hydraulic main. As the tar, as already remarked, is a purifying agent, the gas ought not to be separated from it in the hydraulic main. On examining the nature of tar, we see that it is composed of certain solid properties, such as carbon, naphthalene, &c.; while there are gaseous properties, such as hydrogen, carburetted hydrogen, carbonic acid, sulphide of carbon, &c. The writer nevertheless thinks that tar can certainly be treated as a purifying agent; for without it, or some similarly constituted substance, the purification of coal gas would be a failure. If there were not amalgamation of so many of the properties which crude gas contains as it passes into the hydraulic main, it would be almost impossible to rid it of its impurities. As the gas rises from the retorts and issues at the top of the ascension-pipes, it has a smoky appearance; but after it has passed through the tar in the hydraulic main, and traversed the condensers, it has lost this characteristic. This brings me back to my previous statement that tar is a purifying agent. Let us, then, not look upon it as an enemy, but as a good friend. As soot or solid carbon has no affinity for water or watery vapour—indeed, it repels it—what benefit is there in drawing off the tar, and having a water-seal, instead of passing the gas through the tar in the hydraulic main? The writer is of opinion that if the gas is allowed to go through the tar, and pass on with it to the condensers, it will remove the finely-divided particles of soot or carbon, and at the outlet of the condensers all the smoky colour of the crude gas will have been removed. By using anti-dips, the gas would lose the purifying it gets by passing through the tar. In working inclined retorts, it is well not to have a dry main, or one with a water-seal; for the reason that as soon as the coke begins to form the sulphur passes away with the gas. The formation of coke generally commences at the top end of the retort; and this coke holds the protosulphuret of iron, which, as previously stated, gives rise to bisulphide of carbon. When the driving off of the volatile constituents begins to slacken, this newly-formed coke gives off some of the sulphur compounds it contains. When the heat, after expelling the constituents of the coal, is made to act upon the newly-formed coke, bisulphide of carbon makes its appearance very fast. No one will deny that coke contains sulphur. By using the original dip-pipes, and a wet main, the gas, by passing through the tar, will lose some of its sulphur compounds. The writer's closing advice to young gas managers and gas students is: Do not have anti-dips if you can avoid it, especially if you have to work inclined retorts. If the hydraulic main is kept clear in the way indicated by the writer in preceding articles, there will be no need of anti-dips.

## TECHNICAL RECORD.

### PACIFIC COAST GAS ASSOCIATION.

Annual Meeting at San Francisco.

(Concluded from p. 532.)

Mr. J. L. Howard, of San Francisco, read a paper on "Coal Combustion and Smoke Prevention," dealing with the properties of various kinds of coals as indicated by proximate analysis, the necessary proportion of oxygen to ensure complete combustion, and the fact that smoke consists of volatile matter given off and allowed to pass away, either without being exposed to a temperature sufficient to bring about its complete combustion, or without the admixture of a sufficient proportion of air to supply the necessary quantity of oxygen. In many American cities, anti-smoke regulations were in existence, but were not strictly enforced. He described the principles involved in the construction of smoke-preventing appliances, and said it was a mistake to suppose that because visible smoke represented a very trifling proportion of the total carbon contained in the fuel, complete combustion was not a commercial question. The visible carbon was usually accompanied by large quantities of carbon monoxide and other invisible products of incomplete combustion, which represented a considerable loss or waste of heat. In his experience, any bituminous coal could be consumed without production of smoke, if a self-feeding and clinking arrangement was used, so as to avoid admission of cold air, and also if a large proportion of the air supply (about two-thirds) was admitted above the bed of fuel, and not from below.

Mr. Britton remarked that in many parts of the district liquid fuels were cheaper than solid. Using Coalinga oil by means of a steam-injector, he had avoided the production of smoke, and evaporated 17½ lbs. of water per pound of oil used. He spoke very highly of its advantages, as compared with solid fuels. The boilers were of the ordinary return tubular pattern, always in excellent condition, as he used water that had been proved by analysis to be the purest in the State. Mr. Jones thought the application of the regenerative principle to boiler furnaces would solve the smoke question. It was possible to waste a lot of heat, and yet not show visible smoke; and many of the members had done so when heating beds of threes with the old-fashioned grate furnace. The best practice in ordinary boiler firing was to keep the fuel in an even shallow bed. Mr. Martin said that the temperature of the products of combustion at the outlet-flue to the chimney should not exceed that of the water in the boiler by more than 70°. Much heat was lost by allowing the gases to pass away at too high a temperature.

A paper submitted by Mr. W. M. Parker, of New Whatcom (Washington), was read by the Secretary, in the absence of the author. The title was: "Should Gas Companies do all Gas-Fitting?" Inquiries as to the practice in this respect were submitted to 41 gas undertakings, and elicited 24 replies. These went to show that the usual practice is to run services and fix stoves, but to leave ordinary gas-fittings to local tradesmen—sometimes exercising indirect control over the work. The author favoured enterprise on the part of the gas company in this direction, and would put in fittings at cost price, if necessary, to make sure of a customer. Thirteen companies had furnished him with printed rules for the guidance of gas-fitters, as used in their respective districts. Various details in connection with gas-fitting work were next discussed at considerable length; and a model circular, embracing all the good features suggested by the information obtained, was submitted. The author related some of his experiences in connection with local gas-fitters, which had led him to believe that, in their own interest, the gas company should undertake the whole of the gas-fitting work up to the burner.

The Editor of the "Wrinkle" Department (Mr. Hollidge) next presented a very interesting report, a considerable proportion of which was contributed by himself. Mr. William Parker, the author of the paper already mentioned, also sent several interesting suggestions relating to the details of gas-fitting work. One for laying services in wooden troughs, and surrounding them with pitch, led to a long discussion on the effects of electrolysis; and several speakers described instances where these effects had been observed, when no electric power or supply was in the neighbourhood. These phenomena were observed in marshy, made-up ground, and were accounted for by a galvanic action in the ground itself, due to the presence of salt or other chemicals. The subject of electric lighters for Welsbach burners received a considerable amount of attention. One novel suggestion was that gas-fitters and service-layers should be supplied with white lead putty put up in artists' collapsible tubes. Speaking upon a scheme for lighting purifying houses by means of the electric glow lamp, Mr. Aldrich said that his religion would not allow him to use electric light of any kind on the gas-works; and he preferred to arrange matters so that the purifying-house work was all done in daylight.

The Question-Box was opened. An inquiry as to whether the reading of meter indices should be taught in public schools brought out a long discussion, the tone of which was to the effect that the more the public are taught about meters and their working the better the gas companies will be pleased. A full discussion on the advantages or otherwise of testing meters



*in situ* followed. The President made the remarkable statement that many meters which showed 14 or 20 per cent. slow in place, would prove correct when taken out and carried to the testing-room. He explained this by saying he had found that a sort of fine tarry dirt accumulated on the faces of the valves, forming some fine ridges that allowed the escape of a considerable quantity of gas. But during the act of conveying to the testing-room, the light oil which always accumulated on the floor on which the valves are bedded washed over the valves, and displaced some of the dirt, or at any rate lubricated them and made them tight. Mr. Osborne said that new meters worked stiff at the start, and were usually slow for a time. Mr. Britton remarked that in small towns it was possible to check the meter inspector; but in large places there was no check at all, and everything depended on the honesty of the inspector, where the system of house-to-house testing was followed. The preponderance of opinion was certainly in favour of testing meters in position. In a discussion on the preparation of oxide, Mr. Guldin recommended a layer of pine shavings 15 inches thick, and about 3 inches thickness of fine cast-iron borings spread on the top, the whole to be well mixed and watered with salt water or sea water until oxidation was complete. If any unoxidized iron remained in the mass, when it was used, troublesome deposits of iron carbonyl would occur at the burners. Several members, however, preferred coppers reduced with lime, to the use of borings.

The meeting was brought to a close with the usual votes of thanks.

GERMAN CHEMISTS IN CONCLAVE.

The intimate relation which subsists between the gas industry and modern chemical research was well illustrated by some of the communications made to the general meeting of the Association of German Chemists at Darmstadt this summer. Indirectly Professor Münch's lecture on Linde's process for the liquefaction of air was of interest to gas managers. Of the numerous experiments with which the lecture was illustrated, one—in which a limelight was supplied with vaporized liquid air in place of oxygen—demonstrated in a very practical manner the richness in oxygen of liquefied air. Linde has, indeed, devised a modification of his apparatus, by means of which the separation of oxygen from the atmosphere may be accomplished on a large scale. Dr. W. Staedel gave a brief account of acetylene. He lighted the lecture hall by means of five six-light wall-brackets supplied with acetylene from a cylinder of the liquefied gas. The illumination afforded by these thirty burners consuming acetylene, was better and more effective than that from four arc-lamp pendants with which the hall was ordinarily lighted. Dr. H. Bunte lectured on the "Theory of the Incandescent Gas Light," and illustrated his lecture by numerous experiments with mantles of varying composition. Our readers are already familiar with Dr. Bunte's views on the catalytic or contact action of cerium oxide in the Welsbach mantle from his earlier communications;\* and he introduced no novel matter of importance to his Darmstadt audience. He expressed the opinion that the most promising direction for research in incandescent lighting was that in which the more recent improvements had been made—viz., in the production of better combustion of the gas and of a higher flame temperature. Many points in the theory of incandescent lighting still needed explanation; and he thought that a better knowledge of the action of the flame and mantle would furnish the means for further improvements.

MARKS ASSOCIATION OF GAS AND WATER ENGINEERS.

The Nineteenth Annual Meeting of this Association was held from the 12th to the 14th of August, at Frankfort-on-the-Oder, and was attended by nearly 90 members and visitors. On the first day, the large works of Messrs. Julius Pintsch, at Fürstenwalde, were visited. The extensive use of water gas for various purposes, and the practical employment of the process of electric welding, were the features which specially attracted the attention of the visitors. On the 13th, an early morning visit was paid to the Frankfort works of the German Continental Gas Company. Herr W. Jäger, of the firm of Messrs. Pintsch, next presented an interesting communication on the "Manufacture and Use of Water Gas." Several subjects were discussed, after brief introductory addresses. Among these were "Machine-Stokers," of which those at the Salzwedel works were described by Herr Ludwig; "Naphthalene Stoppages," introduced by Herr Blum; and the "Import Duty on Petroleum," to which the members, on the motion of Herr Silbermann, resolved to direct the attention of the German Association of Gas and Water Engineers, with a view to presenting a petition to the Imperial Parliament praying for the exemption from duty of those petroleum products which are suitable for carburetting water gas. Purifiers, prepayment meters, automatic igniting devices, and water-meters were also briefly discussed. Herr Müller, of Charlottenburg, was re-elected President of the Association.

\* See "JOURNAL," Vol. LXXI., pp. 398, 1579.

THE CHEMICAL COMPOSITION AND TECHNICAL ANALYSIS OF WATER GAS.

By EDWARD H. EARNSHAW,

Chemist to the United Gas Improvement Company of Philadelphia, U.S.A.  
[From the "Journal of the Franklin Institute," September, 1898.]

As is well known, water gas is a product of the reaction between steam and incandescent carbon, whereby there is formed a mixture of carbonic oxide and hydrogen in approximately equal volumes. This mixture, technically called "blue gas," has, of course, no illuminating value; and it is therefore enriched by exposing it, together with hydrocarbon vapours, to the action of intense heat. The hydrocarbon vapours are thus permanently gasified, or "fixed," and impart a high illuminating power to the mixture. This is carburetted water gas—more familiarly known simply as water gas.

The enriching material employed is always petroleum in some form—usually as crude oil, naphtha, or a distillate called gas oil—which during the "fixing" process is converted into hydrogen and gaseous hydrocarbons, together with naphthalene, benzene, and its homologues, and the other pungent empyreumatic compounds found in coal gas, and formed in that case by the contact of the gas with the hot sides of the retorts. The odour of coal gas is due to these empyreumatic compounds; and therefore, as might be expected, the odour of water gas is similar, but even more penetrating.

The Chemical Composition of Water Gas.

The chemical composition of coal gas and water gas is essentially the same—that is to say, the same constituent gases enter into the composition of each mixture, but the relative proportions vary. This is illustrated by the following analyses of coal gas and water gas respectively. The figures given are of actual analyses, but are fairly representative of each class.

|                              | Coal Gas.<br>Per Cent. | Water Gas.<br>Per Cent. |
|------------------------------|------------------------|-------------------------|
| Benzene vapour . . . . .     | 0.50 ..                | 0.6                     |
| Heavy hydrocarbons . . . . . | 4.25 ..                | 12.8                    |
| Carbonic oxide . . . . .     | 8.04 ..                | 30.7                    |
| Hydrogen . . . . .           | 47.04 ..               | 32.4                    |
| Marsh gas . . . . .          | 36.02 ..               | 13.9                    |
| Higher paraffines . . . . .  | 0.00 ..                | 2.4                     |
| Carbonic acid . . . . .      | 1.60 ..                | 2.7                     |
| Oxygen . . . . .             | 0.39 ..                | 0.7                     |
| Nitrogen . . . . .           | 2.16 ..                | 3.8                     |
|                              | 100.00 ..              | 100.00                  |

The composition of the heavy hydrocarbons, or "illuminants," varies greatly with circumstances, both with coal and water gas, though they always consist chiefly of ethylene and other members of the olefine series, together with small quantities of other hydrocarbons, of which acetylene is probably the most important.

From the gas analyst's point of view, the most important feature of the composition of water gas is the presence of notable quantities of paraffines other than marsh gas, since this involves a modification of the methods of analysis commonly in use, and which presuppose that marsh gas is the only paraffine present in the gas mixture. This is the point that I chiefly desire to bring to your attention.

The Analysis of Water Gas.

The scheme of analysis, as far as the absorbable constituents of the gas mixture are concerned, follows the plan elaborated by Hempel, and is as follows:—

(1) The vapours of benzene are first absorbed by shaking the gas in an explosion pipette over mercury with 1 c.c. of alcohol, previously saturated for the less easily absorbable constituents. The vapour of alcohol is absorbed in another explosion pipette by 1 c.c. of water, and the resulting contraction measured.

(2) The carbon dioxide is absorbed by potassium hydrate in a pipette filled with small rolls of iron wire gauze.

(3) The heavy hydrocarbons or fixed illuminants are absorbed by a saturated aqueous solution of bromine. The vapours of bromine are absorbed by potassium hydrate, and the contraction measured. Fuming sulphuric acid may be used instead of bromine, but it is much more difficult and inconvenient to handle, and the results obtained are scarcely more accurate.

(4) Oxygen is absorbed by phosphorus. Some chemists urge the use of an alkaline solution of pyrogallol acid; claiming that the action of phosphorus is unreliable. I have found, however, that in every case where the phosphorus has failed to act, it has been due to incomplete absorption of the illuminants. Therefore, whenever on testing for oxygen, the white fumes of phosphoric acid fail to appear, the gas should be passed once more into the bromine solution. I have never yet analyzed a gas that did not contain at least a trace of oxygen. I strongly favour the use of phosphorus, because the results obtained are at least as accurate as with pyrogallol, and because the appearance of the white fumes is absolute proof of the presence of oxygen, and indicates as well that the illuminants have been completely absorbed.

(5) The carbonic oxide is now absorbed by an ammoniacal or hydrochloric acid solution of cuprous chloride.

At least two pipettes should be used for the absorption; the



last one containing a perfectly fresh solution. It is important to notice that even with this precaution the absorption of the carbonic oxide is seldom complete; usually about 0.5 per cent. remaining unabsorbed. This fact introduces no error in the analysis, as the residue of carbonic oxide can be determined later, as will be shown.

The residue of the gas mixture now remaining may be as follows:—

(a)  $(H_2) + (CO) + (N_2) + (CH_4) + (C_2H_6) + (C_3H_8)$ , &c.

But for all ordinary purposes it is sufficient to assume that the only higher paraffine present is  $C_2H_6$ .

There being no satisfactory known absorbent for any of these gases, it becomes necessary to have recourse to the method of combustion.

A portion of (a) is then mixed with a measured volume of air, and exploded over mercury in an explosion pipette. The contraction in volume is measured; the carbon dioxide formed is determined by absorption with potassium hydrate; the excess of oxygen is absorbed by phosphorus; and the volume of the residual nitrogen is noted.

The equations are—

(1) Contraction in volume =  $\frac{3}{2}(H_2) + \frac{1}{2}(CO) + 2(CH_4) + 2\frac{1}{2}(C_2H_6)$

(2)  $CO_2$  formed =  $(CO) + (CH_4) + 2(C_2H_6)$

(3) Residual nitrogen =  $(N_2) + (N_1)$ ,

where  $N_1$  is the nitrogen introduced with the air. The amount of nitrogen thus introduced may, with sufficient accuracy, be taken at 79.2 per cent. of the measured volume of air.

An examination of these equations shows that the nitrogen may at once be ascertained from Equation 3; but Equations 1 and 2 contain four unknown quantities, and therefore two more equations are needed for the solution. Fortunately the method of fractional combustion over palladium affords the needed information. As is well known, when a mixture of hydrogen and methane with oxygen or air is passed, with the proper precaution, over heated palladium black, the hydrogen burns to water; but the methane is unaltered. If carbonic oxide and any of the higher paraffines are also present, the carbonic oxide burns; but the paraffines do not. If, then, the products from the combustion are received in a pipette over mercury, it is possible to subsequently measure the amount of carbonic acid formed by the burning of the carbonic oxide.

Returning to the analysis, a second portion of (a) is taken, mixed with air, and burned over palladium black. The resulting contraction and the carbonic acid formed are measured. The equations are—

(4) Contraction in volume =  $\frac{3}{2}(H_2) + \frac{1}{2}(CO)$ .

(5)  $CO_2$  formed =  $CO$ .

From these two equations the values for hydrogen and carbonic oxide may be readily calculated.

For simplicity's sake let us now assume that the same quantity of gas mixture (a) was used in both the explosion and the combustion. We may then subtract Equation 4 from 1, and 5 from 2, whence, designating the difference between the contraction due to explosion and that due to combustion by the letter "a" and the difference in the carbonic acid formed by the letter "b," we find—

(6)  $2(CH_4) + 2\frac{1}{2}(C_2H_6) = a$ .

(7)  $(CH_4) + 2(C_2H_6) = b$ .

(8) whence  $C_2H_6 = \frac{4b - 2a}{3}$

(9)  $CH_4 = \frac{4a - 5b}{3}$ .

A very useful check on the accuracy of this determination is obtained from the following:—

Volume of gas taken for explosion =  $H_2 + N_2 + CO + CH_4 + C_2H_6$ .  $H_2$  and  $CO$  are found by Equations 4 and 5, and  $N_2$  is given by Equation 3. Therefore we have—

(10) Volume taken —  $(H_2 + N_2 + CO) = CH_4 + C_2H_6$ ; and this value should be the same as the algebraic sum of Equations 8 and 9; or—

(11) Volume taken —  $(H_2 + N_2 + CO) = \frac{2a - b}{3}$ .

This scheme of analysis is perfectly correct for gas mixtures containing no higher paraffine than  $C_2H_6$ ; but what would happen in case  $C_3H_8$ ,  $C_4H_{10}$ , &c., were present?

Our gas mixture would then contain  $P$  volumes of hydrocarbons of the formula  $C_nH_{2n+2}$ , and would be—

Gas mixture =  $H_2 + N_2 + CO + P(C_nH_{2n+2})$ .

As will be shown later, the contraction in volume due to the combustion of  $P$  volumes of any hydrocarbon of the general formula  $C_nH_m$  would be

$$P(1 + \frac{m}{4})$$

and the carbonic acid formed would be  $Pn$ . But in this case,  $m = 2n+2$ ; and therefore we have,

From the explosion:

(12) Contraction in volume

$$= \frac{3}{2}(H_2) + \frac{1}{2}(CO) + P + \frac{Pn + P}{2}$$

(13) Carbonic acid formed =  $Pn + CO$ .

And from the combustion over palladium:

(14) Contraction in volume =  $\frac{3}{2}(H_2) + \frac{1}{2}(CO)$ .

(15) Carbonic acid formed =  $CO$ .

Subtracting Equation 14 from 12 and 15 from 13, as before explained, we have,

(16) Difference in contraction

$$P + \frac{Pn + P}{2} = a$$

(17) Difference in carbonic acid formed =  $Pn = b$ ; whence,

$$(18) P = \frac{2a - b}{3}$$

$$(19) n = \frac{3b}{2a - b}$$

Equation 18 is identical with Equation 11; and hence it appears that the method is correct as far as the total volume of paraffines is concerned, even though higher paraffines than  $C_2H_6$  are present.

Having thus examined the theory of the analysis by combustion, let us follow the figures of an actual analysis.

The gas was a water gas, enriched by naphtha, and its candle power was 23.5.

Amount taken for analysis . . . . . 100.0 c.c.

|                                                       | Per cent. |
|-------------------------------------------------------|-----------|
| $C_2H_6$ absorbed by alcohol . . . . .                | 0.4       |
| $CO_2$ absorbed by potash . . . . .                   | 2.7       |
| Illuminants absorbed by bromine . . . . .             | 11.7      |
| Oxygen absorbed by phosphorus . . . . .               | 0.5       |
| Carbonic oxide absorbed by cuprous chloride . . . . . | 31.7      |

Of the unabsorbed residue of 53 c.c., 14.05 c.c. were mixed with 87.8 c.c. of air, and exploded by a spark in an explosion pipette over mercury. The resulting contraction in volume was 22.60 c.c. The carbonic acid absorbed by potash was 5.30 c.c.; the surplus oxygen absorbed by phosphorus, 3.80 c.c.; the residual nitrogen, 70.1 c.c. consisting of nitrogen from the air, 69.50 c.c. and nitrogen from the gas, 0.60 c.c.

A second portion of 30 c.c. was now mixed with 70 c.c. of air, and the mixture passed over palladium black to burn the hydrogen and carbonic oxide.

The contraction in volume was 30.40 c.c.

The carbonic acid absorbed by potash was 0.40 c.c.

To calculate the percentage of  $H$ ,  $CO$ ,  $CH_4$ ,  $C_2H_6$ , and  $N$  according to the method already theoretically explained, we proceed thus—

$$CO = \frac{0.4 \times 53}{30} = 0.70 \text{ per cent.}$$

$$H = \frac{(30.4 - 0.2) \times 53}{30} \times \frac{2}{3} = 35.57 \text{ per cent.}$$

Now, as 30 c.c. of gas were taken for the combustion and only 14.05 c.c. for the explosion, we must calculate the contraction in volume and amount of carbonic acid that would have resulted from the combustion of 14.05 c.c. over palladium. Thus—

Contraction in volume would be

$$= \frac{30.4 \times 14.05}{30} = 14.24$$

$CO_2$  formed would be

$$= \frac{0.40 \times 14.05}{30} = 0.18$$

Subtracting these figures from the results of the explosion, we find,

$$22.60 - 14.24 = 8.36 = a$$

$$5.30 - 0.18 = 5.12 = b$$

and hence, from Equations 8 and 9

$$C_2H_6 = \frac{20.48 - 16.72}{3} = 1.25$$

$$CH_4 = \frac{33.44 - 25.60}{3} = 2.61,$$

and therefore,

$C_2H_6$  in original gas

$$= \frac{1.25 \times 53}{14.05} = 4.71 \text{ per cent.}$$

$CH_4$  in original gas

$$= \frac{2.61 \times 53}{14.05} = 9.84 \text{ per cent.}$$

$N$  in original gas

$$= \frac{0.60 \times 53}{14.05} = 2.26 \text{ per cent.}$$

Applying Equation 11 as a check on the accuracy of the determination, we find—

$$14.05 - (9.43 + 0.60 + 0.18) = \frac{2(8.36) - 5.12}{3}$$

or, 3.84 = 3.86, which is a difference well within the limit of errors of observation.

In the calculation of this analysis we have assumed for convenience sake that there are no paraffines present other than  $CH_4$  and  $C_2H_6$ . Of course, it is possible, and indeed probable, that higher members of the series are actually present; so that while the figures obtained in our calculations truly represent the total quantity of paraffines contained in the gas, yet they may not be true as regards the actual composition. The composition



of the average molecule of the paraffines may be obtained from Equation 19, thus—

$$n = \frac{15.36}{16.72 - 5.12} = 1.32$$

whence the average composition of the paraffines  $C_nH_{2n+2}$  would be: C, 1.32; H, 4.64.

The value of this method in giving an accurate conception of the actual composition of a gas mixture, is clearly brought out by comparing the figures just given with those obtained by the more usual methods of calculation. These methods are: (1) When no combustion over palladium is made, and the hydrogen is determined by subtracting twice the volume of carbonic acid formed in the explosion from the contraction in volume, and calling the difference the contraction due to hydrogen. (2) The method recommended by Hempel, who directs that the hydrogen should be determined by combustion over palladium. The contraction in volume due to the percentage of hydrogen thus found, is subtracted from the total contraction due to the explosion, and the remainder is considered to be the contraction due to  $CH_4$ , which is, of course, equal to twice the volume of  $CH_4$ . Both these methods presuppose that no paraffine other than  $CH_4$  is present, and that the carbonic oxide has been completely absorbed by cuprous chloride.

|                                                                                | Calculated by<br>Method<br>Given Above. | By Method without<br>Combustion<br>over Palladium. | By Method<br>according<br>to Hempel. |
|--------------------------------------------------------------------------------|-----------------------------------------|----------------------------------------------------|--------------------------------------|
| Benzene vapours . . .                                                          | 0.40                                    | 0.40                                               | 0.40                                 |
| Fixed illuminants. . .                                                         | 11.70                                   | 11.70                                              | 11.70                                |
| Carbonic oxide . . .                                                           | 32.40                                   | 31.70                                              | 31.70                                |
| Hydrogen . . .                                                                 | 35.57                                   | 30.34                                              | 35.84                                |
| Paraffines $\left\{ \begin{array}{l} C_2H_6 \\ CH_4 \end{array} \right.$ . . . | 4.71                                    | —                                                  | —                                    |
| Carbonic acid . . .                                                            | 9.84                                    | 20.00                                              | 16.30                                |
| Oxygen . . .                                                                   | 2.70                                    | 2.70                                               | 2.70                                 |
| Nitrogen (by difference) . . .                                                 | 0.50                                    | 0.50                                               | 0.50                                 |
|                                                                                | 2.18                                    | 2.66                                               | 0.86                                 |
|                                                                                | 1000.00                                 | 100.00                                             | 100.00                               |

The method without separate determination of hydrogen is the simplest both in method and in apparatus required, and is, therefore, the one in most general use.

In the analysis of water gas by this method, let us consider the equations resulting from the explosion of 15 c.c. of a gas mixture composed of—

|                    |           |
|--------------------|-----------|
| H . . . . .        | 10.0 c.c. |
| $CH_4$ . . . . .   | 3.0       |
| $C_2H_6$ . . . . . | 1.5       |
| N . . . . .        | 0.5       |
|                    | 15.0      |

The resulting equations would be—

|                       |                                                               |
|-----------------------|---------------------------------------------------------------|
| Contraction in volume | $= \frac{3}{2}(H_2) + 2(CH_4) + 2\frac{1}{2}(C_2H_6) = 24.75$ |
| Carbonic acid formed  | $= (CH_4) + 2(C_2H_6) = 6.00$                                 |
| Volume of gas taken   | $= H_2 + CH_4 + C_2H_6 + N_2 = 15.00$                         |
| Nitrogen              | $= N_2 = 0.50$                                                |

At first, it would seem that these equations could be easily solved, and that no more data would be required for the correct computation of the composition of the gas mixture. An attempt to solve the equations, however, discloses the fact that the problem is indeterminate, and that the equations can be satisfied by any value of  $C_2H_6$  from 0 to 3. Thus—

|                              |                               |
|------------------------------|-------------------------------|
| Let $C_2H_6$ . . . . . = 0.  | Let $C_2H_6$ . . . . . = 3.   |
| Then, $H_2$ . . . . . = 8.50 | Then, $H_2$ . . . . . = 11.50 |
| $CH_4$ . . . . . = 6.00      | $CH_4$ . . . . . = 0.00       |
| $C_2H_6$ . . . . . = 0.00    | $C_2H_6$ . . . . . = 3.00     |
| $N_2$ . . . . . = 0.50       | $N_2$ . . . . . = 0.50        |
|                              | 15.00                         |

We may perhaps find in this circumstance an explanation for the continued use of this method by many analysts without suspecting the incorrect application to gas mixtures containing higher paraffines than methane. The analysis would always "add up well," and the amount of nitrogen found would be correct.

I have now indicated a method by which we may obtain a very fair idea of the composition of a gas mixture—sufficient, indeed, for most purposes. But the use of gas as a source of heat is constantly increasing; and I believe the time is not far distant when the heating value of a gas will be considered as important as its illuminating power. It is therefore extremely desirable to be able to accurately calculate the heating value of a gas from its analysis. The labours of many able investigators (and notably those of Professor Julius Thomsen) have supplied us with reliable data concerning the heating value of each of the several combustible gases entering into the composition of illuminating gas; and therefore the problem would offer no special difficulty were it not for the uncertainty regarding the nature of the hydrocarbons removed by bromine, and classed together as "fixed illuminants." We know that these consist chiefly of the series  $C_nH_{2n}$ , together with very small quantities of the  $C_nH_{2n-2}$  series; but the quantitative separation of the different members is not at present possible within the limits of a technical analysis.

If, however, we should succeed in determining the average composition of the hydrocarbons, and should be able to assign a definite heating value, depending upon such average composition, then the problem would be completely solved as far as its practical application is concerned.

The theory of the combustion of any hydrocarbon or mixture of hydrocarbons, of which the unit volume has the average composition  $C_nH_m$ , is as follows:—

$$C_nH_m \left( n + \frac{m}{4} \right) O_2 = n(CO_2) + \frac{m}{2} (H_2O)$$

But in practice the  $\frac{m}{2}$  volumes of water disappear; and therefore we have—

Contraction in volume

$$= 1 + \left( n + \frac{m}{4} \right) - n = 1 + \frac{m}{4}$$

Carbonic acid formed = n

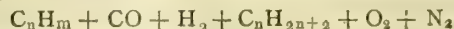
If we let a = contraction in volume for x volumes  $C_nH_m$   
b =  $CO_2$  formed for x volumes  $C_nH_m$  then we find,

$$(20) \quad m = \frac{4(a - x)}{x}$$

$$(21) \quad n = \frac{b}{x}$$

It is now apparent that if we can by any means determine the contraction in volume and the amount of carbonic acid that would be formed by the combustion of a known volume of the illuminants in a gas mixture, then we shall have all the data necessary for the correct computation of the average composition of such illuminants. This can be done very simply and accurately thus—

First absorb the unfixed vapours by alcohol, and the carbonic acid by potassium hydrate. The residual gas will have the composition—



Take a portion of this, mix it with the proper amount of air, and explode the mixture by a spark in the ordinary way. Note the resulting contraction in volume, and the amount of the carbonic acid formed.

The contraction in volume will consist of—

- (1) Contraction due to  $C_nH_m$ ,
- (2) " " "  $CO$ ,
- (3) " " "  $H_2$ ,
- (4) " " "  $C_nH_{2n+2}$ ,

and the carbonic acid formed will consist in like manner—

- (1)  $CO_2$  due to  $C_nH_m$ .
- (2) " " "  $CO$ ,
- (3) " " "  $C_nH_{2n+2}$ .

If, now, we proceed with the analysis, and determine the percentage of each constituent by the method already described, we shall be able to calculate the contraction due to  $CO$ ,  $H_2$ , and  $C_nH_{2n+2}$ , and the  $CO_2$  due to  $CO$  and  $C_nH_{2n+2}$ . This will give us the contraction in volume and the  $CO_2$  due to  $C_nH_m$  alone, and hence the data required.

In practice, it is simpler to calculate the correction for the paraffines and hydrogen directly from the results of the explosion rather than from the percentages of these gases; but this will be made plainer by considering the actual figures of an analysis.

Taking for illustration the same sample of water gas as before, the notes of the analysis would be:—

|                                                                             | Cubic Centimetres. | Per Cent. |
|-----------------------------------------------------------------------------|--------------------|-----------|
| Amount taken for analysis . . . . .                                         | 100.00             |           |
| Residue after absorbing the unfixed vapours and the carbonic acid . . . . . | 96.90 (a)          |           |
| <b>First Explosion.</b>                                                     |                    |           |
| Portion of (a) taken . . . . .                                              | 12.00              |           |
| Mixed with 87.8 cubic centimetres of air and exploded :                     |                    |           |
| Resulting contraction in volume . . . . .                                   | 16.05              |           |
| Carbonic acid absorbed by potash . . . . .                                  | 10.55              |           |
| Excess oxygen absorbed by phosphorus . . . . .                              | 3.40               |           |
| Residue from (a) . . . . .                                                  | 84.90              |           |
| Fixed illuminants absorbed by bromine . . . . .                             | 10.25 = 11.70      |           |
| Oxygen absorbed by phosphorus . . . . .                                     | 0.44 = 0.50        |           |
| Carbonic oxide absorbed by cuprous chloride . . . . .                       | 27.78 = 31.70      |           |
| Residue (b) . . . . .                                                       | 46.45 = 53.00      |           |
| <b>Second Explosion.</b>                                                    |                    |           |
| Portion of (b) taken . . . . .                                              | 14.05              |           |
| Mixed with 87.8 cubic centimetres of air and exploded :                     |                    |           |
| Resulting contraction in volume . . . . .                                   | 22.60              |           |
| Carbonic acid absorbed by potash . . . . .                                  | 5.30               |           |
| Excess oxygen absorbed by phosphorus . . . . .                              | 3.80               |           |

$$\text{The amount taken for the first explosion was } \frac{12}{96.9} = .1237$$

of the original quantity; and we can, therefore, calculate that it was composed of—

|                             | Per Cent.            | Cubic Centimetres. |
|-----------------------------|----------------------|--------------------|
| Fixed illuminants . . . . . | $11.70 \times .1237$ | 1.45               |
| Oxygen . . . . .            | $0.50 \times "$      | 0.06               |
| Carbonic oxide . . . . .    | $31.70 \times "$     | 3.93               |
| Residue (b) . . . . .       | $53.00 \times "$     | 6.56               |
|                             |                      | 12.00              |

The contraction and carbonic acid resulting from the explosion of 14.05 cubic centimetres of residue (b) having been determined by the second explosion, we can, of course, readily calculate the results due to the combustion of 6.56 cubic centimetres.

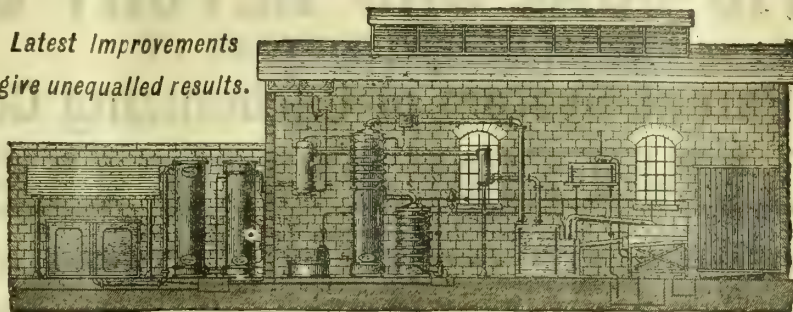


# MAURICE SCHWAB, MANCHESTER,

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GAS ENGINEER.

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Two communications have reached Mr. Gilbert Little (the Chairman and Managing-Director of the New Conveyor Company, Limited, Smethwick) which he is likely to place among his most treasured documents. One is from the Engineer and Manager of the Gas-Works of one of our largest cities, in which the writer states: "I have not seen any automatic retort-houses in Europe equal to your new gas-making plants at Leeds, Nelson, Cambridge, Huddersfield, and Batley;" and the other is from the Engineer-in-Chief of the third largest industrial



undertaking in England, who informs Mr. Little: "I have been all over the United States, and have seen no elevators equal in design or durability to your own; and I have come to the conclusion the Americans surpass us only in electric light work." This Engineer-in-Chief supports his belief in the Smethwick manufactures by recommending his Directors to send the order for one of the largest installations of conveyors and elevators ever placed in this country to the New Conveyor Company, Limited.

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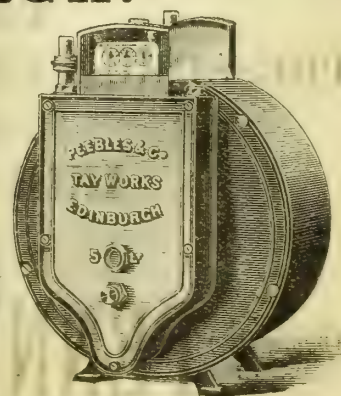
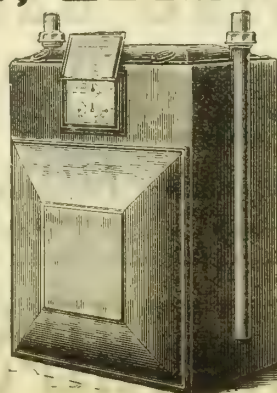
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The results of the first explosion can now be tabulated thus—

|                                                                                      |          | Carbonic Acid<br>Contraction,<br>Cubic<br>Centimetres. |
|--------------------------------------------------------------------------------------|----------|--------------------------------------------------------|
| 1'45 cubic centimetres of fixed illuminants (C <sub>n</sub> H <sub>m</sub> ) gives . | 4'15 ..  | 3'56                                                   |
| 3'93 " " carbonic oxide " .                                                          | 3'93 ..  | 1'96                                                   |
| 6'56 " " residue (b) " .                                                             | 2'47 ..  | 10'53                                                  |
|                                                                                      | 10'55 .. | 16'05                                                  |

and hence from Equations 20 and 21,

$$m = \frac{4(3'56 - 1'45)}{1'45} = 5'82$$

$$n = \frac{4'15}{1'45} = 2'86$$

and, therefore, the average composition of the fixed illuminants C<sub>n</sub>H<sub>m</sub> is: C, 2'86; H, 5'82.

Professor Julius Thomsen in his "Thermo-Chemical Investigations," Vol. IV., p. 275, gives the general formula for the calculation of the heat of combustion of any hydrocarbon of the formula C<sub>n</sub>H<sub>2m</sub>, expressed in calories per molecular weight in grams of the hydrocarbon, thus:—

$$f = n \cdot 135340 + m \cdot 37780 - a \cdot 14200 + 580.$$

For the olefine series, C<sub>n</sub>H<sub>2n</sub>,

$$n = m$$

$$a = n - 1$$

and, therefore, translating the formula into English units, we find for the heat of combustion of any hydrocarbon, or mixture of hydrocarbons of the general formula C<sub>n</sub>H<sub>2n</sub>

$$\text{B.T.U. per cubic foot} = n(757) + 70$$

$$\text{B.T.U. per pound} = 20432 + \frac{1900}{n}$$

For the paraffine series, C<sub>n</sub>H<sub>2n+2</sub>,

$$m = n + 1$$

$$a = n - 1$$

and, therefore, we find for the heat of combustion—

$$\text{B.T.U. per cubic foot} = n(757) + 251$$

$$\text{B.T.U. per pound} = 20432 + \frac{53744}{14n + 2}$$

We found the composition of the illuminants to be C<sub>2.86</sub>H<sub>5.82</sub>; and this approaches so closely to the composition of olefines, that for all practical purposes we may consider the fixed illuminants as belonging entirely to that series.

Therefore, calculating the average heating value of the illuminants from the formula for the olefines, we have—

$$\text{Illuminants, } C_{2.86}H_{5.82} = 2235 \text{ B.T.U. per cubic foot.}$$

We found the average composition of the paraffines to be C<sub>1.82</sub>H<sub>4.64</sub>; and hence from the formula for the paraffines, the average heating value would be:—

$$\text{Paraffines, } C_{1.82}H_{4.64} = 1250 \text{ B.T.U. per cubic foot.}$$

We have shown that the determination of the total amount of paraffines in a gas mixture is not affected by considering CH<sub>4</sub> and C<sub>2</sub>H<sub>6</sub> to be the only two members of the series present; and it is also true that the calculation of the heating value is unaltered by the same assumption. This may be shown thus:

The percentage of paraffines present and their composition, was found by the analysis to be—

$$14'55 \text{ p. c. } C_{1.82}H_{4.64} = 4'71 \text{ p. c. } C_2H_6 + 9'84 \text{ p. c. } CH_4.$$

The calculation of the heating value would be—

$$\begin{aligned} 0'1455 \text{ cubic foot } C_{1.82}H_{4.64} \times 1250 &= 182'9 \text{ B.T.U.} \\ 0'0471 \text{ " " } C_2H_6 \times 1764'4 &= 83'1 \\ 0'0984 \text{ " " } CH_4 \times 1009 &= 99'2 \end{aligned} \quad 182'3 \text{ B.T.U.}$$

Thus the result is the same with each method of calculation.

The heating values obtained by Professor Julius Thomsen for the principal constituents of illuminating gas are given in the following table. Thomsen's original figures are given in calories per molecular weight of the substance in grams; and I have translated these into English units per cubic foot. The temperature of the products of combustion is assumed to be reduced to 18° C. or 64° Fahr.

| Name.                    | Molecular Formula.             | Calories per Molecular Weight in Grams. | B.T.U.'s per Cubic Foot at 60° and 30" W. |
|--------------------------|--------------------------------|-----------------------------------------|-------------------------------------------|
| Hydrogen . . . . .       | H <sub>2</sub>                 | 68,360                                  | 326'2                                     |
| Carbonic oxide . . . . . | CO                             | 67,960                                  | 323'5                                     |
| Methane . . . . .        | CH <sub>4</sub>                | 211,930                                 | 1009'0                                    |
| Ethane . . . . .         | C <sub>2</sub> H <sub>6</sub>  | 379,440                                 | 1764'4                                    |
| Propane . . . . .        | C <sub>3</sub> H <sub>8</sub>  | 529,210                                 | 2521'0                                    |
| Butane . . . . .         | C <sub>4</sub> H <sub>10</sub> | 687,190                                 | 3274'0                                    |
| Ethylene . . . . .       | C <sub>2</sub> H <sub>4</sub>  | 333,350                                 | 1588'0                                    |
| Propylene . . . . .      | C <sub>3</sub> H <sub>6</sub>  | 492,740                                 | 2347'2                                    |
| Butylene . . . . .       | C <sub>4</sub> H <sub>8</sub>  | 650,620                                 | 3099'2                                    |
| Acetylene . . . . .      | C <sub>2</sub> H <sub>2</sub>  | 310,950                                 | 1476'7                                    |
| Benzene . . . . .        | C <sub>6</sub> H <sub>6</sub>  | 799,350                                 | 3807'4                                    |

Returning once more to our analysis, the calculation of the heating value of 1 cubic foot of the water gas would be:—

$$\begin{aligned} 0'0040 \text{ cubic foot } C_6H_6 \times 3807'4 &= 15'2 \text{ B.T.U.} \\ 0'0170 \text{ " " } C_{2.86}H_{5.82} \times 2235 &= 261'5 \text{ " } \\ 0'3240 \text{ " " } CO \times 323'5 &= 104'8 \text{ " } \\ 0'3557 \text{ " " } H_2 \times 326'2 &= 116'0 \text{ " } \\ 0'0471 \text{ " " } C_2H_6 \times 1764'4 &= 83'1 \text{ " } \\ 0'0984 \text{ " " } CH_4 \times 1009'0 &= 99'2 \text{ " } \\ 0'0538 \text{ " " } CO_2 + O_2 + N_2 &= 0'0 \text{ " } \\ 1'0000 &679'8 \end{aligned}$$

## THE USE OF COKE BREEZE IN SEWAGE PURIFICATION.

At the Meeting of the Western (U.S.A.) Society of Engineers a short time since, a paper on the above subject was contributed by Mr. J. W. ALVARD. The portion dealing with the results obtained by the use of coke breeze for sewage purification purposes in England and in Massachusetts was given in a recent number of "Progressive Age," from which the following particulars are extracted.

When Mr. W. J. Dibdin held the position of Chemist to the London County Council, he constructed in 1891 four experimental filters filled respectively with pea ballast, coke breeze, burnt clay, very coarse sand, and polarite (a proprietary article). These filters were worked intermittently for six weeks at average rates of 411,000 gallons per acre per day; the amount of purification effected being indicated by the reduction in oxidizable organic matter in solution as follows:—

|                         |                |
|-------------------------|----------------|
| Burnt ballast . . . . . | 43'3 per cent. |
| Sand . . . . .          | 46'6 "         |
| Pea ballast . . . . .   | 52'3 "         |
| Polarite . . . . .      | 61'6 "         |
| Coke breeze . . . . .   | 62'2 "         |

In his report made at that time, Mr. Dibdin said: "From the results obtained, it appears that a considerable amount of purification could be effected by any filtering material, the *desiderata* evidently being porosity and consequent power of reabsorbing atmospheric oxygen. For foul waters, sand appears too fine; while the burnt ballast used was too coarse. Coke breeze seemed to unite the necessary qualifications; and as it was also a cheap material, it was selected for further trials on a larger scale."

In the second experiment, a full acre filter was constructed at the Crossness outfall of the London main drainage system. The ground was levelled, underdrained, and filled with 3 feet of coke breeze. The sewage was made to flow on to the bed to the level of the surface as quickly as possible, allowed to remain standing full for quite an hour, and then drawn off with the least delay. Working in this way, the filter passed 1½ million gallons (Imperial) a day for six days, resting one day. The purification obtained was 78 per cent., based on the oxidizable matter; and the filtrates were said to be clean and sweet.

At Sutton, a series of preliminary experiments were undertaken on a more elaborate scale, but with approximately similar results. Upon them as a basis, a coarse-grain filter was constructed by filling one of the precipitation tanks, previously used for the chemical process, with burnt clay. The sewage passed from thence into a second tank filled with coke breeze. The operation of this plant commenced on Feb. 11, 1897; and a rate of flow of 773,000 gallons per acre per day was obtained—the rest period included. The results of 76 days' operation in the first tank gave a reduction of 66 per cent. in the oxidizable matter; the effluent from the entire plant showing a total reduction of 86'5 per cent. in the oxidizable matter.

The solid matters held in suspension were reduced by the first tank 95 per cent., and by the combined operation 99'6 per cent. The total quantity of suspended solid matters in the sewage, which were disposed of by the bacteria, was equal to 77 tons of sludge removed during the time of treatment; the average sewage having contained 54½ grains per gallon. The fact that this quantity disappeared without causing nuisance is striking evidence of the capability of the process. At times these filters were worked up to a rate of nearly 3 million gallons of sewage per acre per day. Such high rates checked the bacterial action, but did not permanently disable the filters.

At Exeter, coke breeze filters 5 feet in depth on a similar plan have been in use since August, 1896, receiving sewage effluent much more concentrated than average American sewage. The rate of flow is about 666,000 gallons (Imperial) per acre per day, inclusive of rest periods; and the purification obtained is 75 per cent. in oxidizable matter removed.

In all of these biological filters, the operation is essentially different from ordinary sand filters or intermittent filtration as now practised. Indeed, these biological filters are not filters at all in the sense in which the word is ordinarily used. Mr. Dibdin calls them "bacteria tanks." Another sanitarian proposes the name "digestors." "Respirators" and "aspirators" have also been proposed. The term "biological filters" is not perhaps inappropriate, though the word "filter" is not apt. In these so-called biological filters then the tank is filled with sewage, preferably from the top. It stands full while the bacterial action takes place, and is then emptied as quickly as possible. This is the breathing action. In emptying, the air must of necessity follow down into every part of the mass of the filter, and complete the chemical action of oxidation. No other power is necessary to properly force the oxygen into the filter when the grain is sufficiently coarse. The biological action taking place on the surface of the grain, it follows that the greater this surface the larger the field for action; but as the ordinary suspended matter in the sewage should not be allowed to clog the interstices, a size ranging from peas to chestnuts, dependent upon the amount of suspended matter carried in the sewage, should be selected.

The character of the grain is essential; and that material which will the most readily occlude the atmospheric oxygen is



preferred. A rough porous surface is better than a smooth one, such as wave-worn gravel. Coke has the quality in a high degree, although slag, cinder, and coal are not far behind.

Coke breeze, being cheap and easily obtained, seems to have advantages. Though the selection of the material must be a question of local economy, it is evident that with a material of inferior efficiency a greater quantity and longer contact are necessary to make it economically equal to materials of the first rank.

Coke has the advantage that its porous structure holds large quantities of air in the interior of the grain. Experiments made by the writer show that immersion for a considerable time fails to fill the interior of the grain with liquid. A 24-hour immersion will result in wetting the surface only to the depth of  $\frac{1}{8}$  inch; leaving the air in the interior in place. There is, therefore, a double surface of oxidation to act upon the sewage in the coarser grains, which cannot fail to add greatly to the efficiency of coke for this purpose.

Coke as a filtering material is not new to sewage-purification works; but, so far as the writer is aware, it has never been used as a true biological filter until recently. At Chiswick, coke filter-beds were used to screen the effluent from chemical precipitation by an upward flow through beds 160 feet long, 8 to 10 feet wide, and 2 feet deep. About  $2\frac{1}{2}$  million gallons of effluent daily were passed through these beds by continuous flow. After three months' use, the coke was removed, and burned under the boilers, creating very offensive odours, which contributed to the disuse of the filters. These works were installed in 1879.

At Sheffield, coke-breeze screens were installed in 1886 to filter the effluent from chemical precipitation. The estimated flow was about 10 million gallons of sewage daily. The effluent passed into filter-tanks, of which there were two for each precipitation tank. The filters were 5 feet in depth, and were so constructed that intermittent filtration could take place if desired; but no data can be found as to the rate of flow. The effluent from the filters was regarded as satisfactory. At Bradford and Leeds there are similar works, where the effluent from chemical precipitation is screened through coke breeze.

The continuous use of filters does not permit of biological action; the filters act as mechanical screens. Nevertheless some result is obtained; the quantity of organic matter held in solution by the effluent being reduced about one-fifth, while the mineral matters are reduced about four-fifths.

At Reading (Pa.), there has been in use a coke screen so arranged that the sewage is passed downward through a layer 1 foot thick held upon a wire mesh. About 1,250,000 gallons per day are passed through this screen at the rate of 4000 gallons per square foot per day, and with a reduction, as stated by the Secretary of the Pennsylvania State Board of Health, of about 40 per cent. of oxidizable matter. About 8000 lbs. of coke are used per week to charge the screen; and the removed coke is first dried in an oven and then burnt under the boilers. A visit to this plant showed that the screen was but a mechanical apparatus for retaining solid matters from the sewage in the most ordinary way, and that its use was offensive. The odour from the burning coke was such as would probably cause the discontinuance of the use of the screen at an early date.

From these brief descriptions of coke breeze in purification works, it is evident that all the use which had been made of this material previous to 1891 had been as a mechanical screen, and without reference to its peculiar adaptability as a biological filtration material. The commencement of its use as a true biological filter at Crossness in 1891 has been already noticed; and it only remains to study the experiments made with it by the Massachusetts State Board of Health.

Filter No. 65, filled with coke breeze, was operated at the rate of about 300,000 gallons per acre per day, with a removal of 96 to 99½ per cent. of impurities (measured by albuminoid and bacteria); and it is stated that "the filter has disposed of the applied sewage easily, and its effluent has been of a satisfactory quality." No mention is made in the report of trials at higher rates of flow with a smaller percentage of purification, which would be of great interest in view of the London, Exeter, and Sutton results. Filter No. 81 was also a coarse-grain filter, with cinders as a filtering medium, and was operated by filling and emptying as before described. The sewage run into this filter was ordinary Lawrence sewage strained through coke. The report says: "The filter received sewage at the rate of 514,000 to 610,000 gallons per acre per day, with a purification of from 50 to 75½ per cent.; the results showing less favourably for the cinder than for the coke." Filter No. 22 A, of coke breeze, 60 feet deep, was operated at the rate of 600,000 gallons per acre per day, with a purification of 65½ to 86 per cent. This was with crude Lawrence sewage.

In the general conclusion upon these experiments, the report states: "When coke breeze can be obtained, and the sewage given a preliminary treatment before sand filtration by being passed through this breeze at a high rate in gallons per acre per day, the organic matters in the sewage can be removed from the entire body of the sewage as completely as chemical precipitation removes them from the main body of the sewage."

The Massachusetts experiments do not seem to have produced as high results in rate of flow as the English experiments. The following tables give the results of experiments with coarse-grain filters at the Lawrence experimental station. The depth

of breeze was 5 feet in each case; the rates of flow being 279,000 and 300,000 gallons per acre respectively.

| Entire Year of 1896.    | Free Ammonia. | Albuminoid Ammonia. | Nitrogen as Nitrites. | Nitrogen as Nitrates. | Oxygen Consumed. | Bacteria per Cubic Centimetre. |
|-------------------------|---------------|---------------------|-----------------------|-----------------------|------------------|--------------------------------|
| Strained sewage . . .   | 4'07          | 0'41                | ..                    | ..                    | 2'12             | 1,500,000                      |
| Effluent . . .          | 0'51          | 0'38                | 2'49                  | 0'204                 | 0'15             | 11,127                         |
| Purification, per cent. | 0'875         | 0'905               | ..                    | ..                    | 0'93             | 0'995                          |

| Based on the last Five Months of 1896. | Free Ammonia. | Albuminoid Ammonia. | Oxygen Consumed. | Bacteria per Cubic Centimetre. |
|----------------------------------------|---------------|---------------------|------------------|--------------------------------|
| Strained sewage . . .                  | 4'084         | 0'440               | 2'21             | 1,605,800                      |
| Effluent . . .                         | 0'266         | 0'0366              | 0'15             | 6,552                          |
| Purification, per cent.                | ..            | 0'965               | 0'93             | 0'999                          |

The following table gives the results, in grains per gallon, of analyses made by Mr. Dibdin at Crossness on the efficiency of a coke-breeze filter 3 feet deep and covering an acre of ground. They extended over a period ranging from April 1, 1894, to Sept. 28, 1895:—

| Effluent Passed Daily per Acre. | Average Oxygen Absorbed in Four Hours. |       | Average Albuminoid Ammonia. |       | Average Nitrogen as Nitrates. |        | Average Purification, as Determined by Oxygen Absorbed. |
|---------------------------------|----------------------------------------|-------|-----------------------------|-------|-------------------------------|--------|---------------------------------------------------------|
| Galls.                          | (a)                                    | (b)   | (a)                         | (b)   | (a)                           | (b)    | Per Ct.                                                 |
| 500,000                         | 4'096                                  | 0'856 | 0'416                       | 0'095 | 0'1280                        | 0'2378 | 0'793                                                   |
| 600,000                         | 3'608                                  | 0'730 | 0'396                       | 0'113 | 0'0223                        | 0'1414 | 0'796                                                   |
| 1,000,000                       | 4'113                                  | 0'935 | 0'382                       | 0'114 | 0'3956                        | 0'6990 | 0'775                                                   |
| 1,000,000                       | 3'512                                  | 0'884 | 0'360                       | 0'102 | 0'1431                        | 0'770  | 0'754                                                   |
| 1,000,000                       | 3'233                                  | 0'638 | ..                          | ..    | ..                            | ..     | 0'807                                                   |

(a) Effluent. (b) Filtrate.

It has been suggested that, in the English experiments, effluents from precipitation or septic tanks were used; while in the recent Lawrence experiments the sewage was only mechanically screened. That effluents from chemical precipitation are much more easily oxidized than are the suspended matters of crude sewage is well known. Precipitants, as ordinarily used, not only settle the suspended matters, but partially dissolve them, so that they are more readily broken up by other processes. It will be observed that in the Massachusetts experiments crude Lawrence sewage was used upon a coarse-grain filter with comparatively as good results as with the screen sewage; while among the English results is one at Sutton, where not only is crude sewage, but a particularly concentrated sewage, run immediately upon coarse-grain filters.

The following table shows the quantity of suspended matter, in grains per gallon, removed by the English coke-breeze filters, according to results obtained by Mr. Dibdin:—

| Place.          | Time of Operation. | Crude Sewage. | After Chemical Precipitation or Septic Process. | After Rough Filtration. | Final Effluent. |
|-----------------|--------------------|---------------|-------------------------------------------------|-------------------------|-----------------|
| Crossness . . . | Four years         | 31'0          | 6'3                                             | ..                      | Trace.          |
| Exeter . . .    | Ten months         | 24'5          | 10'8                                            | ..                      | Trace.          |
| Sutton . . .    | Six months         | 60'0          | ..                                              | 2'78                    | 0'75            |

In view of these results, we must believe that the English practice is wholly wrong, or that lack of experiment at Lawrence of high rates of flow for a long time are wanting. The latter supposition seems to be the most reasonable.

In the course of the discussion upon the paper, one of the members asked if there was any peculiar property in coke beyond its porosity and sharp corners—the porosity retaining the air, and the sharp corners being the points upon which the suspended matter might cling; and whether any other material possessing the same mechanical qualities would not answer the purpose. Another member pointed out to the questioner that the great advantage of coke was that it absorbed the oxygen, and that the sewage, when admitted to the tank, confined the air in the coke; giving two surfaces on which the oxygen acted. The same was true of any corresponding porous material.

It may be remembered that, in the course of his Inaugural Address at the recent annual meeting of the Society of Chemical Industry, noticed in the "JOURNAL" for July 19 (p. 151), the subject dealt with in Mr. Alvard's paper was mentioned by Dr. Frank Clowes. He said: "Those who are interested or concerned in the disposal of our town sewage will watch with interest the development in recent years of the process of treating sewage by artificial filtration through coke or other suitable substances. This filtration is known to secure the oxidation of the putrescible matter of the sewage indirectly through the intervention of bacteria. Perhaps the nearest parallel cases are the change of sugar into alcohol and carbon



dioxide under the influence of the yeast cell; followed by the production of vinegar from the alcohol of malt liquor or 'must,' under the influence of the *mycoderma aceti*, which has long been known to be the organism necessary to transfer the atmospheric oxygen to the alcohol. Indeed, just as it is found necessary that the saccharine liquid shall be sown with the yeast cells, and the alcoholic liquid shall become sown with the *mycoderma*, before alcoholic fermentation and acetification can take place with rapidity, so it is found that the bacterial filter for sewage must become infected with the bacteria necessary for the liquefaction of the suspended organic matter of the sewage, and with those suited to effect the oxidation of the dissolved organic substances, before it is in a condition to purify the sewage. In experiments conducted on the small scale, a double filtration of raw London sewage through two small coke bacterial filters has in this way effected upon the raw sewage a purification of 95 per cent. It is hoped and anticipated that experimental filters of a similar kind, but on a larger scale, which are now being started, may produce a similarly successful result, and that their action may be continuous and permanent."

**Societe Technique du Gaz en France.**—We have received the volume of Transactions of this Society for the present year. It contains the report of the proceedings at the 25th annual congress, held at Nice from the 20th to the 22nd of April, under the presidency of M. Ph. Delahaye. Most of the technical matter, which is illustrated by four folding plates, has been already noticed in the "JOURNAL;" and the rest of the contents consists, as usual, of the rules, &c., and M. Victor Delahaye's review of the legal proceedings connected with the gas industry in the year 1896-7. Accompanying the volume is a useful index to the "Proceedings" of the Society from the commencement.

**Improved Anti-Vibration Fittings for Incandescent Burners.**—The use of special fittings to protect the mantles of incandescent gas-burners from the damaging effects of vibration is still necessary; and renewed activity in the production of these appliances is reported by Messrs. Clay and Walmsley, of Bolton. The firm have effected considerable improvement in their coiled-pipes anti-vibrator, and have also in preparation an entirely new form of anti-vibrator called the "cantilever," in which the coil is absent. Mr. Clay's latest invention is his "Floating Bunsen Anti-Vibrator," in which the use of any tube whatever is abolished. In the new anti-vibrator, the bunsen portion of the burner is entirely disconnected from the gas-supply pipe. Mr. Clay is also preparing a floating bunsen incandescent high-power gas-burner on the same lines. We hope to be able to give further particulars of these inventions in an early issue of the "JOURNAL."

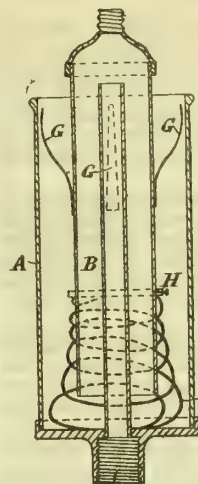
**American Gaslight Association.**—The annual meeting of this Association will be held at Niagara Falls (N.Y.), from the 19th to the 21st prox., under the presidency of Mr. J. B. Crockett, of San Francisco. According to the official notice by the Secretary (Mr. A. E. Forstall), which appears in the "American Gaslight Journal," the following papers will be read: "The Effect of the Depth of Fire upon the Practical Efficiency of a Water-Gas Generator," by Mr. J. M. Rusby, of Jersey City; "Notes on Mains and Main Laying," by Mr. Walton Forstall, of Philadelphia; "The Loss of Illuminating Power of 25 to 30 Candle Gas when Mixed with Air," by Dr. E. G. Love, of New York; and "A Comparison between the Cost of Pumping Gas by Steam and Gas Engines," by Mr. H. L. Rice, of Norfolk (Va.). Papers are expected from Mr. I. Butterworth, of Columbus (Ohio), and Mr. E. C. Jones, of San Francisco; and short topics for discussion will be introduced by Mr. H. L. Doherty, of Madison, and Mr. E. G. Cowdery, of Milwaukee. The business proceedings will be accompanied by the usual social functions, which are always such pleasant features of these gatherings.

**Steel Riveted Water-Pipes.**—The President of the American Society of Civil Engineers, in the course of his recent address to the members, called attention to the fact that steel riveted pipes, for the conveyance of water from the source of supply to the point of consumption, have of late been introduced more liberally in the East. For long distances, with large diameters, under heavy water pressure, especially when few connections have to be used on the way, these pipes, he maintained, are as much superior to cast-iron pipes as the steel substitute is to the old cast-iron tension member of a bridge; and it is not doubted that they will be ultimately used to the exclusion of others. But, unfortunately, though similar pipes made of wrought iron have been successfully used for years on the Pacific coast and elsewhere, it cannot be said that the coatings used to preserve the metal from oxidation are entirely satisfactory. The rivets used for fastening the pipes and the lapping joints impede the flow to a certain extent; and a pipe has been devised, the fastenings of which are entirely outside and provide the pipe with a smooth bore. The great improvement in steel-welded pipes of large diameter will also remedy this defect to a large extent. An order is reported of several thousand tons of welded pipes to be made of Siemens-Martin mild steel, 24 feet long and 42 inches diameter, for the Birmingham Corporation Water-Works. The possibilities of steel pipes are also well illustrated by the proposition to convey a much-needed supply of water (of 5 million gallons per day) to a mining district of Western Australia, by means of a pipe 30 inches diameter and 328 miles long. This is evidently the scheme referred to in our last issue, p. 659.

## REGISTER OF PATENTS.

### Anti-Vibration Appliances for Incandescent Gas-Burners.

Peach, C.; a communication from A. Vaughan, of Sydney, Australia. No. 20,524; Sept. 7, 1897.



This is a modification of the same inventor's English patent No. 29,553 of 1896; and it consists of "a novel method of supporting incandescent gas-burners by means of springs within a luting cup." To effect this, there is connected to the tube or cup A the gas supply-pipe of the lamp. Inside is placed the spring F. Then on the intermediate tube B is adjusted the moveable sleeve H, by means of a set-screw, so that the lower portion of B does not rest on the bottom cup A. Springs G are also fixed on B, and thus communication between the tubes A and B, except by the springs G and F, is prevented. The tube A is filled with luting materials—water, glycerine, oil, mercury, or any other suitable fluid, or combination of fluids—which will flow up the tube B, and form a gas-tight seal, thus preventing the gas escaping from the central tube. A further effect of the luting material is that it will partly support the tube B, and at the same time form around it a cushion which will "retard vibration being communicated to the inner

portions of the fitting."

### Mantles for Incandescent Gas-Burners.

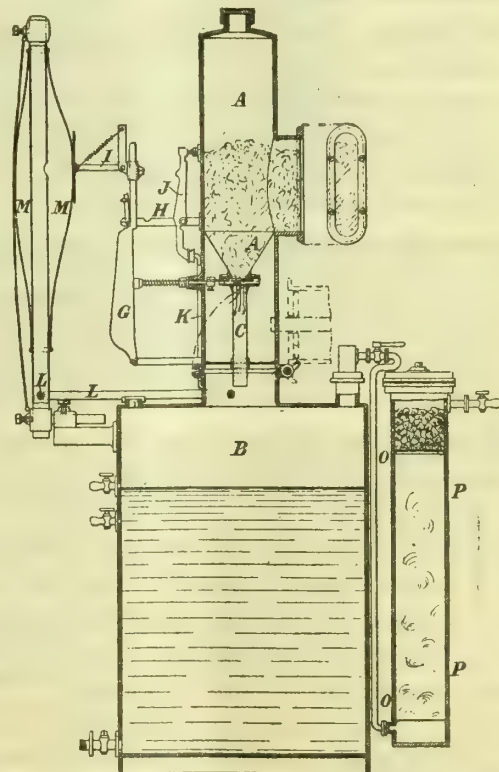
Gomess, A. F. B., of South Kensington. No. 22,327; Sept. 29, 1897.

To overcome the brittleness of collodion-covered mantles, the patentee proposes—after the mantle has been prepared for rendering it incandescent—to coat the fabric of ash with a weak solution of gutta-percha, india-rubber, or similar gum, and over this coating to apply the collodion. According to the second way of carrying out the invention, which the patentee prefers, he treats the finished mantle—i.e., after it has been stiffened as at present—by applying the "gum" over the collodion. The most convenient way of doing so is to immerse the mantle in the required solution and then dry it, repeating the operation, if necessary, until it is found that a sufficiently thick coating has been formed. The patentee mentions the proposal contained in patent No. 11,195 of 1887—to coat mantles with a solution of caoutchouc or with collodion—and he therefore lays no claim to either of these coatings separately; but what he claims is: "In incandescent mantles, the use of gutta-percha, india-rubber, or similar gums, in combination with collodion, for the purpose set forth."

### Producing Acetylene Gas.

Guy, C., of Ivry-la-Bataille, France. No. 24,707; Oct. 25, 1897.

In this arrangement of plant, the carbide, powdered or divided into small fragments, is placed in a receptacle A, into which it is admitted through an orifice at top closed by a lid or plug. In the lower part of A (terminating in a cone), there is arranged the distributor through whose agency the carbide is enabled to drop into the water through a channel C. The lower part of it is closed by a plate provided with a rectangular aperture, below which moves a sliding door, in which is an opening. Below the slide there is a stationary plate provided with an opening similar to that of the slide, so that the slide-valve is comprised between the two plates. The slide is connected with a rod which, under



the action of a spring, presses with its other end upon an arm G, extending perpendicularly. This arm, at a certain point of its length, is guided by a slide H; its upper part being sustained by a spring, so that it is maintained in a practically perpendicular position, while it is also jointed to a lever I, to the end of which there is secured perpendicularly another plate. Upon the slide H, there is likewise arranged a lever J,



provided at its bottom part with a plug that closes the orifice of a tube K, communicating with the reservoir B, while its upper end is subjected to the action of a spring, which ensures the closing of the orifice of the pipe. The lever J carries a stop adapted to come into contact with another stop of the lever G.

The reservoir B communicates by the pipes L with an elastic and gas-tight pouch M. One of the faces of the pouch is confined by a strap, so that when it is inflated it expands chiefly on the side of the plate on the lever I.

The gas escapes from B through a tube O, and enters the main after passing through a purifying chamber P, containing cotton or similar substance, and also a layer of desiccating matter, on gratings or perforated partitions.

The upper part of the apparatus, comprising the carbide receptacle, &c., is secured upon the water-reservoir by a hinge, which enables the interior to be readily inspected, while hermetical closing is ensured by an india-rubber joint. Owing to the provision of a partition in the channel C, the carbide is only exposed to the action of the humid gas through the narrow orifice of the slide-valve; and so the carburet in store is protected from the premature action of moisture.

When in operation, the parts should be so adjusted that when the pouch M is inflated to its maximum volume, the slide-valve below the carbide receptacle is in such a position as to prevent the carbide from dropping into the water contained in the reservoir B. After a certain amount of gas has been produced (by manipulating the slide-valve by hand, so as to cause a sufficient quantity of carbide to fall into the water), there is developed a certain pressure within the apparatus, and the pouch M expands. When it is sufficiently inflated for the orifices in the plates below A to coincide, the apparatus will be in full operation, and may be left to itself. As the production of gas continues, the pouch becomes further inflated, and presently repels the plate which carries the lever G and the slide along with it. The descent of the carbide into the water accordingly ceases; production of gas is interrupted; and matters remain in this state until, as the pressure begins to diminish in consequence of the consumption of gas, the pouch becomes slightly deflated, when the slide-valve will act and the descent of carbide into the water recommences, and with it the production of gas, which, in its turn, stops the further fall of carburet, and so on. Thus it will be seen, says the patentee, that the apparatus "exactly follows the fluctuations of consumption, and maintains itself at a constant pressure."

#### Preparing Calcium Carbide for the Production of Acetylene.—

Lazarus, W. J. H., of Duren, Germany. No. 27,639; Nov. 24, 1897

This invention relates to the manufacture of "calcium carbide cartridges" for the production of acetylene gas; and it consists in first impregnating the calcium carbide with paraffin, or other cementing agent, then reducing the impregnated carbide to powder, and condensing the powder thus obtained into a compact body, or else forcing the powder into an envelope of sheet metal, and closing the filling-in end of the envelope by a substance impermeable to water and vapours. The object aimed at is to prevent "the evolution of gas taking place in a violent and irregular manner, so that the water is contaminated by the mud formed, and the partially exhausted cartridge, after removal from the water, does not allow of being exposed to the moist atmosphere above the water without gas still being evolved therefrom." The patentee acknowledges that it has before been proposed to grind the calcium carbide, to mix the carbide thus reduced with paraffin, resin, or other cementing agent, and to condense the mixture in order to manufacture cartridges for the production of acetylene gas. He therefore does not broadly claim the use of paraffin, or resin, or their equivalents in the manufacture of such cartridges, but as stated above.

#### Acetylene Generators.—

Marechal, V., Moreau, A., and Garcin, L., of Paris. No. 29,405; Dec. 11, 1897. Date claimed under International Convention, June 11, 1897.

This invention has for its object to effect the constant and regular feeding of the water employed for the production of acetylene gas by providing a feeding tube of small calibre in which is a thread or wire, by means of which the capillarity of the tube is increased. The tube has its lower extremity outwardly flaring; while the lower extremity of the thread or wire exceeds the length of the containing tube.

#### Automatic Gas-Lighting Apparatus.—

Rosinski, S., and Ducruix, V. E., of Paris. No. 7280; March 25, 1898.

This invention (applicable to gas-burners generally) relates to the automatic lighting of gas by the "mere act of turning on the gas to the burner." It comprises the provision of a material capable of being rendered incandescent by contact with the gas; of a branch-passage for directing a current of gas on to the material; and of means whereby the branch-passage is closed automatically on the ignition of the gas at the burner by the incandescent lighter.

The last-mentioned part of the invention consists in effecting the automatic closure of the branch-passage by the expansion of a fluid (or any other expandable body) acting upon an elastic bulb or membrane in such manner as to cause the latter, on the expansion of the fluid under the action of the heat of the burner, to shut off the branch-passage. This device consists of a tube having one end closed and the other open, but enclosed by an elastic cap or bulb of india-rubber. The tube contains mercury and a certain volume of air which, under the action of the heat of the lighted burner, is caused to dilate and expand the elastic cap or bulb, and so shut off the passage of the gas through the branch-passage. On the gas being turned off, the air and mercury cool and contract; the elastic membrane resumes its original form; and the passage is unclosed in readiness for the turning on of the tap of the burner.

The composition of the material to be rendered incandescent by the jet of gas consists essentially of gelatinous alumina, impregnated with a solution of platinum chloride, containing 1 gramme of platinum chloride to 4 grammes of alcohol.

#### Incandescent Illuminating Bodies.—

Koch, A., of Bernau, Germany. No. 13,504; June 17, 1898.

This invention consists in combining with the method described in patent No. 30,145 of 1897, a "preparatory process" of impregnating the

fabric or other material employed with an aqueous solution of thorium nitrate; the material being then dried, incinerated, and calcined. The preparatory process may, however, also be made use of in connection with the manufacturing of incandescent bodies in general, in order to improve their durability.

The patentee thus describes the mode of carrying out his proposal: A suitable fabric (of tubular form, but tapering towards the apex) is impregnated with a 30 per cent. aqueous solution of thorium nitrate; then freed by pressure from the adhering liquid, and dried; the dry fabric being subsequently incinerated, and then calcined and fixed in shape by the aid of gas under pressure. The resulting structure or body, which consists (apart from the natural ash-constituents) of pure thorium oxide, is then suspended from a hook, and dipped in a vessel containing organic compounds of silicon, mixed with an alcoholic solution of cerium, as described in the patent already referred to. A thorough moistening of the thorium structure is thus effected; and the latter is then, while still moist, ignited and calcined again for from one to three minutes. This operation results in the combustion of the organic compounds of silicon into silica, which "imparts to the structure a degree of solidity and elasticity hitherto unattainable." In addition to this, "the silica—by reason of its fine state of division on the thorium body, and in conjunction with the cerium—increases the illuminating power to a not inconsiderable extent."

#### APPLICATIONS FOR LETTERS PATENT.

- 19,336.—SIMON, W., "Acetylene gas-lamps." Sept. 12.  
 19,361.—DRAKE, W. A., and MARSLAND, J. S., "Inclined gas-retorts." Sept. 12.  
 19,369.—BOSS, J., "Generating and utilizing acetylene gas." Sept. 12.  
 19,374.—EDWARDS, F., and FRAZER, J., "Storage of acetylene gas." Sept. 12.  
 19,375.—EDWARDS, F., and FRAZER, J., "Burners for acetylene gas." Sept. 12.  
 19,398.—STENT, W. K., "Gas-burners." Sept. 12.  
 19,461.—SPURGE, J. B., "Valves for regulating the flow of gases and liquids under pressure." Sept. 13.  
 19,516.—HARRIS, A. C., "Gas and oil engines." Sept. 14.  
 19,526.—WALKER, F. E., "Gas-brackets." Sept. 14.  
 19,529.—YOUNG, W., and GLOVER, S. & T., "Improved method of separating from gases suspended particles, gases, and vapours, and for the distillation of liquids holding vapours and gases in solution, and in apparatus therefor." Sept. 14.  
 19,533.—BRAHAM, R. W., "Regulating the consumption of gas through argand burners." Sept. 14.  
 19,549.—BROWETT, A., "Generating and burning acetylene gas." Sept. 14.  
 19,565.—SACHSE, A. O., "Anti-vibratory supports for incandescent burners and mantles." Sept. 14.  
 19,641.—DONATH, E., and ORNSTEIN, E., "Obtaining prussian blue, prussiate of potash, and alkaline cyanides from used gas-purifying material." Sept. 15.  
 19,674.—ROBINSON, J. V., "Manufacture of acetylene gas." Sept. 16.  
 19,683.—WAITE, T. R., "Acetylene gas generators." Sept. 16.  
 19,699.—TOURTEL, J., and THE TOURTEL GAS AND GENERAL ENGINEERING COMPANY, LTD., "Coin-freed prepayment meters." Sept. 16.  
 19,706.—CORT, W. L., and LANGWITH, F. A., "Coin-controlled valve mechanism for gas-meters." Sept. 16.  
 19,757.—LANDSBERGER, A., "Purifying acetylene gas." Sept. 17.  
 19,770.—BOULT, A. J., "Metallic mantles for gas-burners." A communication from E. Verbeeke. Sept. 17.  
 19,778.—IMRAY, O., "Bunsen burners." A communication from J. Moeller. Sept. 17.  
 19,779.—IMRAY, O., "Incandescent lamps." A communication from J. Moeller. Sept. 17.  
 19,786.—BILBIE, J., and DRIVET, H., "Treatment of carbide of calcium." Sept. 17.

**The Proposed Purchase of the Falmouth Gas and Water Undertakings by the Corporation.**—At the suggestion of the Gas and Water Purchase Committee, the Falmouth Corporation have decided to again avail themselves of the services of Mr. A. Silverthorne, to advise them in connection with the steps to be taken for the purchase of the two undertakings. It has also been decided that the Town Clerk (Mr. J. H. Genn) shall act as Solicitor to the Corporation in the matter. Some discussion took place as to the Town Clerk's right to charge special fees in connection with the promotion of a Bill in Parliament. He said he wished to be perfectly frank with the Council. This would be an expensive business, and his charges would be made on the usual scale. He should consult Parliamentary Agents as to every step taken, for he declined to bear the responsibility of putting through a big scheme like this without having proper advice.

**Public Lighting in the Bradford Out-Townships.**—A deputation from the Chadderton District Council recently waited upon the Gas Committee of the Oldham Corporation to ask them to supply gas free of charge for the lighting of the public lamps in Chadderton. Mr. Taylor (the Clerk) said that in recent years the expenses of the district had been so enormous that the Council were looking round to see where they could cut them down; and this was one of the items on which they hoped to exercise economy. They thought they were justified in making the application, because the lamps in Oldham were lighted free of charge. After some discussion, the Town Clerk pointed out that if the Corporation supplied the out-townships with free gas for street lighting, they would be £2000 deficient. They would have to raise the price of gas; and as Oldham paid more than two-thirds of the total amount for gas consumption, the ratepayers of Oldham would be paying for the street lighting of the out-townships. Mr. A. Andrew (the Superintendent of the Gas and Water Department) said that last year £2356 was received from all the out-townships for public lighting. The surplus, after paying all charges and retaining the profit to which the Corporation were entitled, was £450. Deducing this surplus, it would be seen that the Corporation deficit, if the public lighting of the out-townships was done free of charge, would be £1900.

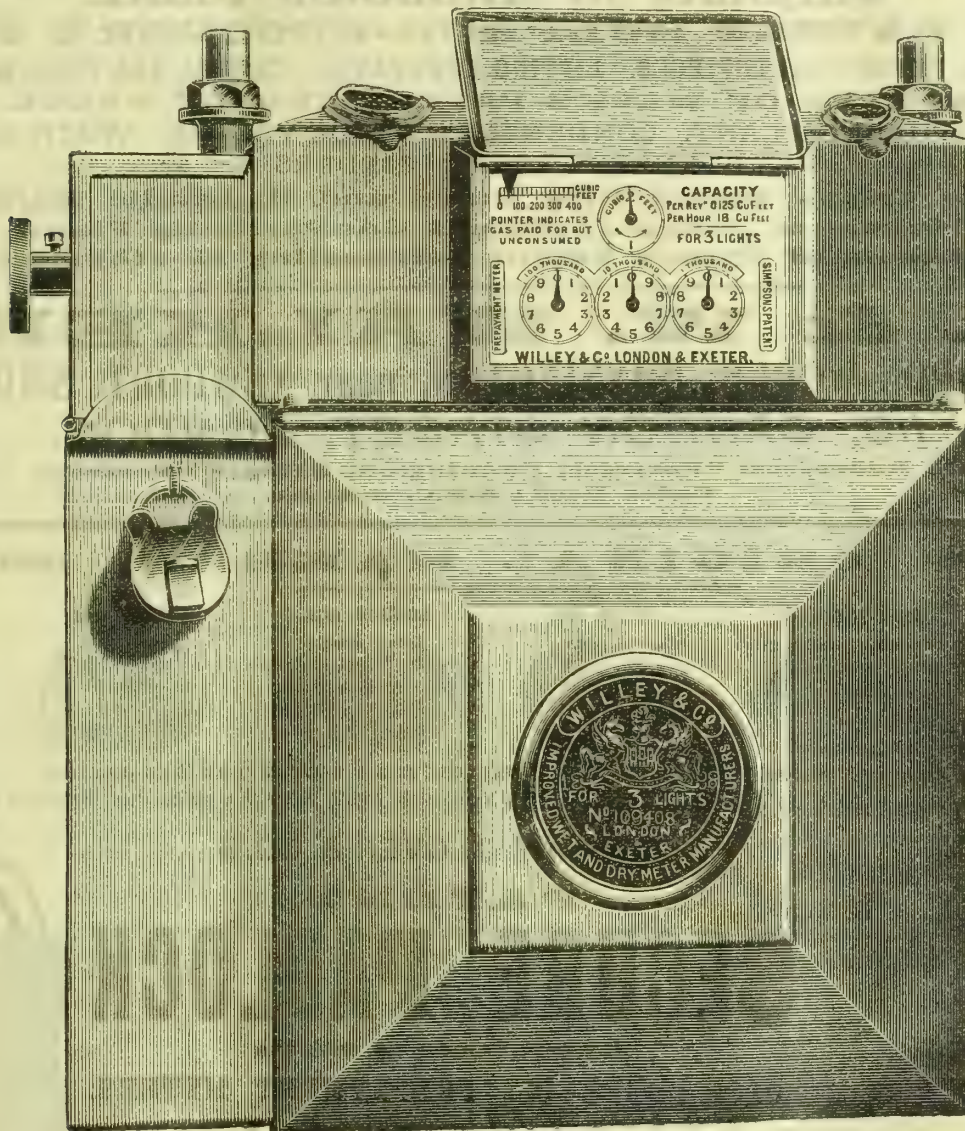


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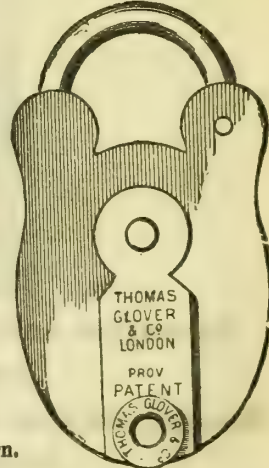
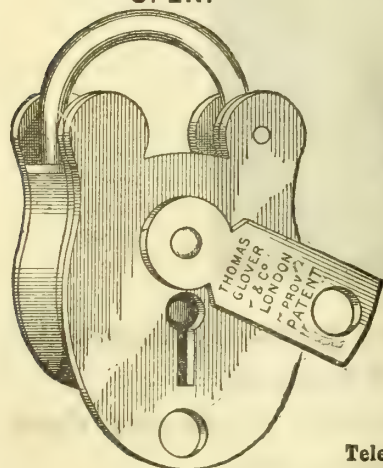
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## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

## The Home Office and Carburetted Water Gas.

SIR,—After an absence from home on holiday, I have read with considerable interest the valuable suggestions in connection with the above published in the "JOURNAL" for Aug. 23. The thanks of all gas authorities are due to you for expressing the sentiments prevailing upon the proposed legislative interference.

The statement of supposititious dangers reminds one of the difficulties experienced by the pioneers of coal-gas manufacture, and indeed by the pioneers of almost anything else. A strong representation to the Authorities at the Home Office would possibly be a distinct advantage. Nothing could be lost; while, on the other hand, something substantial might be obtained. A better object-lesson than the one you have named—that of the Government Vaccination Bill—could not be forthcoming at the present moment.

The chief difficulty arises in obtaining the requisite deputation for the purpose. Naturally the three London Gas Companies suggest themselves as eminently suitable for the purpose—namely, The Gaslight and Coke, South Metropolitan, and Commercial—although this is making a somewhat free use of their names. As, however, they are likely to be as largely interested in the subject as any gas undertaking in the United Kingdom, and are in close proximity to the Home Office, they could do what is necessary in the matter with a minimum of inconvenience.

The present users of carburetted water gas might, of course, combine for the purpose most effectually, if someone could be found to organize a representative deputation.

You clearly state that the best instructed technical opinion confirms that there is not any real question of public safety involved. While on the other hand, the advantage of being able, in case of emergency, to maintain a sufficient supply of light is a most important question of public safety. What evidence might be produced from some of the large cities and towns, where the pressures have had to be reduced to a minimum amount upon a foggy day! and where railway stations inundated with Christmas and holiday traffic and passengers have been subjected to almost Egyptian darkness! Apart from the fogs, the safety of the public during a strike or coal famine is a consideration. For the moment the economical side of the question is "out of court."

A clear statement setting forth the disadvantages of legislative regulations and restrictions as to the percentage of carburetted water gas permissible might perhaps be made to our Members of Parliament, and would be of assistance. The issue is one of national importance and consideration. Many gas undertakings are awaiting the decision of the "powers that be" upon the question of restriction, before erecting an installation of water-gas apparatus.

The present is the time for effectual action upon this highly important matter, although the holiday season is perhaps inopportune for several engineers.

Huddersfield, Sept. 20, 1898.

EDWARD A. HARMAN.

## The Origin of Gas Associations.

SIR,—My interest in the gas business is now limited to a weekly reading of the "JOURNAL," and I was much struck by the speech reported in your issue for the 13th inst., of Mr. J. C. Adamson, of Airdrie, on "The Origin of Gas Associations" when proposing the toast of "The Waverley Association of Gas Managers" at the recent meeting of that body. Mr. Adamson claims for the Association precedence of all others, and says that its formation suggested the organization of the society with which Mr. Mackenzie, of Dunfermline, was so long connected, now known as the North British Association of Gas Managers. This may be so; but it is the first time I have heard of it.

The North British Association arose in this way: In the summer of 1861, I had business in Cupar-Fife, and was accompanied by Mr. W. Proctor, the Gas Manager at Forfar, who was going to Cupar on a similar errand. After our business was done, we together called on Mr. Mackenzie, who at that time was Gas Manager there, where we found Mr. John Lowdon, the Manager from Leven. An adjournment was made to the Royal Hotel, and over a modest meal we discussed all sorts of matters affecting our industry—the doings of Mr. George Flintoff, &c. The meeting was altogether so pleasant and profitable, that we resolved "to meet some other day," and to acquaint all the gas managers in Fife and Kinross, Angus, and Mearns of our intention, and to invite them by circular to be present. Mr. Lowdon was then appointed Chairman and Mr. Mackenzie Secretary; and we four pledged ourselves that, come who might, we would attend.

We were gratified next year to meet representatives from all the four counties to the number of 32. The business of the meeting consisted chiefly in framing the rules and regulations; and they remain almost identical as at that day. These rules were largely the work of Mr. Fraser, of Inverkeithing. Neither at this meeting nor at that of the quartet did I hear any mention of a similar society already formed or then in course of formation.

Perhaps this record will interest some of your younger readers in this northern province.

Saltscoats, Sept. 20, 1898.

G. T. MYERS.

## Retorts.

SIR,—In his "Wayside Notes" in the "JOURNAL" for Sept. 13, as well as in his article on "Gaseous Fuel," on p. 590 of the "JOURNAL" for March 19, 1895, Mr. Cleminshaw states that from settings of six retorts in a bed—the retorts being 22 in. by 14 in. by 9 ft. long—he obtains good heats, so as to get a yield of 8000 cubic feet of gas per mouthpiece, and absence from choked pipes. He gets 888½ cubic feet in 1½ cubic feet of retort capacity.

Allow me to ask him how many cubic feet of gas he gets from a ton of coal, and how many times he charges in 24 hours.

Sept. 14, 1898.

A LESS FORTUNATE BROTHER.

## MISCELLANEOUS NEWS.

## INCANDESCENT GAS LIGHTING IN PARIS.

A recent number of the "Journal des Usines à Gaz" contains particulars as to the important extension of incandescent gas lighting, by Denayrouze burners, which has lately been carried out in Paris by the Gas Company and the Municipality. The portion of the city dealt with is the group of streets in the immediate vicinity of the Opera—the Rue Auber, the Rue du Havre, the Rue Scribe, the Rue Glück, the Rue Meyerbeer, and part of the Boulevard Haussmann. This system of lighting is also in use in the Place du Palais Royal, in the open space in front of the Hôtel de Ville, and in the Rue du Quatre Septembre—the street in which, it may be remembered, the first trials of improved gaslighting in Paris were made many years ago. The new system has been installed by simply substituting Denayrouze burners for the old types formerly in use; the lanterns being those generally employed in the public lighting of Paris. The burners are single, double, or triple, according to the extent of surface to be illuminated; their lighting capacity being respectively 173, 345, and 518 candles. The illuminating effect is therefore equal to, and even surpasses, that produced by the most powerful electric lights in use in the city. Comparing the present lighting of the Rue Auber with that of the Place de l'Opéra, into which it leads, and in which are installed electric lights, our contemporary says a very marked difference is at once presented in favour of gas, which is now shown to be capable of competing successfully with electric arc lighting for the larger public thoroughfares—a domain which has hitherto been considered exclusively its own. In addition to the greater quantity of light obtained, the new system will be productive of economy. The triple Denayrouze burners have replaced the recuperative burners which were formerly employed in lighting the above-named thoroughfares. When it is borne in mind that with the latter burners a minimum consumption of 1.4 cubic feet of gas per hour is required to produce the light of 9.6 candles, whereas a Denayrouze burner will furnish this quantity of light with about half a cubic foot, the advantage gained by the Municipality by the change of system will be readily appreciated. Moreover, it has been effected without necessitating any considerable expenditure for the alteration of existing plant and appliances—another point in favour of gas as compared with electric lighting.

The Denayrouze Company have taken very special precautions in the mounting of their burners, so as to protect the mantles as much as possible against injury from shock or excessive pressure of gas. To minimize the former trouble, the burners have been fitted with very sensitive anti-vibrators, which are stated to give excellent results in working; while the latter is obviated by the use of governors having pressure-gauges arranged to ensure a steady delivery of gas. As no chimney is required with these burners, there is necessarily no expense resulting from breakage of glasses. As far as the trial of the new system has proceeded, it has been found that the life of the mantles fitted up in the manner described has been considerably prolonged.

As to the general effect of the installation, our contemporary says the first impression produced is that of a powerful light to which one has hitherto been unaccustomed. The Rue Auber seems to be literally illuminated; the quantity of light thrown upon the street making the adjacent thoroughfares appear, by contrast, to be plunged in obscurity. Notwithstanding its intensity, the light is agreeable to the eye, due to the incandescent action being spread over the entire surface of the mantle. The effect of the electric arc is just the opposite of this. There the light-centre is much more restricted, and of unbearable brilliancy; while the light afforded is less evenly diffused. These points of difference make for the permanent success of the incandescent gas system.

## THE ACCIDENT FUND OF THE SOUTH METROPOLITAN GAS COMPANY.

## Amendment of the Rules.

In the "JOURNAL" for July 20 last year, we gave an abstract of the rules in regard to the accident fund of the South Metropolitan Gas Company which had been adopted by the Profit-Sharing Committee and accepted by the employees. Experience of the working of the rules led the Committee to recommend certain alterations and additions, which have been adopted by the men; and the new rules have lately been certified by the Registrar of Friendly Societies. As the publication of the abstract drew our readers' attention to the rules, we now indicate the nature of the changes it has been deemed advisable to make in them.

The first important alteration is that the weekly or monthly subscription to the fund need not be paid in advance, as under the old rules. In Rule 6, bearing upon the accounts of the fund, the following paragraph has been added: "The reserve fund shall be used to make good any deficiency in any year, and for the general purpose of the fund; but should there be no reserve fund, then, in the event of a deficiency in any year, the Company shall make it good." According to Rule 7, as originally framed, the Company's contribution to the income of the fund was to be twice as much as that of the men. As altered, they will contribute "at least twice as much." Under Rule 7, as it stood, every man in receipt of weekly wages (including odd men) who accepted the proposal, was to pay in advance ½d. per week, 2d. per month, or 6d. per quarter, as most convenient. The new rule reads as follows: "Every man in receipt of weekly wages exceeding 21s. a week (including odd men) who accepts the proposal, shall pay in advance either ½d. per week, or 2d. a month, or 6d. a quarter, as may be most convenient. Young men and lads whose wages do not exceed 21s. a week shall pay half the above subscription, and receive half the benefits of full members." Considerable changes have been made in Rule 8, relating to the benefits. The allowances, with free medical attendance, for non-fatal accidents, were originally divided into three classes; Class A, for workmen whose injuries had been caused by their own gross negligence, 12s. a week; Class B, for pure accidents, not less



than 18s. a week; and Class C, for accidents clearly caused by negligence on the part of the Company or their officers, 24s. a week. Under the new rules, the allowances, with free medical attendance, are to be at the following rates:—

A.—Minor or slight accidents, disabling for not less than three days nor more than a fortnight, shall entitle members to benefit at the rate of 12s. a week, excepting those men who subscribe an extra 3d. per week to the sick fund, who shall receive in addition to the accident allowance the weekly payment to which the extra 3d. entitles them according to the sick fund rules.

B.—Serious accidents, causing incapacity for more than a fortnight, shall entitle members to benefit at the rate of 18s. a week.

C.—The benefit for accidents, clearly caused by the negligence of the Company or its officers shall be 24s. a week.

D.—Any member whose injuries have been caused by his own "serious and wilful misconduct," whatever may be the period of disablement, shall receive nothing from the accident fund, but will, if he is a member of the sick fund, receive benefit therefrom according to its rules.

The jury system adopted in 1892 is to be continued; and the class in which any man shall be placed is to be decided, in case of doubt, by the jury. In the event of any apparently slight accident put in the minor class and receiving benefit for the first fortnight at the rate of 12s. a week proving serious, it will be transferred from A to B, and, in addition to accident pay at the rate of 18s. a week, will receive towards the deficiency in the first two weeks an extra 3s. a week while incapacity continues; but the extra 3s. a week will in no case be paid for more than four weeks. These payments are to be continued until recovery, or until the doctor certifies that the man is fit for work, or until he is proved to be permanently incapacitated.

With regard to future employment, according to the old rules, in cases coming into Class A the Company gave no undertaking; but for those in Class B work would be found at not less than 24s. a week if the wages exceeded this amount, and in Class C at not less than four-fifths of the day wages previously received, and in no case less than 24s. if they exceeded that figure. The rules in this respect now stand as follows:—

To those men injured by their own "serious and wilful misconduct" the Company gives no undertaking as to future employment. Work will be found for others on recovery at not less than 24s. a week if the wages exceeded that amount; and for those injured by the negligence of the Company, at not less than four-fifths of the day wages previously received, and in no case less than 24s. if the wages exceeded that amount.

Rule 16, dealing with the conditions under which an allowance from the fund can be claimed, has been shortened. It now simply specifies that the accident must be proved to have occurred "while in the employ of, and actually engaged in, the work or business of the Company;" and in case of death or permanent disablement, the Profit-Sharing Committee are to decide what allowance shall be made, in accordance with Rule 8. Under the old rules, the inquiry into a claim in respect of an accident was to be made "as soon as possible;" whereas now it is to be made "within the first fortnight, if possible."

#### SHREWSBURY GASLIGHT COMPANY.

The Annual Meeting of this Company was held on Wednesday last—Mr. J. S. PHILLIPS presiding.

The report which was submitted stated that the available balance of profit was £2539; and the Directors recommended that the authorized dividend be declared. This (after deducting the interim dividend paid in March last) would absorb £2428, and leave a balance of £111 to carry forward. The consumption of gas showed a decrease of 1.23 per cent., principally due to the extreme mildness of the winter season. The unaccounted-for gas rose to 8.34 per cent.; many heavy leakages having been caused by damage to the mains through the sewerage operations which were in progress all the year. The residual products market had again been unfavourable; and a further advance had had to be conceded in the price of coal for the current year. At the beginning of 1898 the Directors decided to commence the supply of coin-meters, and also to let cooking and heating stoves on hire. Up to June 30, 241 slot meters had been fixed, and 82 stoves let on hire.

The CHAIRMAN, in proposing the adoption of the report, said that during the past year they had proceeded on the even tenour of their way, with the same successful results which had attended the Company for the last 78 years. The accounts showed that they had expended on capital account £1027 more than in the previous year, which was entirely due to the new departure entered upon during the last six months of the year, of supplying gas through slot meters and hiring out stoves. Since the prepayment system was commenced in January last, they had fixed 378 of the meters, and had received applications for 80 more. If the demand continued in anything like the same proportion, it would take a considerable amount of capital to supply the wants of their customers. Regarding the consumption of gas, during the year they made 153,738,000 cubic feet—an increase of 1,289,000 feet, or 0.85 per cent., over the previous year. But they had sold 1,715,000 cubic feet less, or a diminution of 1.23 per cent. The shareholders would naturally ask, having made an increased amount of gas, how it was there was less consumed. The fact was the unaccounted-for gas had increased from 6.95 per cent. to 8.34 per cent., which was entirely owing to the sewerage operations in the streets. During the year something like 256 tons of coal less had been used, which was equal to 1.85 per cent., although more gas had been produced. They had sold 10,125 cubic feet of gas per ton of coal carbonized, which was exceedingly satisfactory. On the revenue account they had received from the sale of gas and public lighting £20,974—a decrease of £244 on the preceding year, which was entirely owing to the mild winter. Up to the present, however, there had been a very satisfactory increase during the three months as compared with the corresponding quarter last year. The coal used had cost them more, although they used less, owing to having to pay an additional 6d. per ton, and keeping more in stock.

Mr. BEACALL seconded the motion, which was carried unanimously.

The CHAIRMAN proposed the declaration of a dividend at the rate of 7½ per cent. per annum; less the interim payment of 3½ per cent.

The motion having been carried, the thanks of the meeting were accorded to the Chairman and Directors and to Mr. W. Belton, the Secretary and Manager.

#### ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

##### Half-Yearly Report and Accounts.

In the report which the Directors of the above-named Company will present to the shareholders next Friday, they state that, after the payment of £5379, the interest on the loan capital, &c., there is a net profit of £32,182 on the past half-year's working. They recommend payment of the usual dividends of 10½ and 7½ per cent. per annum on the respective shares. This will involve the withdrawal of £1384 from the reserve fund; but there will remain to the credit of the fund the sum of £42,875. The Directors express deep regret to record the death of their late highly-respected colleague, Mr. Edward Fottrell, J.P., who was a member of the Board during a period of more than thirty years, for twenty-five of which he was Chairman. They have elected Mr. Charles Lawler, J.P., to fill the vacancy. The Directors announce the resignation of Mr. W. F. Cotton, the Company's Secretary and Manager, and set forth the proposed arrangements consequent thereon, as indicated in the "JOURNAL" last week.

The accounts accompanying the report show that the receipts for gas in the six months ending June 30 amounted to £109,689; rental of meters, to £3145; the sale of residuals produced £20,748; and the total revenue was £133,726. The expenditure on the manufacture of gas was £73,475 (coal costing £34,897, and cannel and oil £16,802); on distribution, £8261; on management, £5441—the total expenditure being £96,165—leaving a balance of £37,561 to be carried to the profit and loss account. The working statements show that the quantity of coal and cannel carbonized was 69,128 tons, which produced 699,040,000 cubic feet of gas. Of this, 621,849,000 cubic feet were sold and 631,636,000 cubic feet accounted for. The following are the estimated quantities of residuals produced: Coke, 88,340 chaldrons; breeze, 6773 chaldrons; tar, 642,096 gallons; and ammoniacal liquor, 1,513,704 gallons.

#### OTTOMAN GAS COMPANY, LIMITED.

The Half-Yearly Meeting of this Company was held last Tuesday, at the London Offices, 9, Queen Street Place, E.C.—Colonel JAMES LE GEYT DANIELL in the chair.

The SECRETARY (Mr. T. Guyatt) having read the notice convening the meeting, the Directors' report and the accounts, which were referred to in the "JOURNAL" for the 13th inst., were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said it would be remembered that at the last meeting the shareholders gave the Directors authority to issue some debentures; and these debentures, to the amount of £20,000, had been allotted. The sum of £17,740 mentioned in the accounts was the amount paid up on the debentures at the 30th of June last. Since that date, however, the whole amount due on them had been received. At the meeting of the Company twelve months ago, he had expressed the hope that the peace which was then signed would lead to an increase in the consumption of gas. This hope had in the past half year been fulfilled, though not to so great an extent as might have been wished. The increase in gas-rental for the six months under review amounted to £400; and of course there had been a corresponding increase in the receipts from residual products. Turning to the accounts, the item of sundry creditors, £1194, appeared somewhat heavy as compared with the corresponding period of the previous year; but this included an amount of £413 for gas-engines which had since been paid. Bills payable figured in the accounts at £3916; but since June the amount had been reduced to £838. Turning to the other side of the accounts, it would be seen that the capital expenditure stood at £74,485, from which had been deducted £372 for depreciation. The increase of £2600 in the capital account since Dec. 31, 1897, had been caused chiefly by outlay on new mains, and on the necessary excavations for the holder which they were erecting. It was estimated that the total cost of the holder would be £8500. The item of sundry debtors, £16,442, included a sum of £6000 which would eventually be charged to capital account, but which had been carried to suspense until the work in question was completed. Coming to the revenue account, coals had cost £3230, as against £2708. This increase was explained by the fact that they had carbonized 400 tons more, owing to the larger demand for gas which they had experienced. The negotiations for a new concession, to which he referred at the last meeting, had resulted in the Company being granted a further term of forty years, to commence at the expiration of the present concession in 1902. They had been trying to obtain an extension of seventy years; but he thought it would be safer to base their calculations on the forty years which had been granted. Such being the case, it would be necessary to formulate some scheme for a gradual liquidation during this period, by providing a sinking fund. They were, however, led to hope that ultimately the new concession might be extended to seventy years.

Mr. STEPHENSON R. CLARKE seconded the motion.

Mr. A. M. PADDON asked whether anything had been done towards the introduction of prepayment meters among the consumers. He thought that the coinage in Turkey offered great facilities for the use of coin meters.

Mr. H. W. ANDREWS replied that the Company were at present making a trial of the system.

The CHAIRMAN, in answer to further questions, said that all the debentures had been taken up at par—there had been no underwriting. He had heard nothing more about the electric lighting company to which reference was made at the last meeting; but many people were going over to Smyrna with the idea of starting an electric lighting business. The Ottoman Gas Company, however, were entitled to preference in the matter of supplying electricity, if they offered to do so on as good terms as anyone else.

The motion was then carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. CHARLES GANDON, a dividend was declared at the rate of 7 per cent. per annum on both classes of shares.

A cordial vote of thanks was passed to the Chairman and Directors, on the motion of Mr. HUGHES, seconded by Mr. A. W. COOPER.

On the motion of the CHAIRMAN, seconded by Mr. F. E. LINGG, a like vote was passed to the officers and staff; and the proceedings terminated.



### THE PROGRESS OF THE SHEPPY GAS COMPANY.

The approaching relinquishment by Mr. A. W. Marks of the secretaryship of the Sheppy Gas Company, to which brief reference was made in the last number of the "JOURNAL," calls for more extended notice, not only from his long tenure of the position he is unfortunately compelled, mainly owing to failing health, to vacate, but from the fact that to his occupancy of it must unquestionably be attributed the success which has attended the undertaking. Mr. Marks entered upon his duties in 1862, having previously been engaged under the London and North-Western Railway Company at Camden Town, and for a few years in his father's business at Sheerness. At that time the Company whose service he entered were competing with the Sheerness Gas and Coke Company, who were selling gas at 7s. 6d. per 1000 cubic feet, under many disadvantages. The new Company started to sell at 5s.; and they very soon bought out the old Company. The capital of the Company was less than £8000; and the consumers did not number 300. The Company was re-incorporated by Act of Parliament in 1871. The capital is now £40,000; and the number of consumers upwards of 1500. The original price of 5s. has been gradually reduced to the present figure of 3s. per 1000 cubic feet net. Full dividends have invariably been paid, with the exception of the years of the coal strike some time ago. The Company were among the first to introduce—in 1865—the "fittings on hire" system, which worked very successfully for many years, but has more recently been almost superseded by the supply of fittings and stoves, of the purchasers' own selection, on the three-year system of payment. This is suitable for the better class of consumers; while the "penny-in-the-slot" arrangement suits the poorer classes. Nothing striking is to be noted in the history of the secretaryship except steady hard work, which has been remunerated with increased salary and assistance in the routine duties. Mr. Marks has always had the full confidence of the Directors, with whom he has acted in the most friendly manner; and all his proposals for reductions in price and improving the business of the Company have met with ready support alike from the Board and the proprietors. His resignation will, we are sure, be a matter of regret to all the Directors personally, and to many of the shareholders with whom he has been brought into more immediate contact.

### COLONIAL GAS UNDERTAKINGS.

In the "JOURNAL" for the 13th inst., we gave a report of the annual general meeting of the Australian Gaslight Company, with the results of the working in the six months ending June 30. The accounts of other colonial gas undertakings have since come to hand, from which the following particulars are extracted:—

The Maryborough Gas Company realized £2769 from the sale of gas, gas-fittings, &c., in the half year ending June 30; and the total revenue, with the balance of £1012 brought forward, was £3934. The profit for the six months was £1049; but after deducting £38 for dividend tax, there was £1011 standing to the credit of the profit and loss account. At the meeting of shareholders, the Directors recommended that this should be appropriated as follows: Dividend at the rate of 6 per cent. per annum, £772; balance carried forward, £239.

In presenting their fifteenth annual report and balance-sheet to the shareholders of the Perth Gas Company, Limited, the Directors congratulated them on the increased business and profits of the Company for the year ending May 31 last. The Company supply both gas and electric current; the profit from the former being £8709, and from the latter £3390, together, £12,099. A forfeited deposit of £1000 and a balance of £1472 brought forward made up £14,571, out of which an interim dividend of £1850 had been paid for the six months ending Nov. 30, 1897; leaving £12,721. This the Directors proposed to appropriate as follows: Dividend for the half year at the rate of 2s. per share, £3700; bonus of 1s. per share, £1850; reserve fund, £4666; balance carried forward, £2504. The Directors have decided to further extend operations, by laying mains and erecting cables for the supply of gas and electric current for lighting and cooking purposes, throughout the portions of the city and suburbs not already served; and with the object of encouraging the day consumption of gas, at a reduced price, they are importing a large stock of cooking-stoves. The Manager, Mr. E. Wigglesworth, was sent to England in December last to purchase the necessary machinery for duplicating the present supply of both lights; and contracts have now been completed. For these extensions more capital will be required; and for this purpose 13,000 new shares have been issued. Since the failure of the negotiations for the sale of the Company's business, the Directors have received several offers to purchase; but they have not entertained them. They recommend a reduction of 10d. per 1000 cubic feet on the present price of gas (10s.), with a discount of 10d. per 1000 cubic feet for payment on or before the 15th of each month. Also a discount of 2d. per unit on the price of the electric current (1s.) on the same terms.

The Rockhampton (Queensland) Gas Company, Limited, like the Company just noticed, supply both gas and electricity. In their fifty-first half-yearly report, embracing the six months ending June 30, the Directors express their pleasure in stating that the result of the operations in both sections of the business shows an improvement; and as regards the consumption of electricity, it is expected that during the current half year a still further one will be manifested. A large number of remunerative extensions of mains and services have been made, and applications are in hand for others. The gas operations show a profit of £2142, which is an increase of £316 on the preceding half year, and of £423 on the corresponding half of 1897. On the electrical operations there is a profit of £190, also indicating improvement. The total profit (£2332) from the two sections of the business has been added to the credit of the profit and loss account. After providing for interest on debentures, &c., and dividend duty, a credit balance of £1916 remains; and from this the Directors recommend the payment of a dividend at the rate of 7 per cent. per annum upon the ordinary shares, and 9 per cent. per annum upon the preference shares, amounting to £1683, free of dividend duty, and the placing of the balance (£233) to the credit of the reserve fund for the maintenance and improvement of plant.

The South Australian Gas Company received £76,991 from the sale of

gas, residuals, &c., in the year ending June 30; and the total revenue was £77,260. The expenditure being £46,900, there was a balance of £30,360. Owing to various reductions made in the charges for gas, the receipts for the past year were rather less than those of the preceding twelve months; but the expenditure for coal and maintenance being reduced, the balance of profit is slightly better. As it is proposed to proceed with certain alterations to mains, services, and buildings, the Directors have decided to add £2000 to the replacement fund. New and larger purifiers are being fixed at Brompton; and considerable extensions of mains and service pipes have been made. Additions to plant have also been carried out at the Port Adelaide and Gawler works. The Adelaide Corporation having entered into a contract with the Company for street lighting for five years from September, 1897, more than 900 Welsbach incandescent gas-burners have been provided and fixed by the Company in the City lamps; and the lighting has consequently been much improved. Lamp contracts for five years have also been arranged with neighbouring Councils. The above-named balance of £30,360 added to the amount brought forward (£14,193) made a total of £44,553. The interim dividend absorbed £15,000; and the payment of the final dividend took a like amount—leaving £14,553 to be carried forward.

### THE PROPOSED LIGHTING OF BUCKPOOL BY MEANS OF ACETYLENE GAS.

Reference was made in the "Notes from Scotland" in the last number of the "JOURNAL," to the proposal which recently came before the Buckie Police Commissioners to light Buckpool by means of acetylene gas. It may be remembered that the Bon-Accord Acetylene Gas Company sent to the Commissioners an estimate of the cost of providing and fixing the necessary plant, on the assumption that the extent of main piping to be laid did not exceed three miles, and that the number of lamps to be supplied with the gas was about 60. As a guarantee of the efficient working of the plant, the Company were willing to put in the installation free of expense to the Commissioners in the first instance, and to work it themselves up to the 1st of May, 1899, on the understanding that from the time it was in working order till that date the Commissioners should take their supply of light for the 60 lamps in question from them, paying them at the rate of 7s. 6d. per 100 cubic feet (the equivalent of coal gas at 5s. per 1000 cubic feet) for it, and that on the above-named date they should take over the whole plant, paying for it the sum of £564—being £550 the original cost of the installation, and £14 as interest on £550 for 6½ months at the rate of 5 per cent. per annum—provided that by that time the working of the plant should have been shown to be satisfactory, and that it was in all respects suitable for what was required of it. The outlay for the piping and laying it was estimated at £155 per mile; and the cost of adapting the existing lamps for use with acetylene gas was put at 10s. apiece. The pipes were to be of galvanized wrought iron, and laid at a depth of 30 inches. As this is a definite proposal for an installation of acetylene gas lighting, it may be of interest to give all the figures of the estimate: Piping, 3 miles, at £155 per mile, £465; adapting 60 lamps, £30; No. 4 generator, £40; house for ditto, £10; fixing and starting generator and rail freight on all plant, £5—total, £550. Adding interest, Oct. 15, 1898, to May, 1899, at 5 per cent. per annum, £14, brings up the total to £564.

When the matter was before the Commissioners, the Provost (Mr. Webster) referred to the experiment which is being made with acetylene gas for lighting the neighbouring burgh of Portsoy; and he suggested that the Commissioners should wait and see the result before doing anything in the same direction themselves. This suggestion was supported by Mr. Archibald, who thought it would be wise to wait a little. Whenever they found the thing was really a success, they could deal with it. Bailie Bremner referred to the lighting of the Manchester Ship Canal by acetylene gas, and stated that it had been a success there. He had himself three burners, and was quite satisfied with the result of the installation. Mr. Flett said that, from personal experience, he had found the light excellent. He had it in his yard at Stornoway, where four jets of acetylene gave as much light as 16 ordinary gas-burners. He moved that the offer be accepted. Bailie Bremner seconded the motion. Mr. Archibald again counselled delay until the results at Portsoy were before them; and he moved, as an amendment, that no action be taken. This having been seconded, a further amendment was submitted by Mr. Simpson, to the effect that the Commissioners should make inquiries, with the view to the adoption of acetylene gas for the lighting of Buckpool. Mr. Archibald withdrew his amendment, and that of Mr. Simpson was carried by eight votes against four for the original motion.

**The Godalming Town Council and the Water-Works.**—As a result of negotiations between the Godalming Corporation and the Directors of the Frith Hill, Godalming, and Farncombe Water Company, an extraordinary meeting of the shareholders was held on Monday last week, at which a resolution was proposed agreeing to the acquisition of the water-works by the Council for the sum of £51,000. Although there was a majority in favour of the municipalization of the undertaking, there was not a three-fourths majority, as legally required; and the resolution was rendered abortive. In consequence of this, Mr. J. C. Collier, the Chairman, resigned his position as a Director.

**Hull Corporation Gas Supply.**—Progress is being made with the arrangements for changing the supply of gas in the area of Hull now served by the gas-works which the Corporation acquired from the Kingston-upon-Hull Gas Company, and which are to be dismantled. At the meeting of the Gas Committee last Tuesday, the Town Clerk submitted an agreement which, after considerable negotiation, had been come to with the British Gaslight Company for the supply of gas. The Company are to supply the gas at 1s. 6d. per 1000 cubic feet; and arrangements are made for the revision of the charge at certain intervals—the price to be raised or lowered according to actual cost in the Company's holders. If the Council desire it, instead of going through the books to find the cost, the Company are to charge them 4d. less than the other consumers. The agreement was confirmed. The Committee have also selected a site (for which they are to pay £2000) for the station meter and other purposes connected with the department.



## ELECTRIC LIGHTING NOTES.

The Electric Lighting Committee of the Cardiff County Council have received the sanction of the Local Government Board to the borrowing of £28,125 for electric lighting purposes.

With a view to encouraging the use of electric motors, and securing a day load for the generating plant, the Electric Lighting Committee of the Walsall Town Council have decided to make a special charge of 2½d. per unit for current supplied for motor purposes only.

The Rottingdean Electric Light Company must be in exceedingly low water. They were summoned at the Lewes Petty Sessions last Tuesday for allowing smoke to issue from the chimney at their works in such a manner as to cause a nuisance. Defendants, who were represented by their Manager, pleaded guilty, and were fined £1 and 14s. 6d. costs. The Manager asked for time to pay. The Chairman: What, time to pay £1 14s. 6d.! The Manager: Yes, we are in rather a bad way. Under such circumstances, the Bench could not do otherwise than grant the application.

The Vestry Clerk of Hampstead reported at Thursday's meeting that the accounts of electric light consumers for the Midsummer quarters in 1897 and 1898 were respectively £2119 and £3260—an increase of £1141. In his annual report on the work of the Vestry, the Clerk, referring to the fact that nearly every street of importance in the borough is wired, declares that "the Vestry are therefore in the enviable position of being able to face with confidence the threatened competition from outside companies, even if, as appears doubtful, those companies should be successful in obtaining the powers which they seek." The growth of income during the year shows an average increase of about 48 per cent. Another paragraph contains the remark that "the item for compensation also swells the expenditure this year, owing to the unfortunate fatal accident to one of the Vestry's men in a transformer in March, 1897."

The report of Major Cardew, R.E., to the Board of Trade, on the result of his investigation into the explosion of gas in the electric lighting culvert at Bottom-of-the-Moor, Oldham, on the 10th ult. (*ante*, p. 390) was recently read to the Electric Lighting Committee of the Corporation. Major Cardew, after stating the cause of the explosion, mentioned that the large culvert had since the accident been replaced by iron pipes containing insulated cables in place of bare conductors. There were, however, long lengths of similar culverts still in use in other parts of the town. None of these were at present ventilated, and any of them might become receptacles for explosive gas. The Inspector discussed the matter with the officials; and it was agreed that the following alterations should be carried out with the view of avoiding risk of future explosion: All service lines to arc lamps to be replaced by armoured cables laid solid without pipes; all pipes communicating with culverts or street boxes to be plugged at the ends; long lengths of culvert to be broken up by interposing at intervals cables laid on some solid system instead of the existing bare mains; all culverts to be ventilated as well as can be arranged; frequent inspection to be carried out, and covers of street-boxes to be lifted for such time as will allow of change of air. The Inspector did not think anything further could be done. The ventilation of these culverts, he remarked, appeared to be very difficult to carry out in a satisfactory manner; and frequent inspection was probably the best safeguard.

## PROJECTED ELECTRIC LIGHTING SCHEME FOR ADELAIDE.

As mentioned in the article on "Colonial Gas Undertakings" which appears elsewhere, the South Australian Gas Company have a contract with the Adelaide City Council for lighting a large portion of the city by incandescent gas-burners for five years from September, 1897. The effect produced by the new lighting must be eminently satisfactory; yet a short time ago the Council advertised for tenders for alternative electric lighting schemes. The first was for the right to light the city throughout for a term of 21 years, at the end of which the whole of the plant, works, &c., are to be handed over to the Corporation as a going concern free of cost; the second was for the private lighting of the city for a term of seven years from Dec. 31 next. Four tenders were submitted; and at the date of last advices, they were being considered by the Council.

The Brush Company undertook to put down the necessary plant, machinery, and mains for the supply of electricity to private consumers and to the Corporation for street lighting as required, and to maintain a continuous and constant supply. The maximum rate to be charged to private consumers was to be 9d. per Board of Trade unit; and the Council were to have the right to purchase the whole undertaking at the expiration of 42 years at the then value of the plant, works, mains, &c. When the earnings of the undertaking exceeded 10 per cent. per annum, the price of current was to be reduced to private consumers ½d. per unit below the maximum rate allowable for every 1 per cent. in excess of this rate of profit. The Corporation were to give the Company the sole right of laying mains and supplying electricity for lighting purposes within the city area for a period of seven years. In consideration of the Company being granted this right, they undertook to supply the Corporation with current for street lighting at 5d. per unit. At this rate a 2000 nominal candle power lamp, running from sunset to midnight every night throughout the year, would, they said, cost £23 per annum; and from sunset to sunrise, £45 per annum. Although they had stipulated for the right to charge private customers 9d. per Board of Trade unit, it was most probable that the rate first fixed would be considerably below this. They added: "It is obviously not to the best interests of the general ratepayers that we should offer to do any street lighting free of cost, as it only means that private consumers have to be taxed by increased rates for their supply to cover the cost of the public lighting, which should rightly be borne by the whole of the ratepayers, and not by those who are sufficiently enterprising to adopt the new lighting."

The General Electric Supply Company of South Australia made the following tender for the private lighting: The Company to erect the necessary generating works and lay mains in certain streets named and such others as might offer sufficient inducement, and subject to the consent of the Corporation; and the Corporation to transfer their powers in regard to electric lighting to the Company for seven years. In consideration therefor, the Company undertook to supply, fix, and run from dusk

to midnight, 20 arc lamps, each of 2000 nominal candle power, free of cost to the Corporation for the term mentioned in the specification. The Company were prepared to pay the Corporation 10 per cent. of all net profits over and above 6 per cent. interest on the capital cost of the works for private lighting in the city, or all the net profits over and above 10 per cent. The Company were further prepared to introduce a refuse destructor plant in connection with their works, should the Corporation be willing to enter into an agreement for delivery of all refuse free of cost to the Company. At the end of the term of seven years, if the agreement with the Company was not renewed for a similar term and on like conditions, the Corporation were to purchase at a valuation the whole electric installation for the street and private lighting as a going concern. In the event of the tender being accepted, the Company would be prepared to have the arc lamps fixed and running early in November.

A private firm submitted a tender for the second scheme, which contained the provision that if they secured the contract they would be prepared to put up 20 arc lamps, erect and maintain the whole of the fittings and supply the current for lighting the lamps free of all cost to the Corporation for the term of seven years. They were also prepared to pay to the Corporation a lampage of 2s. per lamp for all lamps installed (outside the area they at present light) for the purpose of private lighting from one central station during the above-named term, such payment to be made annually.

The South Australian Electric Light and Motive Power Company, Limited, offered to undertake the private lighting of the city for seven years from Dec. 31, 1898, on the following terms: The Company to supply to the Corporation free of all cost for public use 30 arc lamps of 2000 nominal candle power; to erect the lamps at their own cost in such places within the city as might be agreed upon; and to maintain them in proper and efficient condition, and cause them to be kept alight from sunset to sunrise. The Company offered to deposit with the Corporation the sum of £500 on the execution of an agreement making the Company's Private Act of Parliament apply to the city of Adelaide, after a poll of the ratepayers sanctioning it. In the event of the Company's offer being accepted, they were prepared to deposit with the Treasurer of the province the sum directed by their Private Act—viz., £5000. It appears that the Act referred to was obtained by the Company last year, and was very different from the one they wanted. However, since they have had it they have been endeavouring to raise money in London; and the foregoing particulars will give an indication of the kind of contract they were anxious to secure.

## PLYMOUTH WATER SUPPLY.

## Completion of the Burrator Storage Reservoir.

The annual "Fyshynge Feasts" of the Plymouth Corporation, which was held last Wednesday, was associated with the formal recognition of the completion of the new storage reservoir which has been constructed at Burrator, on the slopes of Dartmoor. For three centuries Plymouth has derived its water supply from the River Meavy, across which the Corporation, in the year 1584, obtained parliamentary powers to construct a weir and to abstract as much water as would flow into "a diche or trenche conteynng in bredthe betwene sixe or seaven foote." There was no stipulation as to the depth of the "diche," and no provision for compensation water. Sir Francis Drake made the "diche," or leat; and, with the addition of several small storage reservoirs at various points, and other improvements, it afforded Plymouth an excellent and abundant gravitation supply, with which little fault has been found until recent years. Then it began to be discovered that the population had overtaken the means of supply. On two memorable occasions—that in the year 1881, and again in 1891—the leat was blocked by snow and frost, and had to be cleared, at great cost of money and labour, to relieve the water famine which ensued. At other times trouble has arisen through dry seasons. The capacity of the leat was equal to the demands so far made upon it; but more than once, in periods of drought, the river has fallen so low that the yield has been insufficient to maintain the full supply to the town. In spite of the fact that every drop of water has been diverted at the Head Weir into the leat, the town supply has had to be discontinued at night for several weeks past. In order to provide against difficulties of this kind, the Corporation were advised many years since to construct a storage reservoir. So long ago as 1848, Mr. Nathaniel Beardmore recommended this course; and in later years similar advice was received from the late Mr. T. Hawksley, Mr. Inglis, and other engineers. But though they sought advice, the Corporation did not attempt to act upon it until the experience of the year 1881, when the supply was cut off for a week, convinced them that action was necessary. Then, as readers of the "JOURNAL" will remember, ensued a wearisome and costly dispute over the best site for the proposed reservoir. The town was divided into two parties, one of which was in favour of embanking the river at the Head Weir, while the other wished the reservoir to be made at another place known as Harter. In the end, both of the projects were abandoned—the Harter site being rejected by popular vote, and that at Head Weir proving unsuitable because of the nature of the foundation.

Matters were in this position when the blizzard of 1891 came to remind the town of the serious consequences of delay. In that year, Mr. E. Sandeman was appointed Water Engineer, with instructions to report upon a scheme for the improvement of the water supply. He advised the embankment of the river at a point known as Burrator Gorge, where it ran through a narrow and rocky channel. This site had been suggested by Mr. Beardmore, as well as by Mr. Inglis, many years before; but so eager was the dispute over the other sites that their recommendations received scant attention. Mr. Sandeman also recommended that a direct main should be substituted for the winding leat, which in its course over moor and downs paid a heavy toll in leakage and evaporation, and which was also exposed to the dangers of contamination and the risk of being blocked in bad weather. A conspicuous merit of this plan was that it united all parties in the town. An Act of Parliament authorizing the works recommended was obtained in 1893. By May, 1894, the pipeline was completed. The mains are 25 inches in diameter; and they were laid in a direct course from the Burrator Gorge to the first of the Corporation reservoirs at Roborough. The length is 4½ miles, instead of the 8 miles traversed by the windings of the leat. At the same time,



preparations were in progress for the construction of the Burrator reservoir, which has now been completed. Some account of this undertaking has appeared in the "JOURNAL" as the work has proceeded (see Vol. LXXI., p. 958); and it need be only briefly described now. Its chief feature is a masonry dam which crosses the gorge at Burrator. This dam is 410 feet long at the parapet, and 361 feet at the water-level. The height is 77 feet from the river bed, where it is 62½ feet wide; the thickness at the top being 21 feet. Above the dam is a roadway 18 feet wide, carried over the centre of the structure by five arches, each with a 25-feet span, under which the overflow water will pass. In excavating for the foundations, it was necessary to go down 53 feet below the level of the river; and the height of the structure from the lowest point excavated to the top of the parapet is 145 feet. Close upon 32,000 cubic yards of material were taken out. All the fissures in the granite on both sides of the valley and below the river bed were cut out by hand labour; no explosive being used in the excavation, in order to avoid creating any further cracks and crevices in the rock. The face and top of the dam have been constructed of uncoursed ashlar, consisting of square blocks of granite; and the core of the structure is composed of cyclopean rubble, consisting of large masses of granite embedded in concrete. In the construction of the core, the granite blocks, some of them weighing several tons, were placed as close together as possible without touching. Each stone before being put in position was carefully washed and scraped, then bedded in 4 inches of cement, beaten down by heavy mallets, and then filled round with concrete. On the side of the dam which has to resist the water pressure, the granite blocks have been rebated to a depth of 6 inches; leaving a space ¾ inch wide to that depth between each of the blocks. The spaces have been filled in with neat cement slightly damped, and driven in by an iron chisel. By this process an exceedingly hard and water-tight joint has been obtained, so as to make the face of the dam absolutely impervious, and prevent water percolating into the core of the structure. Altogether, some 40,000 cubic yards of masonry and concrete, representing about 60,000 tons of material, have been built into the dam. Great care has been taken in the mixing of the concrete; and exceptionally heavy density was secured by the use of a spiked rammer invented by Mr. Sandeman. The dam was so designed that the pressure of the water against it compared to the resistance of the dam against overturning is as 1 : 3½. In this calculation, the weight of the structure alone was taken into consideration, and the binding effect of the cement omitted, although it adds enormously to the strength of the dam. During the early stages of the work, the river was carried over the site by means of a lander; but as the building of the dam progressed, a tunnel 10 feet in diameter was made on a level with the old river bed, and the stream flowed through this. Two pipes have since been laid in the tunnel, for the purpose of connection with the pipe-line to Roborough; and the tunnel has been permanently closed by an iron shield placed over the entrance—the interior being filled up with concrete. At the level of the leat, a 35-inch steel main pierces the dam. Its purpose hitherto has been to carry forward the water of the leat; but eventually it will be a supplementary outlet for the supply from the reservoir.

A second dam has been constructed farther up the valley, near the village of Sheepstor, where there was a depression in the land. This embankment is only 30 feet above the ground level; but its construction presented considerable difficulty, owing to the disintegrated nature of the soil and the existence of numerous veins of porous material in the rock. At its deeper point, the trench was excavated to a depth of 105 feet below the surface before solid rock was reached. The length of the trench was 700 feet, and along the whole of it a vertical concrete wall 5 feet thick rises to a height of 95 feet. Resting upon its wedge-shaped top rises the core of the embankment formed of clay. The reservoir face of the dam, which has a gradient of 3 to 1, is covered with granite pitching grouted in cement and sand; and the width at the top is 12 feet. A small masonry dam has still to be constructed at the head of the valley, to intercept any stones and debris brought down by the winter floods, and so prevent the rapid silting up of the reservoir. When full, the reservoir will be the nearest approach to a lake to be found on the whole expanse of Dartmoor. Its length will be about 1½ miles; its greatest width, half a mile; and its greatest depth, 77 feet. It will contain 650 million gallons of water, which, without any addition, is equal, at the present consumption of 5 million gallons per day, to 130 days' supply.

On Wednesday the members of the Town Council with the Corporation officials assembled at the Head Weir for what is expected to be the last time, and there drank the ancient toasts—in water "to the pious memory of Sir Francis Drake," and then in wine: "May the descendants of him who brought us water never want wine." Later in the day, the Mayor (Alderman J. T. Bond), who has been Chairman of the Water Committee during the period covered by the inception and execution of the scheme, performed the ceremony of laying the final stone of the embankment—a massive block of granite recording the dates of the commencement and completion of the work, with the names of the Engineers (Mr. James Mansergh and Mr. E. Sandeman, M.M.Inst.C.E.), and the Chairman of the Committee. There was a large crowd present to witness the ceremony. Sir Massey Lopes, the owner of most of the land in the district, presented the Mayor, in the name of the Water Committee, with a silver loving cup as a memento of the occasion; and both spoke in high terms of the excellence of the work done by the Engineers and of the admirable conduct of the men who have been employed by the Corporation in carrying it out. It was mentioned that Sir Massey Lopes gave to the Corporation the land upon which the dam is built and other land in the neighbourhood from which the granite was quarried.

In the evening, a dinner was held in the Plymouth Guildhall—the Mayor presiding. The Recorder (Mr. H. E. Duke) proposed the toast of "The Mayor and Members of the Water Committee;" and Alderman C. H. Radford that of "The Engineers," whose services he warmly eulogized. Mr. Sandeman, who responded, expressed regret at the absence of Mr. Mansergh. With regard to the capacity of the reservoir, he said that the consumption of water in Plymouth was at present 5 million gallons a day; and when it reached 8 millions, the reservoir would be able to supply this quantity for a period of drought extending over five months. He had no fear as to the dam being sufficiently strong to resist the overturning forces, since it was designed to be three-and-a-quarter times as strong as those forces; and if the adhesion of the cement were reckoned upon, it would probably be ten times as strong.

## THE DRY WEATHER AND THE WATER SUPPLY.

### The Curtailment of the Supply at the East-End.

The most noticeable events of the past week in connection with the agitation which has taken place against the East London Water Company, in consequence of the compulsory suspension of the constant supply of water in their district owing to the long-continued absence of rain, were conferences held on Friday and Saturday with Mr. Chaplin, the President of the Local Government Board.

The deputation on Friday was composed of the Members of Parliament for Limehouse, St. George's-in-the-East, Bradford West, and Romford (Messrs. H. S. Samuel, H. H. Marks, Ernest Flower, and L. Sinclair). They urged that the Local Government Board should exert its influence with the East London Water Company with a view to the purchase of water from other Companies on an adequate scale in order to meet the present shortage, and that the Board should also represent to the Company the justice of foregoing a claim for rates in respect of water which had not been supplied. Mr. Chaplin, in reply, said that he had exhausted the powers of the Local Government Board, and had even gone somewhat beyond his legal powers in the course he had pursued. Before the scarcity of water had become known, or was even generally anticipated—namely, in the latter part of May—a letter had been sent to the Company on behalf of the Board inquiring as to the adequacy of the supply for the summer months, in view of a possible drought. Later on the Inspectors of the Board were instructed to furnish reports upon the subject. Furthermore, the Board had made the suggestions to the Company which had resulted in the establishment of the connections with other Companies now created and in process of completion. Mr. Chaplin gave an emphatic assurance that nothing in his power would be left undone to ensure to the East London water consumers the most ample protection that the department could afford, and to obtain for them all possible compensation for the inconvenience experienced.

The deputation on Saturday was organized by the Social Democratic Federation (represented by Mr. Hyndman, Mr. H. Burrows, and Mr. G. Lansbury), and consisted of members of various East-end Local Authorities; Mr. H. R. Taylor, the Secretary of the East London Water Consumers' Association, being in attendance. Mr. Hyndman having formally introduced the deputation, Mr. Lansbury explained that it had been brought about by the people of the East-end at various public meetings; and they wanted to assure the Government that there was a feeling of indignation at a water famine occurring again in two years. The time had now arrived to pin the Government to what was actually required. One of the officials of the Local Government Board visited the East-end a few months ago, and said that the water question ought to be dealt with, and that it was a great shame the people were in this position with regard to the supply. The resolution the deputation had to submit was passed at a mass meeting held at Victoria Park, West Ham, and Trafalgar Square, and was as follows: "That this mass meeting of London citizens protests against the infamous conduct of the East London Water Company in cutting off the water supply of East London 20 hours each day, and calls upon the Government to use such pressure as is necessary to compel the Companies responsible for the water supply of the Metropolis to connect their mains, and so allow all classes to be treated alike; further, to call upon the Government to summon an autumn session to place the whole water supply under public ownership and control; and, further, to urge the people not to pay for what they did not get." They were being denied one of the necessities of life by the East London Water Company; and their story that the consumers obtained so many gallons per head per day was simply nonsense to the people who lived in the East-end. The position was scandalous; and if the Government did not call Parliament together for an autumn session, they would be responsible for the water famine next year if there should happen to be a dry summer. The Government allowed a monopoly like the East London Company to leave the drains unflushed, and cause such a stench as to make life unbearable. It was just possible, after this fine weather, that a frost would follow; and then the people of the East-end would be deprived of water owing to frozen pipes. These views were supported by other speakers.

Mr. Chaplin said the case put before him, which was substantially the same as that submitted by the deputation of Conservative members on the previous day, might be divided into two categories—one dealing with the facts as alleged of the present situation in connection with the water famine (which he deplored as much as anybody); and the other containing certain charges levelled against the East London Water Company, the present Parliament, and the Government, not excepting himself. He had listened with pain to the description of the very serious condition of affairs in East London owing to the present drought; and no one was more sensible than he was of the inconvenience and positive hardship and suffering inflicted upon the poorer classes of the community, aggravated by an almost unprecedented heat. Therefore, he was not surprised that they should demand that this state of things should be permanently remedied. But before going into that question, there were others even more important—viz.: What was being done, what had been done, and what by any possibility could be done to relieve the strain of the present immediate urgency? They had referred to the great danger to health; and on this point he would quote the Local Government Board Inspector, who had been in constant attendance in the district, and whose report was more reassuring than the statements made by the deputation. Dr. Bruce Low said: "In the four weeks before the intermittent supply, the death-rate from all causes had begun to increase in London generally, but more particularly in the East London district. The increase has continued since the intermittent supply, but has been relatively less in the East London district than in London as a whole. The diarrhoea death-rate, which mostly affects young children, has proceeded in the same way as the death-rate from all causes. The increase in diarrhoea is usual in the months of July, August, and September, especially in hot summers such as the present. But the fact that the increase has been relatively less in East London than in London as a whole, since the constant supply in East London failed, is satisfactory, as suggesting that the scarcity of water has not had any appreciable ill effect in encouraging diarrhoea." [There were some murmurs at this point.] They must take the report for what it was worth; but he himself had every confidence in its accuracy. If the state of the public health was more satisfactory than in the circumstances



could have been expected, then it was very much owing to the admirable work which had been done by a great number of the Local Authorities during the drought. Their aid had been invaluable, and had been a most important supplement to the works which had been effected to increase the water supply. The importance of these additions would be seen when he put this statement before them: A pipe had recently been placed through the Blackwall Tunnel, carrying water from the Kent system; the quantity being 250,000 gallons per day. A junction had also been made with the Southwark and Vauxhall Company, which might be expected to give an additional supply of something like 6 million gallons daily. A connection between the mains of the New River and Grand Junction Companies, with the object of releasing an additional quantity of water from the Lea for the use of the East London district, would shortly be completed—probably within the next twelve days—and it was calculated that this would give a further supply of 4 million gallons per day. After giving particulars of other works which were being carried out, he stated that the deficiency which had necessitated the stoppage of the constant supply was estimated at 15 million gallons per day, and 12 millions of this deficiency would be met by the connections completed or in progress. Beyond this, he had before him further proposals from the Company, which, if carried out, would make up 16½ million gallons in addition to their normal supply before they approached the time of what he might call another dry season. The point which he regarded as of more urgency than anything else was, how it was possible, within the time, to prevent a recurrence of another famine, should there be another unfortunate drought during next year. In the opinion of the Local Government Board, the emergency, so far as next year was concerned, would be to a very great extent met by the Company's proposals. Turning from this point, he had to consider the question of a permanent remedy. The cause of the whole difficulty was perfectly simple, and it was explained by the Meteorological Office, from which he had been furnished with information as to the rainfall in London. The gist of it was that, comparing the rainfall in London during a period of 30 years with the rainfall from May, 1897, to the present time, these 17 months showed a deficiency of 12 inches of rainfall, or about 34 per cent., or less than two-thirds of the average for 30 years. In no corresponding period had the rainfall been so small as in the last 17 months. But then it was said, with perfect justice, that there were eight Water Companies in London; and it was asked why the East London Company always failed in times of pressure, while other Companies were able to continue their supply. Well, the answer was this: With two exceptions, all the other Companies drew their water from the Thames; and the Thames had never been known to fail in its supply. The East London and New River Companies, on the other hand, drew their supplies very largely from the Lea; and the East London Company was under the exceptional disadvantage that it could only draw its supplies from that river after the requirements of the New River Company had been met. The lowest quantity ever known to have been drawn from the Lea was about 11 million gallons per day. This had been going on for a great number of years; and it was upon this basis that all the East London Water Company's calculations of the requirements of the population of East London had been made. But this year the Company had only been able to draw daily from the Lea for a long time past, not 11 million, but 2 million gallons. The calculation based on a number of years having been upset, the Company could not be held responsible for failing—or, at any rate, it was a very substantial reason why they had failed—while the other Water Companies had been able to continue their supply. [Mr. Lansbury interposed the remark that their point against the East London Company was that they did not use the powers they obtained last year to make all these connections beforehand.] Mr. Chaplin said he was quite aware of that; but his point was that both the Company and the Board's own officers had been misled owing to the failure of the supply of Lea water. Continuing, he said the deputation had urged that there should be a connection made between the mains of all the different Water Companies in London. This was the opinion he himself had always held most strongly; and when the Government were charged with complete indifference on this subject, he would show that this charge was without any foundation whatever. The Government last year appointed a Royal Commission on the water supply of London, and they were instructed to inquire and report "whether it is practicable to connect any two or more of the different systems of supply now administered by the eight Metropolitan Companies; and, if so, by whom, and in what proportion should the cost of connecting them be borne, and what are the legal powers necessary to give effect to any such arrangement." It was an easy thing to say that all these Companies should be connected; but there were legal and other difficulties in the way which could only be elucidated by information gathered by a Royal Commission. There was this important difference between London and other great cities and corporations where the supply was in the hands of the representatives—that there was a very large area indeed now supplied by the London Water Companies which was entirely beyond the jurisdiction of the London County Council; and the ratepayers in that area had evinced the strongest objection to their water supply being placed under the control of the Council. They claimed, as the London people did, to have the control of their own water supply; and this was not an unnatural claim. As to the charges which had been levelled against the Government and the Local Government Board, he had only to say that he had spared no effort to alleviate the unfortunate water famine. He might mention that great exception had been taken to a letter emanating from the Board as to their views about the waste of water. Well, the Board were continually hearing of taps being left running; and the Water Company urged that, unless some economy in the use of water could be devised, they felt almost certain they would be obliged to further curtail the hours of supply. He wrote a letter to Mr. Steadman, M.P., pointing out this waste of water; but he had no intention of accusing the consumers of intentionally wasting the water supplied to them. His sole object was to warn the public that there was a danger of a further curtailment of the supply owing to waste. With reference to the East London Water Company, he made no charges against them, and he was not there to defend them. As to whether or not the Company had been remiss in their duty—whether they could have procured water earlier than they did—he must refrain from passing an opinion, for the question would shortly come before the Railway Commission. There was one other point of

importance—viz., that in his interview on the previous day he was made to say in the daily papers that he gave an emphatic assurance that he would obtain for the consumers of East London, "all possible compensation for the inconvenience experienced." He did not quite know what this meant. Under the Act passed last year, it was provided that compensation might be given. But he was certainly not conscious of having made any statement of the kind; and it would have been highly improper to say so in view of the matter coming before the Railway Commission. As to the proposed autumn session, he had great doubts as to whether the works proposed could be carried out. The deputation attached much importance to the Water Companies being placed under the control of a public body; but this in itself was not a guarantee against the evils of which they complained, for in some parts of the country, even where water supplies were controlled by public authorities, they were suffering greater distress than the East-end of London. He concluded by expressing his sympathy with the deputation in the present emergency.

In the course of Mr. Chaplin's reply, he referred to the question of the East London water supply shortly coming before the Railway Commissioners. The Commission (consisting of Mr. Justice Wright, the Right Hon. Sir F. Peel, and the Right Hon. Viscount Cobham), had a sitting last Friday, and in the course thereof Mr. Cripps, Q.C., mentioned that an application was being made by the Hackney Vestry against the East London Water Company, under the Metropolis Water Act, 1897, by the provisions of which a local authority may complain to the Commission that any of the Metropolitan Water Companies have failed to perform some statutory duty. As representing the Company, he was anxious to court full inquiry into the matter; and he asked to have a day fixed for the hearing of the application. The Clerk to the Hackney Vestry (Mr. G. Grocott), was in Court, and said the Vestry were not prepared at present to have a day fixed, but they very soon would be. Mr. Justice Wright said that if the application had been considered by the Local Authorities as a matter of great public urgency, the Court would have made arrangements to give the matter as speedy a hearing as possible. This, however, did not appear to be the case. The Water Company were not in order in asking for the matter to be advanced; and their application would have to stand over.

#### The Position in the Provinces.

It is not in East London only that inconvenience is felt from the scarcity of water. The danger of a water famine is imminent in Birmingham, unless there is a break in the weather very soon. The streams from which a considerable proportion of the daily supply is obtained are yielding very greatly diminished quantities; and demands have to be made upon the reservoir storage to an extent which is causing the Water Committee of the Corporation to look to the future with alarm. Appeals have already been issued to the public to curtail as much as possible the use of water; and the Committee themselves have restricted the watering of the streets to a narrow area in the centre of the city. In the Chiltern Hills district of Buckinghamshire, great anxiety prevails, in consequence of the continued drought. In many of the upland parishes, the majority of the villagers depend upon tanks and cisterns; but these receptacles have been exhausted for some weeks, while the sources of supply from neighbouring ponds and wells have given out. In several instances, 2d. and 3d. per pail is paid for water; and during the past week one of the street-watering carts has been employed to convey a supply daily from High Wycombe to Hampden, a distance of about seven miles. A charge of £1 per cartload of water is made. The Great Missenden Parish Council have voted £25 towards supplying with water some of the parishioners living on the hills; and they have also appointed a Committee to devise the best arrangements in the interest of the parish generally. At Dunstable, many of the wells have given out; and the Water Company have lately had about forty applications for a supply. Serious inconvenience is being caused to villages in Northamptonshire, most of which are dependent upon surface springs. At the shoe-manufacturing town of Earl's Barton, the Surveyor has reported that there are only 6 inches of water in the reservoir. A number of isolated villages are without any water whatever. The scarcity of water is seriously affecting the South Staffordshire Water Company, who until recently had supplied their whole area in the Black Country in a very satisfactory manner. Last Friday they requested the various sanitary authorities to cease watering the roads. Old wells are being reopened in some cases. Householders are warned to be exceedingly careful, and not to use any more water than is absolutely necessary. As many of the districts depend almost entirely upon the street hydrants supplied by the Company, the consequence would be grave should there be any serious outbreaks of fire.

#### HALIFAX CORPORATION WATER SUPPLY.

##### The Walshaw Scheme to be Carried Out.

A Special Meeting of the Halifax Town Council was held last Wednesday—the Mayor (Mr. J. H. L. Baldwin) presiding—to consider the recommendation of the Sub-Committee authorizing the Water Committee to carry out forthwith the works in connection with the construction of the Walshaw scheme of water supply, authorized by the Halifax Corporation Act of the past session, at an estimated cost of £157,000. The Sub-Committee had prepared a report, the adoption of which was proposed and seconded.

Mr. HEDDEN moved as an amendment that the Committee be authorized to carry out forthwith the works in connection with the upper reservoir of the Walshaw Dean scheme. He said the whole scheme included the constructing of three reservoirs. The average rainfall for the last forty years had been 46 inches; and with a continuation of such a rainfall, they would not require an additional reservoir for the next twenty years. He ventured to predict that the construction of the three reservoirs would mean a cost of a quarter of a million sterling. For the last ten years the requirements had been almost stationary. The one reservoir which he proposed should be constructed would have a capacity equal to 209 million gallons. The most serious question to take in hand was that of leakage. He showed that in the past an enormous quantity of water had run to waste.



Mr. MAUDE seconded the amendment.

Alderman WOODHEAD reminded the Council that it was for an exceptional year that they wished to provide. The most economical plan would be to put the Committee in a position to let the whole of the contracts at the same time; for by this course they would be able to save some thousands of pounds. The period Parliament allowed the Corporation for the completion of the entire works was ten years. He pointed out that in the application for the Act recently obtained they spent more than £2000. They had had to fight the West Riding County Council and the West Riding Rivers Board; and had they been compelled to insert such clauses in their Bill as these two authorities desired, it would have put the Corporation to an additional cost of £60,000. As a proof of the increase in the demand for water, he might say the receipts in 1878 amounted to £30,416; in 1883, to £33,164; and in 1898, to £46,919.

Mr. WADE (the Chairman of the Water Committee) pointed out that if one reservoir only were constructed, the 125 riparian owners on the line would be in a position to claim more water as compensation than the reservoir would contain.

The ENGINEER (Mr. J. A. Paskin) confirmed this statement.

Mr. HEBDEN thereupon withdrew his amendment.

Mr. J. T. SIMPSON expressed the opinion that they had an adequate water supply. No case of urgency had, he said, been made out. He moved that the consideration of the work of constructing the Walshaw Dean reservoirs be deferred for about two years.

Mr. KERR believed they had nothing to fear so far as the water supply was concerned for some years to come. He seconded the proposition to defer the matter.

Alderman BOTTOMLEY did not think they would be obliged to go to Parliament for the continuation of powers in case the reservoirs were not constructed in ten years. He protested against the monstrous expenditure proposed.

The ENGINEER stated, in answer to a question, that in 1887 the whole of the water in store was only equal to thirty days' supply.

The MAYOR spoke in favour of the Sub-Committee's report. He said that they would be glad to see the water-carriage system of sewerage adopted before long; and this would increase the consumption of water.

Mr. WADE explained that the rate-in-aid from 1858 to 1888 amounted to £86,635. This had, he said, all been paid with the exception of £18,000; and within the next two years the whole of the amount would be cleared off. It would take nine years to build the three reservoirs, the total capacity of which would be 630 million gallons.

The report was adopted; the voting for the proposal to defer the work being 14 in its favour and 27 against it.

### CARLISLE CORPORATION WATER SUPPLY.

#### The Annual Accounts.

We noticed in the last number of the "JOURNAL" the accounts of the Gas Department of the Carlisle Corporation for the year ending June 30. The following figures relate to the Water Department: The amount derived from water-rental for the year, after deduction of discounts and allowances for empty houses, &c., was £9272. The revenue account shows a gross profit of £6056—an increase of £358 over the preceding year. After payment of income-tax, there is a sum of £5896 to be paid into the district fund. The payments out of the fund on account of water-works loans are: A year's instalment of loans, £1038; one year's interest, £377—leaving a balance available of £4481. This shows a considerable increase over previous years, owing to the fact that the loan contracted in 1866 for the purchase of the works has now been entirely repaid. For the year ending June 30, 1897, the gross profit paid into the district fund was £5558. The amount of instalments of loans for the year was £2071; and interest was £417—together, £2488—leaving an available balance of £3070.

### THE DERWENT WATER SCHEMES.

Yesterday week there was an important conference at Derby, in reference to the proposal of the Derby and other Corporations to secure the upper waters of the Derwent for the supply of their towns. The conference was between the Health Committee of the Derbyshire County Council and delegates from the various Urban and District Councils in the county. The proceedings were strictly private; and it has been impossible to obtain any information regarding them either from officials or delegates—it being considered that at this stage it would be premature to make any announcement. It is, however, believed that a Sub-Committee of the County Council and delegates were appointed to watch over the interests of the county.

It seems that the Corporation of Sheffield are by no means disposed to admit the claim put forward by Derby to the exclusive use of the waters of the Derwent; and for some weeks the matter has been under the consideration of the Water Committee. A Sub-Committee was appointed to get into communication with neighbouring towns, with a view to focussing opposition; and this Sub-Committee made a report to the Water Committee at a meeting held on Wednesday. After conferring by letter with the Authorities at Leicester, Nottingham, Rotherham, Doncaster, and Barnsley, the unanimous recommendation of the Sub-Committee is that, in default of a definite agreement being concluded with Leicester for joint action at an adjourned conference, the Council at once authorize the Water Committee to take all necessary steps to apply, without or in conjunction with the Councils of Nottingham, Rotherham, Doncaster, and Barnsley, or any of them, for a Bill to acquire the water supply of the Rivers Derwent and Ashop, or a competent share thereof. The report was adopted; and the Lord Mayor was requested to summon a special meeting of the City Council to consider the recommendations.

**Croydon Water Supply.**—The Local Government Board have refused to sanction the Croydon County Council's scheme for new water-works at Waddon. Strong evidence against the proposal was given on behalf of the riparian proprietors and millowners on the River Wandle.

### THE LANGSETT WATER-WORKS OF THE SHEFFIELD CORPORATION.

#### The Safety of the Reservoir Embankment.

The Water Committee of the Sheffield City Council have published some important correspondence concerning the Langsett reservoir embankment. It indicates that in its construction they are proceeding with the utmost caution; and with the awful experience of 34 years ago before them, they have certainly good cause for anxiety. The correspondence opens with a memorandum, by Professor Boyd-Dawkins, on the result of an examination he made of the excavations so far carried out for the embankment; and this and a subsequent report were submitted to the Consulting Water Engineer (Mr. E. M. Eaton) for his criticisms. Dealing with the reports from the engineering point of view, Mr. Eaton disagreed in one or two important particulars with the Professor's conclusions, and also made additional recommendations. But finally the two experts visited the site of the embankment together; and on the following points there appears to be perfect unanimity: That the black shales on the sides of the valley are solid and offer an excellent foundation for the embankment; that it is unnecessary to excavate further into them on the north side, with the exception of a weak area of folded and crushed shale extending for a distance of about 30 feet in the line of the trench; that it will be necessary to deepen the trench in this weak area until a good foundation is reached; that it is expedient to sink a shaft to ascertain that the strata under the present bottom of the trench are sound; and that, on the north side where the top water-line cuts the rough rock (sandstone overlying the black shale), it is advisable to carry a wing-trench into the black shales at the north-eastern end of the embankment to prevent leakage through the sandstone. With regard to a slip on the south side, there is a unanimous agreement that it is expedient to remove it, irrespective of the question of its removal being necessary, which Professor Boyd-Dawkins does not admit. The portion of it in question is small and superficial; and its removal will entail very little extra work. There is a fault running across the valley to the east of the concrete trench. But it is small and unimportant, and will not affect in any way the stability of the works. Professor Boyd-Dawkins considers, from every point of view, that the site is a good one, and that the strata present no special engineering difficulties. Mr. William Walls, the Engineer for the Langsett works, has advised, and Mr. Eaton concurs, that the northerly or Langsett end of the trench should at once be refilled with concrete for a sufficient distance on either side of the shaft to afford a good foundation for the outlet tunnel; and, on the 7th inst., the Water Committee, after consideration of the correspondence, adopted this recommendation.

### THE EPIDEMIC OF TYPHOID FEVER AT MAIDSTONE.

#### The Report to the Local Government Board.

In the "JOURNAL" for Aug. 30 we gave extracts from the report made to the Local Government Board by the three Inspectors—Mr. J. S. Davy, Dr. Theodore Thomson, and Mr. G. W. Willcocks—appointed by them to inquire into the cause and spread of the epidemic of typhoid fever which occurred about this time last year at Maidstone. The report contains a great mass of matter, including plans, maps, and diagrams. It opens with a brief sketch of Maidstone from a geological and commercial point of view, and then goes on to deal with its sanitary administration, sewerage and drainage, and water supply. A history of the typhoid epidemic is next given; the evidence adduced at the inquiry being exhaustively reviewed. The conclusions arrived at by the Inspectors are as follows:—

On a review of the whole of the evidence, we have no hesitation in coming to the conclusion that the epidemic was caused by the pollution of the water supplied by the Maidstone Company from their Farleigh sources. It is true that there is abundant testimony to show that grave sanitary defects exist in the construction of some of the sewers, and of many house drains and water-closets within the borough; while one of the expert witnesses, Dr. Corfield, said that, in his opinion, these defects were sufficient to account for the epidemic. But the sudden and simultaneous outbreak of fever over a wide area, and the rapidity with which the epidemic grew, cannot be accounted for by the existence of defective conditions of sewerage and drainage. Further, the facts as to the local incidence of the disease, which have already been stated, are not consistent with the theory that these conditions had anything to do with its origin. The old brick barrel sewers are almost all in the lower part of the town, which was comparatively free from attack, especially at the commencement of the epidemic, and the hand-flushed closets and defective house drains are distributed pretty equally over the whole town; whereas the cases of typhoid fever were confined to the Farleigh area of water supply to an extent which quite precludes the possibility of mere chance. It was suggested that the special incidence of the epidemic on this area was due to the fact that it includes the higher levels of the town, and therefore would be the most liable to suffer from the ill effects of sewer emanations. On the other hand, evidence was given that the direction of currents of air in sewers is frequently from the higher to the lower levels. However this may be, there are other facts which make the suggestion of little value in determining the cause of the epidemic. The incidence of the disease on that part of the rural district which has no connection whatever with the sewers of Maidstone, shows the same relation to the Farleigh water supply as that in the borough. And though the Asylum, which suffered heavily, drains into the Maidstone sewers, yet in this case there is no allegation of any defect of drainage conditions, flushing, or water-closet connections; while the Farleigh water was supplied.

It was objected that this evidence, strongly as it points to the pollution of the Farleigh supply, was circumstantial, and established grounds of suspicion only. But it was supplemented by other facts, which appear to us to leave no room for doubt. The chemical analyses of samples of water taken from some of the springs after the epidemic broke out show



that the Farleigh supply had been dangerously polluted; and the bacteriological examination of the samples from two at least of the springs afforded conclusive evidence of excremental pollution by man or the lower animals. Dr. Sims Woodhead, indeed, contended that his examination did not definitely prove that this was the case, and that the colonies which he found were merely indicative of what he called "surface relations." It would be beyond our province to discuss the difference of opinion between Dr. Sims Woodhead and the other experts who were examined as to the exact significance of the discovery of the *bacillus coli* in water, or as to the proper classification of bacteria of this species; but it may be pointed out that "relations" between water supplies and the "surface" of gardens and fields like those which surround the Farleigh sources must be extremely dangerous. And in this case the evidence shows clearly that the neighbourhood of some of the springs was, immediately before the outbreak, plentifully covered with human excrement. It has, moreover, to be borne in mind that Dr. Woodhead's samples were taken some time after the water had been examined by Dr. Washbourn, and that consequently the condition of the water may have altered considerably. The testimony of the scientific witnesses at the inquiry was to the effect that the *bacillus typhosus* is seldom or never recognized in water, so that the fact that it was not discovered in this case is not remarkable, even if no allowance be made for the time which had elapsed between the introduction of the poison into the springs and the examination of the water. With reference to the fact that there was no history of any recognized case of typhoid fever in the neighbourhood of the Farleigh springs before the epidemic, it may be remarked that cases of typhoid fever are not always recognized and notified.

As was pointed out at the inquiry, the hop pickers did not arrive at Tutsham until Aug. 26, while, according to Mr. M. A. Adams, there were four cases attacked in the borough during the week ending Aug. 28, and 29 during the week ending Sept. 4. But any inferences from these dates would only be material as relating to this particular group of itinerant labourers, and to the Tutsham-in-Field source; whereas the evidence clearly establishes that many of the other Farleigh springs were in the immediate neighbourhood of hop and fruit gardens, and that they were all exposed to the risk of pollution. The chemical analyses, the bacteriological examinations, and a consideration of the surroundings of the site, all tend to show that the Tutsham-in-Field spring was the most dangerous; but one of the chemical analyses shows that even the Ewell water, which must be regarded as the safest, was not absolutely free from suspicion; and Mr. Percy Adams at his first visit saw human feces in dangerous proximity to two of the catchpits. It is true that during the epidemic, and since that time, a population of about 60 persons in the parishes of West Farleigh and Yalding was supplied with water from the Ewell springs exclusively, and that no case of typhoid fever is known to have occurred among them. On the other hand, 13 cases were notified from the Asylum after Oct. 10, when all the water except that from Ewell was cut off; and allowing a period of three weeks for incubation and notification, seven of these cases cannot be attributed to water supplied before the other springs were cut off, and must be otherwise accounted for. Two also of the three cases which were notified from the rural sanitary district after the beginning of November, resided in the area supplied by the Water Company with water from the Ewell springs only. As to whether these cases, either from the Asylum or from the rural district, are to be regarded as "secondary," no evidence was given—in fact, there is no conclusive evidence to show how the specific pollution of typhoid fever was introduced into the supply, or which of the springs was thus polluted.

The evidence given by Mr. Adams regarding relationship between the fever and conditions of rainfall and level of subsoil water as affecting the Farleigh sources of water supply, is of much interest. The facts adduced by him on this point, if they cannot be held as definitely proving the relationship he seeks to establish, are nevertheless suggestive of causative connection between these factors and the outbreak of typhoid fever. His contention, however, that these conditions were also related to prevalence of "premonitory" diarrhoea in the borough of Maidstone shortly before the outbreak of fever, is based on less sufficient evidence. Indeed, the data upon which this contention is based are too incomplete to warrant acceptance of the belief that the fever outbreak was actually preceded by prevalence of diarrhoea of a sort differing materially from the seasonal diarrhoea usual in towns during the summer. While this is so, yet the evidence, as far as it went, suggests that there had been a special incidence of diarrhoea on the areas within the borough of Maidstone supplied by Farleigh water; and that, in the opinion of at least some medical men in the town, the diarrhoea was of unusual character. These statements, coupled with there having been, mainly in August and September, an unusual prevalence of colitis in the Asylum, render it to be regretted that fuller evidence should not have been available on this subject.

There remain for consideration three contentions put forward by the Water Company:—

- 1.—That although the bulk of the fever cases occurred within the area supplied with Farleigh water, yet that there had been many in the Boarley and Cossington areas, and that these must have been due to other causes than consumption of Farleigh water.
- 2.—That between Oct. 10, 1897, and Jan. 20, 1898, 357 cases of typhoid fever were notified; but that, as all the Farleigh supply, except the Ewell and the Big Church springs, was cut off from Maidstone 16 days before Oct. 10, these 357 cases cannot reasonably be attributed to that water supply.
- 3.—That the causes operating to bring about these 357 cases may also have been operating during the earlier part of the epidemic, and thus have caused cases wrongly attributed to the Farleigh water supply.

As regards the first of these contentions, evidence was for the most part wanting to show how persons residing in the Boarley and Cossington areas, and attacked by the fever, had contracted it. It was suggested that they had drunk Farleigh water while visiting an area supplied with that water. But regarding most of the cases in the Boarley and Cossington areas, no evidence was given either for or against this hypothesis. It is therefore impossible to decide whether they had contracted the fever in this way, or, as suggested by the Water Company, in other ways.

The second contention is, in our judgment, in the main a just one. Probably, the 10th of October is too early a date to lay down as the limit of extension of influence of the Farleigh water supply, in view of

the time occupied by the distribution of the water, the incubation of the disease, and the sufficient development of its symptoms to permit its recognition and notification. It has also to be borne in mind that the evidence given at the inquiry was not such as to prove that the water of the Big Church spring may not have had some share in the causation of the epidemic; nor did it clearly appear that the Ewell springs were beyond suspicion. Water, however, from both these sources continued to be supplied to Maidstone during four days after the rest of the Farleigh springs had been cut off. But nearly all the cases notified after the 18th of October (some 280 in number) are to be regarded as having had a cause other than consumption of Farleigh water. By Mr. M. A. Adams they were referred to direct infection from previous cases, and to unsanitary conditions of water-closets, drains, and sewers. This explanation appears to us to be the probable one, if the unsanitary conditions referred to be taken in the wide sense of including the fouling of the soil by leakage from these defective drains and sewers. Recent researches into the life-history of the *bacillus* of typhoid fever go to show that this organism finds in a soil contaminated with foul matters from leaky sewers, drains, and cesspools, conditions especially favourable to its vitality and multiplication. That the soil on which Maidstone stands is thus contaminated was set beyond doubt by the evidence put before us. To the existence of these conditions is mainly, we consider, to be attributed the remarkable persistence of fever in Maidstone after the primary cause of the outbreak had been removed by cutting off the Farleigh water supply.

The third contention of the Water Company is probably in some degree admissible. Infection, however, from polluted soil and from defective water-closets and drains, being consequent on their first receiving infective material, cannot have played other than a subordinate part in the earlier stages of the epidemic. Be this as it may, we are of opinion that many of the cases of typhoid fever in the borough of Maidstone were due to defects of drainage and sewerage, with consequent pollution of the soil underlying the town. The responsibility for the existence of these unsanitary conditions lies with the Town Council, whose duty it was to take steps that would lead to effective remedy of these defects. This duty they have in large measure neglected; notwithstanding that for many years the Medical Officer of Health has in the plainest language repeatedly warned them of the risks to which the health of the inhabitants of the borough was exposed, by the continuance of these unsanitary conditions. The Town Council, therefore, cannot plead ignorance of the facts by way of excuse for their failure of duty in this respect—a failure of duty which has led to the gravest consequences.

It does not appear that the exceptional prolongation of the epidemic was in any way due to any subsequent laxity of administration; for as soon as it became evident that the epidemic was serious, the Sanitary Authority displayed the utmost energy and resource in dealing with it. Some doubt was expressed as to whether the Water Company had been sufficiently prompt in cutting off all the sources of the Farleigh supply when requested to do so by the Sanitary Authority. It appears to us that there was some unnecessary delay before the Big Church and Ewell springs were cut off from the town; but it must be remembered that the position of the Directors of the Water Company was a difficult one, having regard to their obligations to provide a sufficient supply of water for all purposes. In all other respects there was no hesitation on the part of the Directors in carrying out every recommendation of the Town Council; and their appointment of Dr. Sims Woodhead to investigate the cause of the outbreak and to act as their sanitary adviser was made unconditionally. The Emergency Committee of the Corporation, acting under the advice of Mr. M. A. Adams, and indefatigably assisted by Mr. L. Monckton, organized a most complete system of hospitals, medical attendance, and district nursing, and made arrangements for the washing and disinfecting of the infected clothes and bedding, which were carried out most efficiently, and on a scale which we believe has never before been attempted. The current sanitary work, the cleansing and flushing of the sewers, the disinfection of the houses, and the removal of the patients was most energetically superintended by the Sanitary Committee, under the chairmanship of Mr. Spencer.

We have already called attention to the fact that Mr. M. A. Adams did not consider it to be part of his duty, as Medical Officer of Health, to make inspections of the works of the Water Company which were outside his district, and that, in fact, he had never seen the Farleigh springs. In his capacity of County Analyst, he was paid by the Sanitary Authority for making periodical analyses of the four water supplies belonging to the Company and to the borough; but he was not instructed to analyze the various springs separately. Seven years ago the Town Council, influenced apparently by motives of economy, decided that these analyses should be made every quarter instead of every month as before; and their action in this respect has given rise to much unfavourable comment. As to this it may be remarked that, although frequent chemical analyses and bacteriological examinations may, by comparison of their results, show changes in the constituents of water, which may serve as a useful warning of liability to pollution, yet they by no means constitute all, nor indeed the chief, measures that should be adopted with a view of ascertaining the quality of water supplies. For the specific pollution of typhoid fever, which is certainly beyond the reach of chemistry, and generally, it would seem, also of bacteriology, to detect, may escape detection in a water in which it is nevertheless present. Further, it has to be borne in mind that detection of specific pollution of a supply may come too late to prevent the consumption of the contaminated water. Clearly chemical analyses and bacteriological examinations should be supplemented by skilled inspections of the actual conditions, geological, topographical, and sanitary, of the surroundings of the sources of supply.

While, on the one hand, the Sanitary Authority of Maidstone only took a precaution which was in its nature inadequate for the protection of the public health in its relation with the water supply of the borough, the Water Company, on the other, do not appear to have realized in any way the necessity of a constant and regular supervision either of the gathering-grounds of their supply or of its purity. Before a spring was brought into the supply, the water was analyzed by Dr. Gregory on behalf of the Company; and when complaints were made that any spring was polluted, it was cut off. But, generally speaking, the Directors relied on the quarterly analyses made by Mr. M. A. Adams; and there was never any systematic inspection of the works from a sanitary point of view. Apart from all question as to the possible means of protecting underground



supplies in this geological formation, the evidence clearly showed that, occasionally at least, the condition of the surroundings of some of the Farleigh springs was obviously and abominably filthy. There could have been nothing exceptional in this state of things, which must naturally result periodically from the aggregation of labourers on the hop and fruit farms at certain seasons of the year; and it could not possibly have escaped attention if there had been any attempt on the part of the Directors to secure not merely the safety, but the decent cleanliness, of the water supply by means of a regular inspection of the condition of the gathering-grounds. The importance of the matter never seems to have occurred to them.

The history of the epidemic at Maidstone appears to us to raise the question as to how far the regulations of the Board relating to the duties of Medical Officers of Health, and the statutes which regulate the powers and obligations of private water companies, are sufficient to ensure a reasonable amount of protection to the public health. The General Order of the Board of 1891 prescribes that the Medical Officer of Health "shall inform himself, as far as may be practicable, respecting all influences affecting or threatening to affect injuriously the public health within the district." This regulation might be held to make it the duty of the Medical Officer to visit and inspect the works of a private water company supplying water to his district, even though the works were situated outside it, as is the case at Maidstone. This, however, was not the construction which was put upon the regulation by Mr. M. A. Adams, whose zeal in the performance of his duties is beyond question; and, as a matter of fact, he had never seen the sources of the water supply furnished to the Farleigh area. He pointed out with considerable force that he had no legal right of access to the works, and no power to take samples of the water. The Medical Officer of the Rural Authority would have to meet the same difficulty as to the right of access to the works and as to taking samples of the water, although the works are locally situated in his district, a very small part of which is supplied with water by the Company. Yet section 7 of the Public Health (Water) Act, 1878, imposes upon Rural Sanitary Authorities the duty of taking such steps as may be necessary to ascertain the condition of the water supply within their district. It must be stated, however, that it did not appear that any application to inspect the works or to take samples of the springs separately was ever made to the Directors of the Water Company by either of the Sanitary Authorities concerned.

As we have already reported, a question arose during the course of the epidemic between the Town Council and the Water Company as to the necessity of cutting off certain of the suspected springs. This measure was recommended by the Medical Officer of Health. But the Town Council had no power to carry it out; and the Directors hesitated to take the responsibility of diminishing the supply of water for general purposes. The delay which resulted from this cause was short; but it is clear that, under less fortunate circumstances, such a difference might lead to the most serious results.

In conclusion, we have to report that we received every assistance, both from the Town Council and from the Water Company, who gave us without reserve, all the information in their power. In addition, our

thanks are especially due to Mr. L. Monckton, who spared no pains to help in every possible way; to Mr. M. A. Adams, under whose supervision the diagrams annexed to this report were prepared; to Mr. Percy Adams; and to Mr. Ware, the Manager of the Water Company.

The correspondence that passed between the Local Government Board and the authorities of the borough and others on the subject of the epidemic is set forth in appendices attached to the report. Copies of the many different water analyses, chemical and bacteriological, made by order of the Town Council, are also given, and statistics are quoted which show the extent of the epidemic within the borough. The total number of typhoid cases was 1847, of which 132 were fatal; the total mortality being 7.14 per cent.

## NOTES FROM SCOTLAND.

### From Our Own Correspondent.

Saturday.

In connection with the valuation of the Falkirk Gas-Works, to which I referred last week, I may mention that on Tuesday night a meeting of the Corporation was held, at which the Clerk intimated that he had, as instructed, applied to the owners of the gas-works at Stirling, Dumbarton, and Alloa, for a statement of the valuation put upon their works. He had received answers from all; but in the reply from Dumbarton it was stated that the information was for private use only, so that he could not give them the exact valuation. He might say, however, that in none of the three burghs were the gas-works valued at as much as one-half of the amount which the Falkirk works were valued at. The valuations were all under £2000; whereas the valuation of the Falkirk works was over £4000. The Assessor, the Clerk said, fixed his valuation on the revenue and the expenses (the profits I suppose he meant to say); and this brought out the remark, from the Convener of the Works Committee, that he thought the Assessor was wrong. Of course, the Assessor is not wrong in following this rule. He may be wrong in his application of the rule—as to that I have no information; but the rule is well established, and is recognized everywhere. What the Corporation of Falkirk have to learn is how to work so as not to make such a profit as will raise the valuation of their works. That is quite legitimate.

Since the Glasgow Corporation Gas Committee commenced to work their stove-hiring department, they have done a big business in the hire and sale of gas-stoves, &c.; but it might have been greater. The last return prepared by Mr. W. Foulis shows that in the hiring business the transactions amounted to 14,149, including stoves and range fittings. In the sales business, however, a much larger trade was done. Including stoves, range fittings, fires, burners, &c., the number disposed of amounted to 22,724. It may be possible later on to make a very material increase to the business in both branches—that is to say, when the purchase and sales of stoves, &c., have been brought nearer to the houses of the gas consumers.

At the last meeting of the Glasgow Corporation Sub-Committee on Gas

## GAS AND WATER COMPANIES STOCK AND SHARE LIST.

Referred to on p. 688.

| Issue.    | Share. | When ex-<br>Dividend. | Dividend<br>or Dividend<br>& Bonus. | NAME.                      | Closing<br>Prices. | Rise<br>or<br>Fall<br>in<br>Wk. | Yield<br>upon<br>Invest-<br>ment. | Issue.    | Share. | When ex-<br>Dividend. | Dividend<br>or Dividend<br>& Bonus. | NAME.                       | Closing<br>Prices. | Rise<br>or<br>Fall<br>in<br>Wk. | Yield<br>upon<br>Invest-<br>ment. |
|-----------|--------|-----------------------|-------------------------------------|----------------------------|--------------------|---------------------------------|-----------------------------------|-----------|--------|-----------------------|-------------------------------------|-----------------------------|--------------------|---------------------------------|-----------------------------------|
| £         |        |                       | p. c.                               |                            |                    |                                 | £ s. d.                           | £         |        |                       | p. c.                               |                             |                    |                                 | £ s. d.                           |
| 590,000   | 10     | Apr. 15               | 10½                                 | <b>GAS COMPANIES.</b>      |                    |                                 |                                   | 75,000    | 5      | June 29               | 6                                   | Malta & Medn., Ltd.         | 43-5½              |                                 | 5 14 3                            |
| 100,000   | 10     | " 1                   | 7½                                  | Alliance & Dublin 10 p.c.  | 22½-23½            | ..                              | 4 9 4                             | 541,920   | 20     | June 10               | 5                                   | Monte Video, Ltd.           | 13½-14½            |                                 | 6 18 0                            |
| 300,000   | 100    | July 1                | 5                                   | Do. 7 p.c.                 | 16½-17½            | ..                              | 4 5 9                             | 617,946   | Stk.   | Aug. 31               | 9½                                  | Newcastle & Gateshead Con.  | 230-240            |                                 | 4 1 3                             |
| 200,000   | 5      | May 26                | 6                                   | Australian 5 p.c. Db. Stk. | 105-107            | ..                              | 4 13 6                            | 252,355   | Stk.   | Jan. 3                | 3½                                  | Do. 3½ p.c. Db. Stk.        | 113-117            |                                 | 2 19 10                           |
| 40,000    | 5      | "                     | 6                                   | Bombay, Ltd.               | 6½-7               | ..                              | 4 5 9                             | 150,000   | 5      | May 26                | 8                                   | Oriental, Ltd.              | 7½-8               |                                 | 5 0 0                             |
| 380,000   | Stk.   | Aug. 12               | 12                                  | Do. New, £4 paid.          | 4½-5               | ..                              | 4 16 0                            | 135,000   | 5      | "                     | 8                                   | Do. New, £4 10s. pd.        | 6½-7               |                                 | 5 2 11                            |
| 240,000   | "      | "                     | 9                                   | Brentford Consolidated     | 275-280            | ..                              | 4 5 9                             | 15,000    | 5      | "                     | 8                                   | Do. do. 1879, £1 pd.        | 1½-1½              |                                 | 4 11 5                            |
| 50,000    | "      | "                     | 9                                   | Do. New                    | 210-215            | ..                              | 4 3 9                             | 60,000    | 5      | Mar. 11               | 7                                   | Ottoman, Ltd.               | 6-6½               |                                 | 6 6 2                             |
| 159,375   | "      | June 10               | 4                                   | Do. 5 p.c. Prf.            | 140-145            | ..                              | 3 9 0                             | 500,000   | 100    | June 1                | 6                                   | People's Gas & 2nd M.       | 103-108            |                                 | 5 11 1                            |
| 220,000   | Stk.   | Sept. 15              | 11½                                 | Do. 4 p.c. Db. Stk.        | 130-135            | ..                              | 2 19 3                            | 848,070   | 10     | May 26                | 6                                   | of Chicago Bd.              | 92-93              |                                 | 6 3 1                             |
| 226,320   | "      | "                     | 8½                                  | Brighton & Hove Orig.      | 262-267            | ..                              | 4 6 2                             | 250,000   | Stk.   | June 29               | 6                                   | Do. 4 p.c. Db. Stk.         | 99-101             |                                 | 3 19 3                            |
| 933,500   | Stk.   | Aug. 31               | 5                                   | Do. A. Ord. Stk.           | 190-195            | ..                              | 4 7 2                             | 250,000   | 10     | Apr. 29               | 10                                  | San Paulo, Ltd.             | 15-16              |                                 | 6 5 0                             |
| 420,000   | 20     | Mar. 30               | 10½                                 | Bristol, 5 p.c. max.       | 125-130            | ..                              | 3 16 11                           | 135,000   | Stk.   | Sept. 15              | 10                                  | Sheffield A.                | 242-245            |                                 | 4 1 8                             |
| 50,000    | 10     | Aug. 12               | 11½                                 | British                    | 51-53              | ..                              | 3 15 6                            | 209,053   | "      | "                     | 10                                  | Do. B.                      | 242-245            |                                 | 4 1 8                             |
| 75,000    | 10     | "                     | 8½                                  | Bromley, Ord. 10 p.c.      | 25-27              | ..                              | 4 5 2                             | 447,427   | "      | "                     | 10                                  | Do. C.                      | 242-245            |                                 | 4 1 8                             |
| 500,000   | 10     | Apr. 29               | 6                                   | Do. 7 p.c.                 | 20-22              | ..                              | 3 17 3                            | 5,600,000 | Stk.   | Aug. 12               | 5½                                  | South Metrop., 4 p.c. Ord.  | 140-143            |                                 | 3 14 7                            |
| 98,132    | Stk.   | June 29               | 4                                   | Buenos Ayres (New) Ltd     | 9-9½               | ..                              | 6 6 4                             | 1,460,000 | "      | July 14               | 3                                   | Do. 3 p.c. Db. Stk.         | 101-104            |                                 | 2 17 8                            |
| 150,000   | 20     | July 14               | 8½                                  | Do. 4 p.c. Db. Stk.        | 98-100             | ..                              | 4 0 0                             | 60,000    | Stk.   | Aug. 31               | 12                                  | Tottenham & J. B.           | 280-290            |                                 | 4 2 9                             |
| 100,000   | 10     | June 10               | 7                                   | Cagliari, Ltd.             | 29-30              | ..                              | 5 10 0                            | 60,000    | "      | "                     | 9                                   | Edmonton J. B.              | 200-210            |                                 | 4 5 9                             |
| 50,000    | 50     | May 3                 | 6                                   | Cape Town & Dis., Ltd.     | 15-16              | ..                              | 4 7 6                             | 182,380   | 10     | June 10               | 7                                   | Tuscan, Ltd.                | 104-113            |                                 | 6 1 9                             |
| 550,000   | Stk.   | Apr. 15               | 13½                                 | Do. 6 p.c. 1st Mort.       | 58-60              | ..                              | 5 0 0                             | 149,900   | 10     | July 1                | 5                                   | Do. 5 p.c. Dbs. Red.        | 100-103            |                                 | 4 17 1                            |
| 200,750   | "      | "                     | 10½                                 | Commercial Old Stock.      | 315-325            | ..                              | 4 3 1                             |           |        |                       |                                     |                             |                    |                                 |                                   |
| 800,000   | Stk.   | June 10               | 4½                                  | Do. New do.                | 252-257            | ..                              | 4 1 8                             |           |        |                       |                                     |                             |                    |                                 |                                   |
| 200,000   | "      | "                     | 12                                  | Do. 4½ p.c. Db. do.        | 148-153            | ..                              | 2 18 10                           |           |        |                       |                                     |                             |                    |                                 |                                   |
| 51,600    | Stk.   | Aug. 31               | 9                                   | Continental Union, Ltd.    | 207-212            | ..                              | 5 13 2                            |           |        |                       |                                     |                             |                    |                                 |                                   |
| 168,400   | "      | "                     | 14                                  | Do. 7 p.c. Prf.            | 193-198            | -4                              | 4 10 11                           |           |        |                       |                                     |                             |                    |                                 |                                   |
| 555,000   | Stk.   | Aug. 12               | 5½                                  | Croydon A 10 p.c.          | 305-310            | ..                              | 4 10 4                            | 746,164   | Stk.   | June 29               | 10½                                 | <b>WATER COMPANIES.</b>     |                    |                                 |                                   |
| 60,000    | "      | "                     | 11                                  | Do. B 7 p.c.               | 255-265            | ..                              | 4 3 0                             | 150,000   | "      | "                     | 5                                   | Chelsea, Ord.               | 318-318            |                                 | 3 6 0                             |
| 496,090   | 10     | July 28               | 11                                  | Crystal Palace Ord. 5 p.c. | 125-130            | ..                              | 4 0 9                             | 160,000   | "      | "                     | 4½                                  | Do. 5 p.c. Prf.             | 170-175            |                                 | 2 17 2                            |
| 354,060   | Stk.   | "                     | 5                                   | Do. 5 p.c. Prf.            | 140-145            | ..                              | 3 9 0                             | 175,785   | "      | Mar. 30               | 4½                                  | Do. 4½ p.c. Prf. Stk., 1875 | 148-152            |                                 | 2 19 3                            |
| 5,923,230 | Stk.   | Aug. 12               | 12½                                 | European, Ltd.             | 23-24              | ..                              | 4 11 8                            | 1,720,560 | Stk.   | Apr. 15               | 8                                   | Do. 4½ p.c. Db. Stk.        | 157-162            |                                 | 2 15 7                            |
| 100,000   | "      | "                     | 11                                  | Do. £7 10s. paid.          | 17-18              | ..                              | 4 11 9                            | 654,740   | "      | June 29               | 4½                                  | East London, Ord.           | 212-217            | -1                              | 3 13 9                            |
| 665,000   | "      | "                     | 4                                   | Gaslight & Coke, A. Ord    | 292-297            | +1                              | 4 2 6                             | 890,000   | "      | "                     | 3                                   | Do. 4½ p.c. Db. Stk.        | 157-160            |                                 | 2 16 3                            |
| 80,000    | "      | "                     | 10                                  | Do. B, 4 p.c. max.         | 120-125            | ..                              | 3 4 0                             | 700,000   | 50     | June 29               | 7½                                  | Do. 8 p.c. Db. Stk.         | 103-105            |                                 | 2 17 2                            |
| 60,000    | "      | "                     | 5                                   | Do. C, D, E, 10 p.c. Prf.  | 305-310            | ..                              | 3 4 6                             | 310,000   | Stk.   | Mar. 30               | 4                                   | G'd Junction, 10 p.c. max.  | 115-118            |                                 | 3 3 7                             |
| 463,000   | "      | "                     | 7                                   | Do. F, 5 p.c. Prf.         | 152-157            | ..                              | 3 3 8                             | 708,000   | Stk.   | Aug. 12               | 14                                  | Do. 4 p.c. Db. Stk.         | 142-147            |                                 | 2 14 5                            |
| 476,000   | "      | "                     | 10                                  | Do. G, 7½ p.c. do.         | 230-240            | ..                              | 3 2 6                             | 160,000   | "      | "                     | 7                                   | Kent                        | 364-369            |                                 | 3 15 11                           |
| 1,061,150 | "      | "                     | 6                                   | Do. H, 7 p.c. max.         | 195-200            | ..                              | 3 10 0                            | 1,043,800 | 100    | June 29               | 10                                  | Do. New, 7 p.c. max.        | 212-217            |                                 | 3 4 6                             |
| 294,850   | "      | June 10               | 4                                   | Do. J, 10 p.c. Prf.        | 305-310            | ..                              | 3 4 6                             | 460,200   | 100    | "                     | 7½                                  | Lambeth, 10 p.c. max.       | 298-303            |                                 | 3 6 0                             |
| 958,000   | "      | "                     | 4½                                  | Do. K, 6 p.c. Prf.         | 182-187            | ..                              | 3 4 2                             | 350,000   | Stk.   | Mar. 30               | 4                                   | Do. 7½ p.c. max.            | 227-232            |                                 | 3 4 8                             |
| 70,000    | 10     | May 12                | 8                                   | Do. L, 4 p.c. Db. Stk.     | 131-133            | ..                              | 3 0 2                             | 500,000   | Stk.   | Aug. 12               | 13½                                 | Do. 4 p.c. Db. Stk.         | 140-145            |                                 | 2 15 2                            |
| 8,900,000 | Stk.   | "                     | 10                                  | Do. 4½ p.c. do.            | 148-153            | ..                              | 2 18 10                           | 1,000,000 | Stk.   | July 28               | 6                                   | New River, New Shares       | 432-437            |                                 | 3 0 7                             |
| 376,400   | 100    | Aug. 2                | 4                                   | Do. 6 p.c. do.             | 198-203            | ..                              | 2 19 1                            | 902,300   | Stk.   | June 29               | 4                                   | Do. 4 p.c. Db. Stk.         | 140-145            |                                 | 2 15 2                            |
| 473,600   | Stk.   | Aug. 12               | 3½                                  | Hongkong & China, Ltd.     | 14-15              | ..                              | 5 6 8                             | 126,500   | 100    | "                     | 6                                   | Do. do. 7½ p.c. Prf.        | 164-169            | -2                              | 3 11 0                            |
| 560,000   | 100    | Apr. 1                | 5                                   | Imperial Continental       | 218-223            | ..                              | 4 9 8                             | 489,200   | Stk.   | "                     | 5                                   | Do. do. 5 p.c. max.         | 157-162            |                                 | 3 14 1                            |
| 250,000   | 100    | "                     | 4½                                  | Do. 4 p.c. Dbs. Red.       | 98-101             | ..                              | 3 19 3                            | 1,019,585 | "      | Apr. 15               | 4                                   | Do. do. 4 p.c. Prf.         | 168-172            |                                 | 2 18 2                            |
|           |        |                       |                                     | Do. 3½ p.c. Db. Stk.       | 101-104            | ..                              | 3 7 4                             | 1,155,066 | Stk.   | June 10               | 10                                  | Do. 4 p.c. A Db. Stk.       | 141-144            |                                 | 2 15 7                            |
|           |        |                       |                                     | Met. of Mel. 5 p.c. Db.    | 111-113            | ..                              | 4 8 10                            | 200,000   | "      | "                     | 4½                                  | West Middlesex              | 300-305            |                                 | 3 5 7                             |
|           |        |                       |                                     | bourne 4½ p.c. Db.         | 107-109            | ..                              | 4 2 7                             | 200,000   | "      | Sept. 15              | 3                                   | Do. 4½ p.c. Db. Stk.        | 162-165            |                                 | 2 14 7                            |
|           |        |                       |                                     | * Ex div.                  |                    |                                 |                                   |           |        |                       |                                     |                             |                    |                                 | * Ex div.                         |

† Next dividend will be at this rate.



Finance, the Treasurer (Mr. Fleming) reported on the collection of the gas-rents outstanding as at the 31st of May, when the balance was struck for the year 1897-8. At that date, it was calculated that there was still outstanding a sum of £68,578; and when the report was brought before the Finance Sub-Committee, it was stated that there had been collected to date a sum of £67,027; so that there was a balance still outstanding amounting to £1550. Of course this amount is decreasing every day. At the same date Mr. Fleming reported that for the new year, 1898-9, there had been collected a sum of £2333; while at the same date in the preceding year it was £1557; thus showing for the current year an increase amounting to £776. The current collecting term is one of six months, extending to the end of November; the other collecting terms are periods of three months each.

All danger of the chimney at the Edinburgh Gas-Works falling is now past. When I saw it this afternoon, there was only about 12 feet of the brickwork standing. Below that is a square stone base, about 20 feet in height. In other two weeks, probably, the whole will be removed. The work has been very expeditiously gone about, and without accident. Curiously enough, a chimney is also being taken down at the Stirling Gas-Works. A new retort-house is being built; and in connection with it a chimney has been erected, a short distance from the old one, and a good deal smaller than it. When I saw the place this week, the old chimney was in process of demolition; the top half of it having been already removed. The first section of the new retort-house has been completed. It is a lofty and commodious building.

Another death has resulted from the accident at the works of the Scottish Cold Storage and Ice Company, Glasgow, to which reference was made in the "JOURNAL" last week. Thomas Graham, a compressor, died on Monday night in the Glasgow Infirmary. At a special meeting of the Company held that day, the Chairman (ex-Bailie Simons) made a statement to the representatives of the Press at the close of the proceedings, in the course of which he said: "It is a mistake to suppose that there was any explosion at the George Street works on Saturday afternoon. Not a pane of glass or an electric lamp was broken, and there was no report. The accident is entirely attributable to the bursting of an iron pipe, through which the ammonia was conveyed from one part of the system to another, just as any ordinary gas, water, or steam pipe might have burst. The pipe in question was subjected by the manufacturer to a hydraulic test pressure equal to 700 lbs. on the square inch, which was considered ample, as that is considerably more than double what it would be subjected to in connection with plant working in normal conditions. An examination of the pipe showed that a piece was blown out in the side at what is known as a knee—a bend of that shape—but how this occurred in the case of such a strong pipe still remains a mystery."

The Glasgow water-pipe contract has passed through another phase. Last week the Corporation resolved to divide the contract between Messrs. R. MacLaren and Co., of Glasgow, and Messrs. R. D. Wood and Co., of Philadelphia. The division was made as to sizes; and its effect was to give about two-thirds of the whole to the Glasgow firm, and one-third to the American firm. Messrs. MacLaren would not agree to the division. They wrote that their quotation was an overhead one; and

that before they would consent to accept a portion of the order, they would require to raise their price by 13s. per ton. After this communication, the Water Committee met and resolved to give the whole of the contract to the American firm.

The Edinburgh and District Water Trust, on Friday of last week, made an inspection of their new works in the Talla Valley. These were found to be making good progress in the hands of Messrs. Young and Sons, the Contractors. When on the spot, the Trustees directed their attention to two subjects. One was the proposal, which has been mooted, to construct a bank at the upper end of the reservoir. The object of making the bank is to avoid the laying bare of a large area of ground in dry weather, upon which vegetable matter would grow, and would be again submerged. The embankment would be so constructed as to give a depth of 10 feet of water at the edge of the loch, at which depth vegetation does not flourish. It is estimated that the construction of the bank would cost £9000. The Trustees are to consider the matter. The other subject had reference to the nature of the bed of the reservoir. Mr. Baxter, a Leith representative, had made the allegation that there was bog, or peat, in great quantity, which would require to be cleared out, at a probable cost of £200,000; or that, if left, it would contaminate the water. The statement was contradicted; and Mr. Baxter was asked to point out where the peat was. This he was unable to do, though he kept the company wandering over the place till there was scarcely time for dinner. The truth is that the bed of the Talla Valley is, like nearly every other valley, composed of soft material which has been washed down from the surrounding hills. It is not peat, however, and will not discolour the water. The Contractors are bound to strip off the vegetation, if required; and should this be done, the bed of the reservoir will be like that of any natural loch—neither better nor worse.

The Falkirk and Larbert Water Trust had a revenue last year of £7627, and an expenditure of £7025; leaving a balance of £602. A year ago the domestic rate was reduced from 1s. to 10d. per pound, and the shop rate from 7d. to 5d. per pound. As a consequence the revenue from the rates was £3501, as compared with £3769—a decrease of £268. But for the reduction of the rates, there would have been an increase of about £250. During the year £3830 was expended upon new works, and £3755 upon extensions to the distributing plant.

**The Expenses of the Maidstone Typhoid Epidemic.**—A letter has been received at Maidstone from the Local Government Board, stating that a loan to cover the expenses incurred by the Town Council in connection with the epidemic of typhoid fever which occurred in the borough last autumn can only be granted for three years. The Council had applied for sanction to borrow £18,000, and to spread the repayments over twenty years. The Local Government Board intimate that they are disposed to grant a loan of £15,000 only. This decision, both as to the amount and the period of the loan, has caused great surprise in the borough, to which it means an annual rate of 1s. in the pound for the three years.

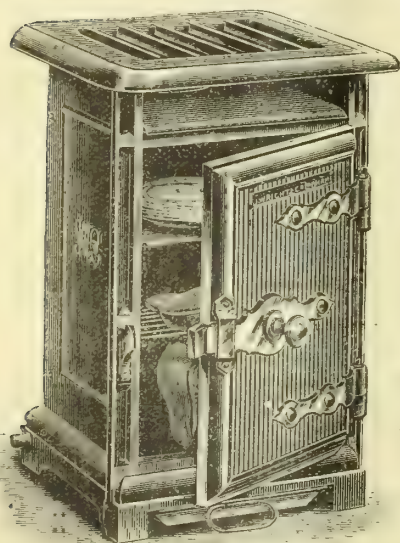
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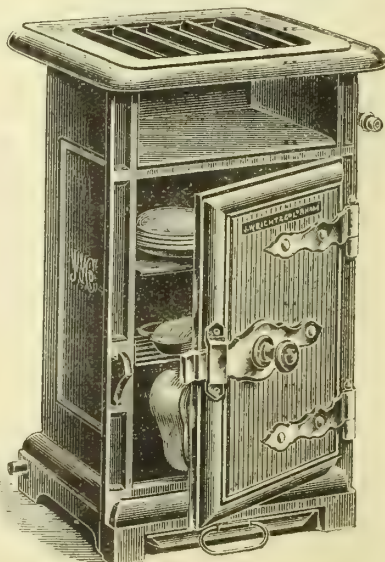
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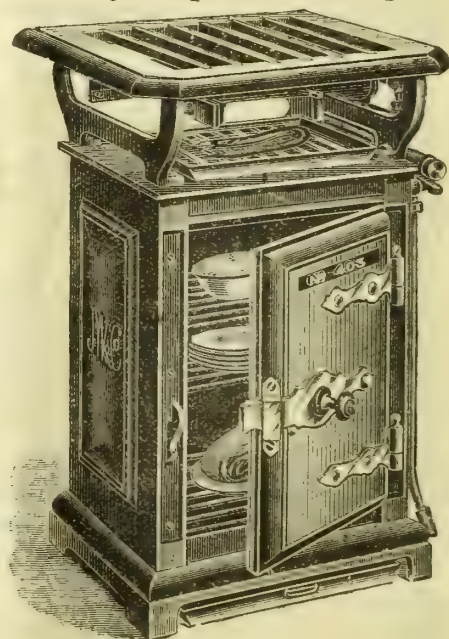
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Nos. 806 and 3806.



Nos. 403 and 812.

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## EDITORIAL NOTES.

## Lights for the Winter—Gas Ahead!

WITH the approach of winter, the subject of artificial lighting for the long evenings assumes importance; and it may well occur to the gas engineer and manager to ask whether matters have materially changed in this respect since last spring relegated the question of domestic and street lights and lighting to comparative insignificance. The first result of a glance over the whole field covered by this question is the assurance that things are very much as they were in this regard—with the exception that gas is once more well to the front. Lest we should be accused of partiality in making this declaration—of indulgence without excuse in the cry, "There's nothing like leather!"—let us remind our readers of one or two facts. The only novelty in artificial lights that has come to the front during the past summer is the new Welsbach burner. There can be no question about this significant circumstance. It is not, of course, that the whole future of gas lighting is bound up with the development of the Welsbach method of burning gas for the purpose of giving light; but the fact remains that, apart from this, there is no advance to record. Flat-flame gas-burners still have their field of usefulness; and a very wide one it is. Argand gas-burners retain their friends; and the regenerative gas-lamp is as good as ever it was. But these things hold their old positions. They do not advance in any direction. They have touched the high-water mark of efficiency and of public favour; and beyond it they do not offer to pass. With the incandescent gas-burner it is different. The capability of the system has displayed unsuspected elasticity; and he would be a bold man who should say that the ultimate possibilities of the principle have been realized, or even indicated.

Meanwhile, what have the electricians been doing to improve their lamps? Nothing at all. This may seem a hard saying; but we have searched their own recent advertisements in vain to find any allusion to the securing of a better lighting effect. The arc and incandescent lamps offered by electricians are practically the same, and give the same duty as they have done these years past. There is at the present moment an Electricity Exhibition open in Turin. This is the second of its kind to be held in the same city; the first having been in 1884, when the famous Gaulard and Gibbs transformer was new to the world. Now the question of transformers and "phase" is still occupying the attention of electricians; but there are no new lamps. When the enterprising electrician is not engaged in contemplating the engrossing topic of "phase," or preoccupied with "boosters," or "rectifiers," he loves apparently "to lie a-basking in the sun." At any rate, he cannot gain very much comfort from the study of electric lamps with the object of getting a better duty from them. Similarly, the petroleum lamp interest is "marking time." We learn from the "Ironmonger" that "it is stated in some quarters, with much foreboding, that the best days of the oil-lamp trade have passed away. To some extent there is truth in the statement." Lamp makers do not advance. They busy themselves over small variations of detail and pattern of stand and shade; but "there is, in the aggregate, a marked absence of originality in the burners." It is long since a really new oil-lamp flashed upon the market. Lamp sellers and users discuss the comparative merits of metal and glass containers, the gauging of wicks and their tubes, and so forth; but essentially the type of the oil-lamp remains fixed. The incandescent oil-lamp seems to have failed to "catch on," for some hitherto unpublished reason. The very fact of there being a cry in the lamp trade for the standardizing of burner-fittings is a sign that no advance is regarded as possible in this direction. All this is encouraging to the partisan of gas for lighting, to say nothing, for the present, of other purposes. His is the one progressive illuminant; and it will be his own fault if he fails to benefit from this great advantage.

## The Morley Arbitration.

THE Morley gas arbitration took place last week under the presidency of Mr. James Mansergh, sitting as Umpire, with Mr. Thomas Newbigging as Arbitrator for the Company, and Mr. Corbet Woodall filling a like office for the Corporation. The arbitration was held under the terms

## TO CORRESPONDENTS.

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of the Morley Corporation Gas Act of this year, according to which it was to be governed by the provisions of the Lands Clauses Acts "with reference to the purchase and "taking of lands otherwise than by agreement." It is also provided that, in ascertaining the amount of the purchase-money to be paid by the Corporation for the Gas Company's property, due allowance shall be made for the reasonable expense of re-investment. Other considerations affecting the price of the undertaking are stated in the Act. Mr. Pember, Q.C., was leading Counsel for the Gas Company; and his "string" of experts included Mr. E. H. Stevenson, Mr. W. R. Chester, and Mr. R. Porter. Mr. Balfour Browne, Q.C., was for the Corporation, advised by Mr. Charles Hunt and Mr. W. A. Valon. The valuation of the property was intended to be upon a liberal scale; and the Company asked through their Counsel for 30·77 years' purchase of the maintainable profit, with 10 per cent. added for compulsory purchase. The amount of the maintainable profit was taken to be £4078. After all additions and deductions had been duly made, including 2½ per cent. for re-investment, the gross valuation of the undertaking came out at £133,688. The share capital of the Company is £46,100, upon which last year's dividend amounted to £3389. There are no arrears of dividend; the works are in excess of present requirements, albeit of an old-fashioned type; and there is plenty of land. The price of gas is only 2s. 4d. per 1000 cubic feet; and the district has been well served by the Company, who, on the other hand, have been prosperous from the commencement of their existence. An interesting feature of the proceedings was the application made of the statutory direction to allow for the cost of re-investment. The witness who dealt with this matter—a Leeds stockbroker—showed that it would probably take three months to wind up the Company and distribute the money, during which time the shareholders would be standing out of their customary income from the investment. Then six weeks should be allowed for finding a fresh investment; so altogether 2½ per cent. upon the value was the figure arrived at as representing this allowance. The case put forward by Mr. Balfour Browne was merely a pulling to pieces of the valuation submitted by his learned friend on the other side. This being a maximum dividend Company, everything beyond the full dividend and the reserve fund belongs to the consumers. With regard to the number of years' purchase, it was suggested that 25 should be the proper multiple of the maintainable profit, which did not come out so high as had been stated. All sorts of things required to be done to the works; and there was no justification for the proposed 10 per cent. allowance for the compulsory purchase. Besides, 2½ per cent. is a ridiculously high charge for re-investment! The Corporation experts valued the undertaking at a little less than £80,000. The difference between the two valuations is thus very considerable. Upon the case as it stands, however, the Arbitrators will not experience much difficulty in striking a fair mean. It is not for us to anticipate the issue, of course; but we shall return to the subject when the award is published.

#### The Report and Accounts of the Commercial Gas Company.

THE report of the Directors and the accounts of the Commercial Gas Company for the past half year have been issued. The ordinary general meeting of the Company will be held on Thursday next. A profit of £53,958 has been earned on the half-year's working. Deducting interest on debenture stock and loan, there remains standing to the credit of the net revenue account a balance of £49,189. The Directors recommend the declaration of a dividend at the rate of 13½ per cent. per annum on the old stock, and of 10½ per cent. per annum on the new stock. The capital account being again considerably overdrawn, the proprietors will be asked to sanction another new issue. The expenditure upon prepayment meters seems to be slackening off a little. The receipts on revenue account show a fair increase, due to a larger gas-rental; residuals having fallen off slightly. On the other hand, working expenses have been less. Coals cost £70,588, as compared with £72,011; and carbonizing wages actually fell from £21,126 to £18,300. This is a most satisfactory sign. The net result is to increase the profit balance from £47,227 to £53,958. The management is to be congratulated upon this evidence of its quality. The other entries of the accounts do not call for special comment. The undertaking is manifestly prospering; but it will be interesting

to hear what the Chairman has to say concerning the price of coal in respect of the immediate future. Rumour has it that the Company had to pay pretty smartly for their year's supply; but, of course, rumour may not be reliable.

#### The Affairs of the British Gaslight Company.

THE meeting of the British Gaslight Company, which we report elsewhere, is interesting on several accounts. Being the sole surviving representative of an order of Gas Companies that in their day were instrumental in carrying light into various dark places in the land, this time-honoured and honourable Company must always attract a degree of sympathetic attention so long as it exists. It would be impossible to maintain, however, that the system represented by the Company has always been justified, even in their own case. The instance of the Norwich undertaking sets off that of the Hull concern. The public of the different towns served by the Company have no reason to complain of the system, so far as it works out in the price of gas; but the Company themselves are not equally happy everywhere. At Hull, they seem to be on the best of terms with everybody; and no system could supply the Potteries with cheaper gas. But Norwich is a troublesome customer. The Company's experience here illustrates the question as to the expediency of giving discounts upon gas accounts. The nominal price of gas was 3s. 6d. per 1000 cubic feet. This was the figure that stuck in the people's mind; and they never thought of the discount. The Directors have now cut the price down to 3s. per 1000 cubic feet, in the endeavour to reconquer their lost ground. Other steps have been taken to the same end; and the profession in general will wish the new management, in the person of Mr. John Young, every success. There is one source of trouble at Norwich that merits special notice, as it is of a very exceptional and instructive character. This is the enormous amount of the local rating, which has now attained the startling figure of 8s. 8d. in the pound. Curiously enough, this very subject of the heavy rates of Norwich is singled out for mention in "The Times" abstract of the last report of the Local Government Board. The observations of the Inspector of the Board for the Eastern Counties are a lesson in political economy deserving of being taken to heart everywhere. It is upon the question of pauperism. In Ipswich, the Inspector says, there is the one Union in this part of the country which administers the Poor Law under a code of sensible rules which are rigidly adhered to. "The result is, not only that its "pauperism is lower than in any other district of the "Eastern Counties, but the working classes are thrifty "and independent. In Norwich, on the other hand, "where the enormous funds of old charities have for "generations led people into the habit of depending on "doles, and where the Guardians give relief freely without "asking inconvenient questions, pauperism abounds, and "the poor-rate is naturally high." The British Gas Company are now suffering from the consequences of the indiscriminating almsgiving that stood for piety in the past.

#### The Dublin Gas Company—Retirement of Mr. W. F. Cotton.

THE meeting of the Alliance and Dublin Consumers' Gas Company, on Friday last, was signalized by an important change in the internal economy of the Company. Mr. C. Lawler, J.P., the Chairman, presided; and the Directors' report and statement of accounts, referred to in last week's "JOURNAL," were received and adopted. Their contents do not need to be discussed at length. They go to show that gas is holding its own in the Irish capital, and that the people of Dublin are beginning to awake to a better sense of the value of gas as a cooking agent. Dublin is a most conservative city, as regards the social arrangements of the population; and the householders are not prone to take up with new aids to the performance of domestic tasks. Still, gas is going rather better in Dublin than ever before. The chief event of the meeting was the fact that Mr. W. F. Cotton appeared for the last time as the Secretary and Manager. It is unnecessary to recount here the claims of Mr. Cotton upon the proprietors of the Dublin Gas Company. A quarter of a century ago the Company were in low water. Fortunately, the Directors of that day recognized the fact that they wanted a man to help them out of their trouble; and, more fortunately, they knew where to go for him. Mr. Cotton took charge of the undertaking; and under his care it slowly but surely began to mend.



Mr. Cotton's wisdom, patience, business capacity, integrity, and knowledge of his people, both inside and outside the Company, have stood the undertaking in good stead more frequently than he himself knows. Now he is to retire, but not wholly from the service of the Company. Relieved from the routine and detail work of the office, Mr. Cotton joins the Board in the capacity of Managing-Director; receiving an allowance equal to his full salary, and being succeeded in his old position by his son. It is a fitting conclusion of a worthy career pursued in one of the most trying posts in the whole range of the gas industry of Great Britain. We congratulate both the Dublin Gas Company and Mr. Cotton, and hope he may long live to advise the administration of the great undertaking he has served so long and so well.

#### The North of England Meeting.

THE meeting of the North of England Gas Managers' Association at Sunderland last Saturday was of a quality which gives the best possible contradiction to the oft-repeated remark that nowadays, with so many Association meetings, it is difficult to find anything that is worth saying. A man who has the command of his mother tongue, and an idea in his head, will give utterance to the idea; and people will listen to, and be benefited by, it. This remark is the most obvious comment which can be made upon Mr. Charles Dru Drury's broad and statesmanlike Presidential Address. The topics dealt with were numerous; but upon each of them there was shown a comprehensive and far-reaching grasp of mind, based upon, it must be inferred, active observation and experience. There follows, as a further illustration of the continuing utility of District Associations, the statement contained in the report by the Hon. Secretary as to what has been accomplished in the matter of insurance under the Workmen's Compensation Act. It was only in April last that Mr. T. Bower, of West Hartlepool, introduced the subject to the Association. At that time the rates quoted were as high as 25s. per cent. The Association took action; and Mr. Penney was able to report that, in their district alone, through the instrumentality of their Committee, about forty insurances of wages amounting to £125,000 had been effected at 9s. 6d. per cent. This result is an object-lesson which is not likely to be lost in connection with other subjects where united action would be beneficial. There remains to be noticed the paper by Mr. J. Holliday, of Scarborough, upon "The Policy of Discounts." The paper (read in the author's absence) was found to be an excellent medium for the raising of a stirring discussion upon a subject on which, as would appear, opinions are strongly divided, and practice is more varied than could have been supposed.

#### End of the Coal "Crisis."

IT is, with unmixed satisfaction we record the peaceful issue of the so-called coal trade "crisis," which occupied so much of our attention last week. Threatening as the aspect of affairs was for the moment, we did not believe there was any real prospect of a suspension of output in the Federation districts; and the event has justified this expectation. A conference of delegates, held in Westminster on Thursday, was able to record the fact of the acceptance—by a large majority—of the terms offered by the employers on July 6, and endorsed by the Union leaders. Thus the stake played for by the latter, as described in this column last week, was won. Yorkshire fell into line, and the threatened strike faded away. At the adjourned conference of coalowners and miners' delegates, presided over by Mr. A. Hewlett, the gratifying announcement was made that the latter were authorized to accept the terms of July 6. A request was preferred that the settlement should be enlarged to include the surface men; and this point was gracefully conceded.

This is all very fine; and the parties are to be congratulated upon their mutually satisfactory bargain. But there is something else to be said from the side of the coal purchaser. We remarked last week upon the existence of a rumour that the whole dispute was a "put up" thing, as between the coalowners and their hands, with a view to getting a higher price for the coal. According to the "Daily Chronicle" of Tuesday last, this is really the secret of the whole business. It is averred that the employers gave a hint to the men's leaders to threaten to put the screw on, in order that more favourable contracts might be made with Railway and Gas Companies. "To a certain extent, this has happened." A pretty bit of

business, truly, if the tale is true! The story is "queered" partly by the circumstance that the very largest gas and railway coal contracts do not, as a rule, go to the Federation districts; but still the fact that two out of the three London Gas Companies were caught, and made to pay a heavy advance on their coal contracts for the year, lends colour to the tale. There is something disquieting in the idea of the coalowners and miners' leaders plotting together to get a rise out of the unwieldy Gas Companies. It is so easy to do this, with some of them. A suspicion of this character, when once aroused, is difficult to remove. If nine coalowners out of ten were to come forward and swear by all their gods that they never, never did anything of the kind, the tenth would be held to prove the allegation by his abstention; while if all of them agreed, their unanimity would be regarded as giving them away. 'Tis a wicked world!

#### The Workmen's Compensation Act—Mr. John Aird's Point.

IT appears that the point of law raised by the Liverpool County Court Judge in connection with the award under the Act of compensation to the legal representative of a workman, and commented upon by Mr. John Aird, is not to be finally disposed of as summarily as this gentleman supposed in the communication to which we referred last week. It has since been pointed out that Mr. Aird's quotation from the Chancellor of the Exchequer only goes to show that the Board of Inland Revenue do not require probate or letters of administration "so far as they are concerned." The immediate question in the Liverpool case, however, was as to who was the "legal personal representative" of the deceased; and it was the responsibility for defining this claim that the County Court Judge declined. The true legal claimant can only be constituted by grant of probate or letters of administration. If the County Court Judge were to accept the unsupported claim of the first applicant, there would be nothing to prevent a second plaintiff turning up, who might prove to be the real personal representative of the deceased, and might in this capacity obtain a second verdict against the unfortunate employer. The point really means that proof must be given as to the legality of the claimant's position. Administration must be taken out, not with a view to payment of duty, but for the purpose of constituting a legal personal representative of the deceased, who alone can give a reliable receipt for the compensation payable in case of fatal accident. Consequently, solicitors advise that administration should always be taken out in such cases. It can be done by personal application to the local Inland Revenue Officer, at a cost of 15s. for fees and expenses; and employers should insist upon it for their own protection.

## WATER AND SANITARY AFFAIRS.

EAST LONDON members of Parliament very likely think to render themselves peculiarly popular with their constituents by advocating a remission in the charge for water in proportion to a deficiency in the supply. Mr. H. S. Samuel, member for Limehouse, informs his District Board that he has waited on one of the Whips of the Conservative party, and told him that unless the Government introduce a Bill embodying the principle that people shall not pay for water they do not receive, he will bring forward such a Bill himself. Mr. Samuel must know very well that the Government will not take any such step as that which he proposes, but will leave him to make himself ridiculous if he chooses to do so. This gentleman is also anxious that a test case should be tried, in order to see how far the East London Company are right in making a full charge; and he is willing to guarantee the expenses of any such action which any Limehouse consumer may bring forward. Mr. Samuel need neither trouble nor tax himself. Mr. Chaplin's Act of last year provides a sufficient remedy for any consumer who feels himself aggrieved. A local authority may assist a complainant consumer in getting a settlement of his grievance, and the Court may award him damages. But wherein can the East London Company be said to have failed in their statutory duty? They are not only exempt on account of the extraordinary drought, but they have sent from their works a sufficient supply of water if each consumer had only possessed means for storing it. It is true they have not maintained a constant service; but the supply per head has been ample, and a delivery for four hours per day is as much as the City, which is served by



the New River Company, generally receives. Some years ago, as stated by Dr. Sedgwick Saunders, the supply to the City was only for one hour per day. The present failure at the East-end is in cisterns rather than in water. As to the intentions of the London County Council for the future of the Metropolitan Water Supply, nothing appears on the *agenda* for to-day, when the first Council meeting takes place after the summer recess, except a couple of notices of motion comprehending an attempt to obtain legislation on the subject in the coming session, and the bringing of a new supply from Wales.

The report by Major-General Scott on the Metropolitan Water Supply of 1897, contained in the annual report of the Local Government Board, issued last Thursday, while repeating much that has been said before, does so to good purpose, and gives the public the benefit of trustworthy data. Respecting the sufficiency of the Thames for the demands made upon it, the Board's report, founded on that by General Scott, is perhaps a little misleading. It states that, on the completion of the works sanctioned under the Staines Reservoirs Act of 1896, the quantity of water which may be withdrawn from the Thames in 24 hours will be increased to 305½ million gallons. It should be understood, as shown by General Scott, that this is the quantity which may be abstracted "in any given day," the average being 185½ million gallons, or at the utmost, after allowing for certain exceptional cases of extra draught, decidedly less than 200 million gallons. In fact, General Scott puts the lesser amount as the quantity of water "which may be delivered daily." In the 305½ million gallons there is included an abstraction of 100 million gallons by the Southwark and Vauxhall Water Company, and of a like quantity by the Staines Reservoirs Committee. Much of this, therefore, besides being limited to the abstraction for "a given day," lies in the future; and how the case stands at the present time may be judged by the circumstance that the monthly returns for last year show the largest daily average as occurring in the month of July, when it was 128·6 million gallons. Last July the daily average was 130·3 million gallons. In August, 1897, the natural flow of the Thames was particularly low; being only 518·3 million gallons per day. Of the latter amount the quantity withdrawn for the Metropolitan supply was 23·5 per cent. But in February the abstraction was only 2·8 per cent. The natural flow of the Thames at Teddington Weir—that is to say, the observed quantity *plus* what has previously been taken out by the Water Companies—has been known to vary from 252 to over 5000 million gallons per day. These extreme variations point to the necessity of large storage reservoirs, so as to secure an abundant reserve to meet coming exigencies. The average flow of the Thames is abundant; but the minimum flow is apt to become very small in comparison. Great weight attaches to the remark by General Scott that if reservoirs were constructed on a large scale for the purpose of impounding the river water during freshets (a remedy which is really being adopted), the influence of the minimum or dry-weather flow of the Thames "as a factor limiting the capacity of the river for the supply of the Metropolis would be to a considerable extent eliminated."

These considerations, and some others which arise out of General Scott's report, need to be kept in view at a time when there is a tendency to disparage the conclusions arrived at by the Royal Commission under Lord Balfour. Lord Farrer's letter which appeared in "The Times" last Wednesday, stands in relation to this part of the water supply controversy. His Lordship dwelt especially on the future of the Lea; but he also suggested that we may be approaching in the valley of the Thames the same conditions which already prevail in the other valley. "If there is the least fear of this," it is argued that action should be taken at once to secure some unappropriated area—evidently at a distance—which shall furnish a supply for the Metropolis. But Lord Farrer, and others who take the alarmist view, would be nearer the mark if they were to show, as General Scott does, that the immediate question is not so much one relating to a new source, as to the construction of proper works. The average flow of the rivers and the yield of the wells being far beyond any possible requirement for a long period of time to come, the actual need is that of storage. It is a curious coincidence that the recent distress in East London has not been due so much to failure of the supply as to lack of

storage. The domestic cistern is founded on the same principle as the Company's reservoir. To store the water when it is to be had is to provide against the period of scarcity, whether it be hours or months. General Scott mentions that the East London Company have almost doubled the storage capacity of their works by completing the reservoirs provided for in their Act of 1894. Even more than this is needed "in order to provide for the immediate future." But it is signified that the Company "have obtained statutory powers which will enable them to undertake this work." The fact that the volume of discharge of the River Lea "during periods of drought" falls far below the requirements of the population of East London in the matter of water supply," emphasizes the demand for reservoirs—a demand which it is only fair to say is being met. The New River Company are also constructing works which will give them an ample supply from the Thames.

The intensity of the recent drought is really shown by a variety of facts; and it is difficult to find anything equal to it in the past, unless at some remote date. The earth has been so baked that where the clay formation is at the surface the soil has in some cases become contracted to such a degree as to injure superincumbent buildings. Instances of this nature are reported from various parts of Hertfordshire, especially in those near London. In Essex and Mid-Kent the villagers have been greatly distressed by the drying up of wells and streams. Other parts of the country are found in similar straits. As mentioned by Mr. Chaplin, in his reply to the recent deputation, municipal authorities are not exempt from difficulties in regard to their water supply, of which Birmingham furnishes a notable example. The capital of the Midlands, where the water-works are the property of the Corporation, is even in a more precarious state with regard to its supply than that which lately befel the East-end of London. Towards the close of last week, one of the two principal reservoirs at the Birmingham water-works was absolutely dry, although capable of holding about 20 million gallons of water. The great Shustoke reservoir, having a storage capacity of 400 million gallons, was more than half empty. The River Bourne, which should feed that reservoir, is described as having become "little more than a trickling ditch." The sum total of the situation is that, of the 19 to 20 million gallons per day now given out, only 8 million gallons are yielded by the streams, the flow of these being greatly reduced. The deep wells give some 6½ million gallons daily; but it is feared that this cannot be fully maintained. There remain about 5 million gallons per day to be drawn from the storage. The danger which most forcibly presents itself is that of an early frost, by which the inflow will be arrested; leaving a half-exhausted reservoir—of itself in its present state, only equal to ten days' supply—as the sole aid to the wells. In order to keep up the reserve, an earnest appeal has been made to the people of Birmingham to economize their use of water, but apparently without effect. The constant service is continued, and it is known that the consumption is more than it need be. There is a supply to come from Wales, but it will be four years before the works can be completed; and it is urged that Birmingham consumers must be careful not to waste any of their supply pending the opening of the aqueduct. The entire case shows that even municipal wisdom may be baffled by the exigencies of the water supply as affected by phenomenal weather.

**Society of Engineers.**—At the meeting of this Society at the Royal United Service Institution, Whitehall, last night, Mr. Sherard Cowper-Coles read a paper on "Protective Metallic Coatings for Iron and Steel."

**Artesian Wells in Paris.**—We learn from the "Builder" that the Municipal Engineers of Paris have just completed the piercing of the artesian well at Buttes-aux-Cailles, commenced in 1864 by MM. Dru, and finished by M. Cerrault, who has had charge of the work since 1872, and has encountered unexpected difficulties which have delayed its completion. This is the fourth of the important artesian wells in Paris, all of which give a full flow of water. The first one to be sunk was that at Grenelle, commenced in 1833, and completed in 1841. Its depth is 1797 feet. The second was commenced at Passy in September, 1855, and completed in September, 1860. The boring passed through the chalk formation, and tapped the greensand at a depth of about 1920 feet. The third was started in the Place Hébert in 1863, and, after an interruption of the works, was continued till a depth of 2355 feet had been reached. The cost of this well was rather more than £80,000.



## ESSAYS, COMMENTARIES, AND REVIEWS.

## GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 768.)

LAST week opened on the Stock Exchange still burdened with the weight of depression which marked the close of its predecessor. Anxiety concerning the state of political unrest, and the possibility of more trouble in the coal-fields, had a very unfavourable tendency. But by mid-week more hopeful views prevailed; and this, in conjunction with the colliers' decision to accept the masters' terms, relieved the position, and so things continued to the close. Business, however, was at no time brisk; and prices were not largely affected. This was partly owing to its being account week, and partly to the condition of the Money Market, where there was a very strong demand both for Stock Exchange purposes and other requirements incidental to the close of the quarter. Discount rates however eased off as the run on gold slackened. In the Gas Market, business was extraordinarily quiet—indeed, it is questionable whether we have ever had to note a week in which there were so few transactions marked. It has thus been an uneventful period; but it is satisfactory to observe that, notwithstanding the stagnation, prices did not droop as they very frequently will when they receive no support. In fact, changes of quotation, though few in number and slight in degree, are all for the better. In Gaslights, the "A" was occasionally dealt in at the old figures, ranging from 292½ to 295½, and showing no move. But in the secured issues, a parcel of the 10 per cents was taken at a good price; and the quotation advanced a couple of points. South Metropolitan ruled easy at first, and seemed inclined to drop; but the closing mark was better. One deal in the debenture was all that was done in Commercial. The issue of the Company's accounts completes the history of the Metropolitan undertakings to Midsummer, and shows that the Company have earned their dividend, as well as a nice balance to carry forward. The Suburban and Provincial undertakings were quite quiet and unchanged. At the British Company's meeting on Wednesday, the reduction of the dividend to a 10 per cent. rate was approved. The Continental Companies were as quiet as the rest; but Imperial pushed up another two points. Among the rest, Melbourne, Ottoman, and Cape Town profited by *ex div.* changes. The Water Companies were fairly animated, considering the general torpor. The tendency was decidedly good, and quotations advanced—East London making a further recovery.

The daily operations were too small for detailed notice. On Monday and Tuesday there were only about a dozen transactions in Gas; and on Wednesday only two, and quotations did not move. But in Water on Wednesday, East London rose 3; Kent, 1; Southwark ordinary, 1; and ditto "D," 3. There was still nothing doing in Gas on Thursday; but in Water Southwark ordinary gained 1. Gas was nearly stagnant on Friday; but Imperial moved up 2. Lambeth Water rose 2. On Saturday, the only feature was a rise of 2 in Gaslight 10 per cent. preference.

## ELECTRIC LIGHTING MEMORANDA.

The Development of Electric Tramway Working in London—A False Start  
—A Fair Offer—The Objection to the Trolley-Wire System.

A SMALL crisis appears to have arrived in respect of the development of electric traction for tramway working in London. The London United Tramways Company have addressed an appeal to the London County Council for permission to apply the overhead trolley system on three short lengths of the Company's lines which lie within the area controlled by the Council. Parliament last session granted powers to the Company to work the greater portion of their mileage by electricity; but, in view of the opposition hitherto offered by the Council to the trolley-wire system, the end portions of the lines that entered the County Council area were left out of the Bill. Accordingly, while 22 route-miles of tramway stretching away to the western outskirts of the Metropolis may be worked electrically, the inner 4 miles must continue to be worked by horses, unless the County Council yield to the prayer of the Company and allow them to do by grace what they have no power to do by law. The course taken by the Tramway Company in this affair strikes us as being more cunning than clever; and we doubt very much if it will prevail with the County Council. Afraid to meet the Council before the impartial tribunal of a Parliamentary Committee, the Company drove not only the thin end, but almost the whole of their "wedge" of electric traction into their system. Now they want the Council to stand aside and let them finish the job. If the Council object, it will be sought by the Company to cast upon this much-abused body the odium of what will be represented as a standing in the way of real "progress." Indeed, this has already been done. The Tramway Company have tuned that highly respectable, impartial, and well-informed journal, the "Financial News" to sing a song whereof the burden is—see how the London County Council lags behind Middlesbrough and Stockton in furthering development of electric tramway working! Why, the Council is the

most retrograde public body in the kingdom; because they have not succumbed to the charms of the overhead trolley wire!

This is not the way to approach the London County Council or any other self-respecting Local Authority. The less the financial press has to say in favour of electric traction, the better for its prospects in London and elsewhere. The very worst thing that could happen to the United Tramways Company's scheme would be for it to fall under suspicion of being pushed by the methods of financial journalism. Electric traction may be a good thing for the United Tramways Company and their public; but if so, Parliament should have been consulted as to the expediency of the opposition of the London County Council. To shirk this ordeal may have been prudent. Probably it was wise for the Company to shrink from antagonizing the County Council. It is scarcely wise, however, to attempt to get round the Council by taking advantage of a side-wind immediately after declining to face their opposition. Perhaps the appeal of the Tramways Company in this instance is not expected to succeed, but is only put forward "on the off-chance," so to speak, of finding the Council in a yielding mood. If it fails, then the Company will be in no worse case than they were before; while they will have given the County Council and the public to understand what they would wish to do if they could have their own way. This desire may or may not be altogether admirable. The public will have a means of judging between the Company and the County Council when the bulk of the Company's mileage is worked in the manner proposed. Not before.

Our contemporary the "Electrician" supports the Company; agreeing that disadvantage to the public will result if the Company are compelled to have three dead-ends to an otherwise through and complete electrical system worked by horse haulage, "in place of enjoying one unbroken mode of traction from end to end of the lines." This is just the point which the public may well be left to appreciate. On the face of it, there is no particular reason why the break between horse and electric traction should not occur in one place as well as at another. It is not as if this Tramways Company had the whole of London to deal with. Nobody proposes to hand over the central thoroughfares of the Metropolis to the joys of electric tramcar working by the trolley wire. This may be a source of pleasure to Stockton and Middlesbrough; but Ealing and Shoreditch will not be connected in this way yet awhile. Hence the best and most extensive western metropolitan electrical tramway must have an end inwards as well as outwards; and is there not enough scope for the trolley wire outside the County Council area, without troubling the latter body to reconsider their declared policy? Why not let the facts speak for themselves, when they are realized? It must not be overlooked that the Tram Company have made the County Council a handsome offer with a view to gaining consent to the scheme. The Company would be prepared to hand over to the Council, without charge, all the electric-line equipment which is outside the purview of the purchase clauses of the Tramways Act, 1870. They would further agree to remove the overhead equipment at a year's notice, if deemed undesirable, and would engage to substitute for the system any better mode of electric traction which may in future be commercially developed.

This is a better way of talking. The world may consent to endure the overhead trolley system of tramway working for want of something less unsightly and dangerous; but it is a reproach to modern electrical science, not a credit, that nothing of the kind is available. None but the most perfunctory of enthusiasts for electric traction at all costs would consent, say, to Piccadilly Circus being delivered over to the overhead trolley system. In resisting the threatened encroachments of the system on the outskirts of the town, the London County Council are only acting consistently with the principle underlying the objection to its advance into Piccadilly Circus. They are waiting for something better; and until this appears, they are justified in protecting the region committed to their charge from unnecessary inroads. It is idle to throw names of other places at the London County Council, as though London were at all susceptible of being classed with any other city or town of the whole world as regards street traffic. Parliament, in its wisdom, has sanctioned a trial of electric traction below the central regions of the Metropolis, and away in the suburbs. Let it approve itself under these diverse conditions, before asking for further patronage. It is greatly to be desired, meanwhile, that some better system of working electric tramways than by the single overhead trolley could be perfected. Owners of gas and water mains in the thoroughfares marked out for "improvement" in this way cannot look without misgiving upon the prospect thus opened before them.

**Municipal Engineering Classes at University College.**—A new branch of the work at University College, London, has been started, with the support of the Chadwick Trustees, in connection with the teaching of municipal engineering. Mr. Osbert Chadwick, M.Inst.C.E., has been appointed first Professor; and Mr. M. T. Ormsby will be in charge of the drawing office. Special courses of lectures are to be delivered by Mr. R. E. Middleton and Professor Corfield, on "Water Supply, Sewerage, &c.," and on "Hygiene and Public Health." The Trustees have made a grant of £1000 to the College for increasing the laboratory equipment.



# THE EVIL OF UNPROVED ASSUMPTIONS IN PHYSICAL SCIENCE.

THE liability of the human mind to bind itself with the shackles of preconceived ideas, is one of the humbling lessons of history. Time and again a retrospect of the development of some department of man's work in the past shows how much observance has been paid to imaginary conditions which had no justification in fact, and how persistently mankind has followed self-imposed rules which were absolutely groundless. Medical men of the present age are apt to exhibit impatience when reminded of the empirical practices of their predecessors in the art of healing—practices which were followed for centuries before the practitioners awoke to the fact that they had never cured anybody. The followers of Galen and Hippocrates, however, have not been the only self-styled men of science to become lapped in hoary tradition, to the exclusion of the light of truth. Every art and science has similarly suffered hindrance and limitation through the same evil. In his presidential address to the Mechanical Science Section of the British Association (see *ante*, p. 589), Sir J. Wolfe Barry made some instructive remarks upon the unfortunate influence exercised down to the present day upon engineering achievement by baseless theorizing and erroneous deduction from facts true enough so far as they go. His observations upon this head should be deeply pondered by all engineers.

The speaker began by referring to the history of the Great Western steamship. This was a new departure in the naval architecture and marine engineering of the day, and as such the enterprise of her designers met with much discouraging criticisms from "authorities" who presumed to know all about it. Foremost of these was the redoubtable Dr. Lardner, who at the meeting of the British Association in Bristol in 1836 made the public declaration that the whole idea of ocean navigation on voyages as long as from Bristol to New York was an "abstract impossibility." It can be easily imagined how difficult it must have been for the builders of the ship to go on with the work in face of such condemnation. As a matter of fact and of history, they did go on. The steamship was launched in 1837, sailed from Bristol in 1838, and arrived at New York, in fourteen days, with 200 tons of coal in her bunkers. It is like a breath of bracing air to hear such tales of the triumph of human daring and perseverance over the equally human evil of ignorance masking as complete knowledge. Those who are jealous of the fame of science in general, and of Dr. Lardner's reputation in particular, have sought to minimize the part played in this business by the eminent philosopher in question. Sir John Barry, however, will not have him or his science whitewashed in any such way. Dr. Lardner's views, hostile to the success of the first Atlantic steamship, were arrived at after calculation and reasoning, and were boldly and honestly enunciated by him. These conclusions were based on principles which he supposed to be sound, but which were, in fact, assumptions. The opposition between Lardner and Brunel was typical. Lardner believed that the resistance to the progress of a ship varied directly with her capacity; that a certain number of tons of coal were required per horse-power for the voyage across the Atlantic; and that, this being so, enough fuel could not be carried in a ship, however large she might be made. Brunel, on the other hand, contended that Lardner's views were fundamentally erroneous; for that, whereas the capacity of a ship increased in the ratio of the cube of her dimensions, the resistance to her progress varied not in the ratio of the cube, but nearly as the square of her capacity. Thus, by adopting a proper length, beam, and draught, a ship would not only carry coal for the journey to New York, but be commercially successful in respect of cargo and passengers. The event proved Brunel to be in the main right, although later science has shown that the speed and fuel consumption of steamships are dependent chiefly upon certain considerations of which he was necessarily ignorant.

Sir J. Barry's motive for raking up this old controversy was a desire to exhibit the danger of reasoning on unascertained premises. He went on to recount another instance that comes closer home to gas engineers—the unfounded assumptions with regard to wind pressure which have been used to condemn engineering structures of an extraordinary character, notably the Forth Bridge. When the design for the Forth Bridge had been selected by the Railway Companies who were to pay for it, and had passed the ordeal of a parliamentary inquiry, a most distinguished man of science (the then Astronomer Royal) promulgated the opinion that the proposed structure would be unsafe and ought not to be constructed, because the engineers had neglected certain laws which he enunciated respecting the resisting power of long struts to buckling. Taking the conventional value of wind pressure into account, Sir George Airy stated in a letter to a newspaper that "we may reasonably expect the destruction of the Forth Bridge in a lighter gale than that which destroyed the Tay Bridge." This was a most serious indictment; but it was, in point of fact, baseless. Another distinguished mathematician publicly criticized the Forth Bridge with equal vigour, "basing his views that it was fundamentally incorrect on another set of equally erroneous assumptions, maintaining again that it should not be permitted,

because he proved by reasoning on these assumptions that it must be absolutely unsafe." This is pretty bad for the theorists and mathematicians; but Sir J. Barry goes on to show that it is not only the men of science who occasionally obstruct the advance of engineering. So-called practical men are equally prone to assert the existence of conditions which are purely imaginary. He cites the example of Mr. W. Froude and his experiments with ship models. Until these were begun "on the highly difficult and almost insoluble causes of the retardation of ships and their behaviour in waves—beginning at the beginning, taking nothing for granted, and eliminating all elements of possible errors—little or nothing was known of the laws governing these questions. Laws had been laid down by high authorities as to the causes of retardation of ships, many of which in fact were not true, while some of the assigned causes were non-existent, and some real causes were unrecognized." Mr. Froude was told that the behaviour of his models would never teach anything applicable to the moulding of full-sized ships; but he went on, and now it is the outcome of his *a priori* depreciated experiments which determines the shape of every ship in the Royal Navy and not a few in the Merchant Service.

Reverting to the question of wind pressure, of which so much was heard when the design of gasholders was in course of revision, ten years ago, Sir J. Barry discussed it as an example of "hasty generalization." The responsibility for this begins with Tredgold, who, sound engineer that he was, laid down in 1840 that a wind pressure of 40 lbs. per square foot should be provided for in calculating the strength of roofs. He reasoned, no doubt, from the fact that such a pressure had in this country been registered on a wind gauge of a square foot or less in area. As a consequence, and quite naturally, Tredgold assumed that the same force could be exerted by the wind on areas of any dimensions. He put the rule into his famous book; and thenceforward it became imperative to allow for a wind pressure of 40 lbs. per square foot of the whole exposed surface of a bridge, roof, or other structure similarly conditioned. In 1879 the Tay Bridge fell. Its piers had not probably been strong enough to resist a wind pressure sideways of one-fifth this amount. Sir J. Barry passed over the real cause of this deplorable mishap. It was sufficient for his purpose to cite the disaster as having instigated the Board of Trade to order in 1880 all railway bridges throughout the kingdom to be designed to resist 56 lbs. of horizontal wind pressure on their whole exposed areas, with the ordinary factors of safety for the materials employed, as if such horizontal strain were a working load. This order is still in force.

Meanwhile, it had long been suspected that these small-gauge experiments were untrustworthy. Experiments were instituted at the Forth Bridge on two wind gauges of 300 square feet and  $1\frac{1}{2}$  square feet respectively. These indicated that, with an increase of area, the pressure fell off in a very marked degree. Under the same conditions of wind and exposure, the larger gauge registered a pressure  $3\frac{7}{8}$  per cent. less per square foot than the smaller gauge. Sir J. Barry has been able to carry the experiments further at the Tower Bridge, by observing the pressure on the surface of the bascules of the bridge as evidenced by the power exerted by the actuating engines. He said: "In this case we have a wind gauge of some 5000 feet in area, and it has been shown that, while small anemometers placed on the fixed parts of the bridge adjoining the bascules register from 6 to 9 lbs. per square foot, the wind pressure on the bascules is only from 1 to  $1\frac{1}{2}$  lbs. per square foot." This is an astonishing discovery. Sir J. Barry went on to remark that "it is difficult to imagine the amount of money which has been wasted in unnecessary provision against wind strains of 56 lbs. per square foot on large areas, in consequence of this hurried generalization from insufficient data." He knows something of what this provision cost at the Tower Bridge, and does not wish to mention it. Yet what can an engineer possibly do, when he has to get his plans passed?

The gas engineering world knows well what a tempestuous controversy, of any amount of "wind-power" in itself, was aroused by the suggestion to abolish or substantially modify the lofty framing of gasholders, for the reason that the conventional provision against wind-strain was extravagant. Every constructor who took part in this discussion had had Tredgold's 40-lb. rule rubbed into him from the day of his entrance into the drawing office, and most of them could not emancipate their ideas from it. Yet the truth was with the few who ventured to doubt the fact of any gasholder having been exposed to such an overturning pressure as that of 40 lbs. per square foot of its windward side. The application to gasholder guiding of the Pease wire-rope system has enabled direct measurement of the overturning pressure to be made; and this has been found to be far below what was expected. Engineers will heartily echo Sir J. Barry's declaration that "we should exert all our influence against rules or calculations based merely on hypothesis, and not be content with assumptions when facts can be ascertained, even if such ascertainment be laborious and costly."

But it is not sufficient to ascertain facts, which are apt to prove as misleading as figures unless properly used. In engineering progress, the operation is always that of extending from the known to the unknown; and the uncertainty as to the result proceeds not more often from the use of undetermined data than from insufficiency of such data as are certainly known to bear the construction sought to be put upon them. The question of wind pressure is a particularly glaring example of the latter rather



than of the former possible source of error. Tredgold was correct as regards his starting point; but the error crept in when his datum was treated as a unit, to be multiplied *ad infinitum*. We may get our experimental results quite accurately, and yet fail to reason from them correctly. An illustration of this kind of failure is the obstacle that was placed, and remained for years, in the way of gaseous firing for industrial furnaces, by an imperfect understanding of the calorific tests of carbon burnt to carbonic acid and carbonic oxide. There was no doubt that carbon burnt to carbonic oxide, and this again burnt to carbonic acid, gave a much lower total calorific return than carbon burnt directly to carbonic acid. All the physicists said so; and, of course, all the text-books on heat faithfully reproduced their dicta, until Mr. Frederick Siemens was able to come and sweep all this teaching away. It was the same in regard to the principle of the regenerative gas-burner. Careful experimenters looked into the principle, and reported that there was nothing in it. But again the theoretical impossibility was proved to be a practical success. When the incandescent gas-burner first came out, there were not lacking those who shook their heads over the proposal to get more light out of gas by making its heat act upon a foreign body than could be obtained by burning its "natural" carbon. Many more illustrations of the risk of relying upon *à priori* assumptions in the arts and sciences might be adduced.

There is another side to the picture drawn by Sir J. Barry—the too frequent presumption of outsiders that because the experts are sometimes shortsighted or mistaken, they do not know more of their own subjects than an uninstructed member of the general public. Let an outsider attempt to formulate such a criticism of physical science and engineering as this address of Sir J. Barry, and he would quickly discover that there is a good deal to be known about such matters before anyone can perceive their shortcomings. With all his candour, Sir J. Barry spoke to the initiated, and not to the populace; and only the former can hope to profit by his warnings.

#### GAS ACTS FOR 1898.

WE commence to-day our notice of the gas and water legislation of the year. The following Acts of Parliament, relating either wholly or in part to gas supply, were passed last session:—

The Clacton-on-Sea Gas and Water Act incorporates with statutory powers a Company formed in 1875. The Company obtained a Provisional Order in 1876, and again in 1885. At the time of going to Parliament, the subscribed and paid-up share capital of the Company was £20,000 of original 10 per cent. capital, and £10,000 of additional 7 per cent. capital; with a loan of £12,500. By the new Act, the capital is increased to £40,000, whereof £30,000 is called the original capital, and £10,000 is the new 7 per cent. capital. Though the whole of the old capital is thus called "original," the rates of dividend payable in respect thereof remain as before. Borrowing powers to the extent of one-fourth of the share capital are granted, without prejudice to the existing loan. The gas and water undertakings are to be divided. The gas limits are the urban district of Clacton, in the county of Essex. The maximum price of 15-candle gas is 6s. per 1000 cubic feet. Four per cent. interest is to be allowed on consumers' deposits. An agreement dated April 15, 1898, between the Company and the District Council, for the transfer of the undertaking is scheduled and made binding. The consideration for the sale of the property is to be a lump sum to be ascertained, if necessary, by arbitration under the Lands Clauses Act, as for a compulsory sale, together with a further sum of £4000 (in full discharge of all claims for back-dividends and compensation to directors, officers, and servants) and the taking over of the mortgage debt.

The Cromer Gas Act incorporates a Company formed in 1874. A Provisional Order was obtained in 1876. The authorized share capital consisted of £5000 in 10 per cent. shares; £5000 in 7 per cent. shares; and £5000 borrowed on mortgage. The limits of the Act are the parishes of Cromer, Overstrand, Runton, and North Repps, all in the county of Norfolk. The capital of the Company is stated to be £72,000 ordinary 5 per cent. stock, whereof £17,000 is to be divided among the old shareholders in the manner following: £9500 is apportioned to the holders of the one thousand £5 shares in the limited Company entitled to a 10 per cent. maximum dividend, at the rate of £9 10s. of ordinary stock in respect of each share; and £7500 of ordinary stock is to be similarly apportioned to the holders of the £5 shares of 7 per cent. in the old Company. New ordinary stock to the amount of £55,000 may be issued, with borrowing powers to the extent of one-fourth. The initial price of 15-candle gas is 4s. 6d. per 1000 cubic feet, with a sliding-scale of 2s. 6d. per cent. of dividend for a penny up or down in the price. Certain lands are to be compulsorily purchased. An agreement between the Company and the trustees of certain lands is scheduled and confirmed. Pipes may be laid in undedicated roads. No penalty is to accrue for unavoidable defects of supply, with the proviso that insufficient capital is not to be pleaded as an excuse. In the event of a consumer's meter being proved defective, the erroneous registration "shall be deemed to have first arisen during the then last preceding

quarter of the year, unless it be proved to have first arisen during the current quarter."

The Rhymney and Aber Valleys Gas and Water Act incorporates a Company for consolidating and extending the supply of gas in a region mainly lying in the watershed of the Rhymney River, in the counties of Monmouth and Glamorgan. The capital of the Company is £280,000, whereof £80,000 is gas capital, with the usual borrowing powers. There are eight schedules to the Act dealing with the various interests concerned. The gas undertakings amalgamated or bought up according to the terms of the scheduled agreements are: The Rhymney Gas Company, Limited, the New Tredegar Gas and Water Company, Limited, the Rhymney Valley Gas and Water Company, and the Caerphilly Gaslight, Coke, and Water Company, Limited. All the gas lands occupied by these undertakings are vested in the Company, whose maximum price for 15-candle gas is 5s. 6d. per 1000 cubic feet. The gas is to be tested upon each works used as a separate source of supply. The Rhymney Valley proprietors are to receive share for share in the new Company. The Rhymney Company's proprietors are to be bought out at the price of £20,475. The proprietors of the Caerphilly Company are similarly bought out at the price of £6000. Sanction is given for the acquisition by agreement only of the undertaking of the New Tredegar Gas and Water Company, Limited.

The St. Anne's-on-the-Sea Gas Act incorporates a Company formed in 1875, who obtained a Provisional Order in 1876, fixing their capital at £15,000. A portion of the undertaking was purchased by the Blackpool Corporation, under the powers of their Improvement Act of 1893. Of the Company's prescribed capital, 1409 shares of £5 have been issued as ordinary shares, and 1168 as preference shares entitled to a cumulative preferential dividend of 7 per cent. There was also a loan of £13,000. In 1886, the Company created a contingent yearly rent-charge of £268 in favour of the St. Anne's-on-the-Sea Land and Building Company, Limited, in discharge of a debt of £5370 17s. No dividends whatever have been paid on the ordinary shares of the Company; and the preference dividend is in arrear. The capital of the Company is increased to £60,000, by the addition of £45,000 of 5 per cent. capital. Further borrowing powers are conferred, under special conditions. Additional gas lands are to be acquired compulsorily within two years; and a subway under a railway is to be constructed. The maximum price of 15-candle gas is 5s. per 1000 cubic feet. Three per cent. interest is to be allowed on consumers' deposits. The period of error in defective meters is to be limited to the quarter preceding the testing, unless it shall be proved to refer only to the current quarter. Power is given for the inspection of interior gas-fittings in new buildings, with the right of refusal to supply in case of defect. Tenants are made liable for sub-tenants' gas accounts up to three months. Gas-pipes may be laid in undedicated roads in the district.

The Sherringham Gas and Water Act incorporates a Company formed in 1887, who obtained a Provisional Order in 1888 giving them a district comprising the parishes of Sherringham and Beeston, in Norfolk, and a gas capital of £6000. The Act adds £12,000 of 7 per cent. stock to the gas capital, with the usual borrowing powers. Surplus lands may be leased or sold. The Company obtained the sliding-scale by their previous Order, ten years ago.

The Stirling Gas Act incorporates a Company originally formed by a contract of copartnership in 1845. The capital stock of the Company was £12,400, with power of augmentation to any sum that might be deemed expedient by two-thirds of the partners present at a general meeting convened for the purpose. There was no limit to the dividend. In 1878, the Directors, taking into consideration the fact that from time to time large sums from the revenue of the original Company had been laid out in forming additions to the works and plant, of which no systematic account had been kept, had a valuation made, and found that the works represented £30,000. The process went on as before; and when they came to Parliament, the original Company had no debt. The capital now consists of a sum of £40,000 2s. 6d. of original capital and £10,000 of new authorized 5 per cent. capital. Of the former amount, £24,000 is "A" capital, entitled to 10 per cent. dividend; the balance being 5 per cent. "B" capital. The usual borrowing powers are conferred in respect of all the share capital. The Company's books are to be made up to May 15 in each year. Surplus lands may be leased or sold. Three per cent. interest is to be payable on consumers' deposits. The sliding-scale is applied, with the initial price of 3s. 4d. per 1000 cubic feet for 25-candle gas. Discounts up to 10 per cent. may be allowed. The period of error in the case of defective meters is limited to the current quarter, unless the contrary is proved to the satisfaction of the inspector who tests the meter.

The Whitwick and Coalville Gas Act incorporates a Company formed in 1859 for the purpose of supplying with gas the parish of Whitwick, in Leicestershire. The old share capital consists of £8000, besides a loan of £2500. The works have been improved out of revenue to the amount of £2000. The limits of the Act are defined. The capital of the Company now consists of £8000, representing the 10 per cent. share capital of the limited Company; £2000 called capital stock "B," earning 5 per cent., and representing the improvement expenditure out of revenue; and £5000 additional 7 per cent. capital. Capital



stock in the original Company is transferable in sums of five shillings and multiples thereof. Clause 32 enacts that the Directors may, if they think fit, annually appropriate out of the revenue of the Company, and as part of the revenue account, any sum not exceeding  $1\frac{1}{2}$  per cent. on the paid-up capital as a renewal fund. This fund may accumulate until it amounts to 5 per cent. on the paid-up capital, and does not exceed £1000. This is additional to the customary insurance fund. The usual borrowing powers are given. The sliding-scale is enacted, operative for every half year, with an initial price of 4s. 2d. per 1000 cubic feet of 15-candle gas, tested on or within 200 yards of the works. Pipes may be laid in undedicated roads. "All fittings connected with any service gas-pipe to communicate with the mains and pipes of the Company which shall be provided by any person, shall be placed and removed under the superintendence of the Company, and at the expense of such person." Prepayment for supplies of gas may be required in certain instances. Error in the case of defective meters shall be deemed to have first arisen during the then last preceding quarter of the year, unless it be proved to have first arisen during the then current quarter. Discounts up to 20 per cent. are sanctioned. If the Coalville Urban District Council shall introduce a Bill in Parliament next session to enable them to purchase the undertaking, the Company are only to oppose on clauses. Arbitration upon the transfer price is to be under the Lands Clauses Acts, on the basis of compulsory sale. In addition to the ascertained value of the undertaking, the Company are to receive the actual costs of the Act, and the costs of winding up and compensating officers and servants; but the arbitrator is not to have regard to the fact of the Company being incorporated by Act of Parliament.

#### ACETYLENE PLANT FOR HOUSE SUPPLIES.

THE most promising sphere of usefulness for acetylene at present appears to lie in the supply of buildings which are placed out of reach of the ramifications of the mains of gas-works undertakings. Undoubtedly acetylene has a very legitimate application in this direction. The difficulties of its safe generation must, however, be completely overcome; and the gas must be adequately purified. The odour of the unpurified gas must not be in evidence within the immediate precincts of a dwelling-house; for it is sufficiently objectionable and potent to cause many to refuse to use acetylene solely on account of its prevalence wherever an acetylene installation is placed. We give the organizers of the late Acetylene Exhibition at the Imperial Institute credit for recognizing this fact, and for placing the generating plant far enough from the public galleries to prevent casual visitors complaining of the odour. In that instance, also, the best carbide was used, and the generators were not cleaned or re-charged during the hours when the Institute was frequented by the public. But other cases might be quoted to show that the precautions taken there to prevent the smell of the gas asserting itself at inconvenient times were necessary in order to avoid a bad impression of the new illuminant being created. In many instances in which acetylene is used, there is no doubt the uninitiated do not locate the source of the most objectionable smell, as they certainly would have done at the exhibition at the Imperial Institute had it not been carefully suppressed. But at the International Universal Exhibition at Earl's Court there are some acetylene installations; and the first warning a visitor receives of their proximity is the objectionable odour of impure acetylene. If he is familiar with it, he naturally looks for acetylene flames among the myriads of other lights, and discovers them perhaps thirty or more feet distant! If he is not familiar with the odour, and does not naturally associate it with acetylene, the connection between it and the small bright flames he sees escapes notice. Most of these acetylene lights are virtually in the open air; and the odour therefore would be much more strongly in evidence were the installation situated within a building. It is very essential that acetylene plant to supply dwelling-houses should be placed not less than ten yards from them, and should include purifiers capable of removing objectionable impurities from the gas.

Generators in which the feed is automatically controlled according to the consumption of gas are usually unreliable, and few (if any) are suitable for providing the gas supply for a house. Generators of which the action is not subject to automatic control are numerous; and in our articles on the exhibits at the Imperial Institute, we mentioned several which appeared to be free from grave faults. Among these was one made according to the patents of Professor Raoul Pictet (see *ante*, p. 251). The Berlin Company which owns Professor Pictet's German patents has modified the apparatus in several respects, and, according to the "Journal für Gasbeleuchtung," has greatly improved it. In the present form of the German generator, lumps of carbide are dropped through an opening in the side of a feeding-shoot attached to one side of the generator. The opening is closed by a weighted flap-valve, except when the valve is lifted by hand for the purpose of introducing carbide. The base of the feeding-shoot is inclined, and opens into the generator, in which is an inclined grid, down which the carbide rolls as it falls from the shoot. The generator and shoot contain water, which stands at a somewhat higher level in the shoot owing to the small back-pressure thrown by the purifiers on the gas in the upper part of

the generator. There is an overflow-pipe from the shoot, by which water can escape when the evolution of gas in the generator causes the level of the water in the shoot to rise above the orifice of the overflow-pipe. Water is introduced when necessary through the shoot, and air is completely expelled from the generator through a cock in its top, by filling that vessel with water before any carbide is introduced, and then passing purified acetylene from the gasholder into the generator until the working level is established. The way from the generator to the purifiers is next opened. Carbide is then introduced through the shoot, and rolls down the inclined surfaces to the side of the generator which lies opposite the shoot. The gas evolved cannot, therefore, pass up the shoot, but collects in the upper part of the generator, and passes on to the purifiers; while the water it displaces escapes by the overflow-pipe from the shoot. The carbide, as soon as it enters the apparatus, is completely immersed in water; and therefore there can be no after-development of gas. The pressure in the generator cannot become excessive, as it is limited by the water-seal in the shoot. A mixture of air and acetylene cannot occur in the generator. The operation of generating the gas is thus made simple and safe; and the addition of the special shoot and flap-valve through which the carbide is fed, removes the chief objection to the English form of the apparatus—viz., the very objectionable smell due to the escape into the atmosphere of small quantities of gas.

Great attention is paid to the proper purification of the gas in the German plant. We have always contended that English manufacturers of acetylene plant were too much disposed to ignore the fact that the gas needs purification, even if good carbide is employed in its manufacture. The Pictet acetylene apparatus as made in Germany purifies the gas according to a scheme elaborated by Professor Pictet and Dr. Wolff. The different impurities are removed in turn. The gas is first washed with a solution of calcium or magnesium chloride, by which the greater part of the ammonia and sulphuretted hydrogen in the gas is abstracted. It is then treated with lead acetate and silver nitrate, which remove the phosphuretted hydrogen and whatever sulphuretted hydrogen remains in the gas. It then passes through a desiccating chamber into the storage holder, and it is again dried when it leaves the latter. The purifiers have lids sealed in water lutes, so that any dangerous amount of pressure in the vessels is impossible. The scheme of purification is a systematic one, and should prove efficient.

We have referred to this modification of Professor Pictet's plant, because it appears to have been designed with the care which should be bestowed on an apparatus for the supply of acetylene to an isolated house dependent on it for artificial light. No doubt it is far from perfect in many respects; but it embodies the points which we deem essential in an acetylene plant for house supplies. These are briefly: (1) The generation of the gas by the addition of carbide to water instead of by the converse operation; (2) provision for preventing the overheating of the gas and for avoiding undue pressure and the presence in the apparatus of mixtures of gas and air; (3) provision of a gasholder of sufficient capacity to supply at least the maximum 24 hours' demand; (4) provision of a generator capable of filling the holder in about 20 minutes, so that the plant only needs the services of an attendant for about half an hour daily; (5) provision of adequate purifying apparatus.

It should not be difficult to construct generating and purifying plant which embodies these essential points, and is of simple construction. If such a plant be placed under a simple roof with light supports, at a sufficient distance from the house to prevent any smell which arises during generation penetrating to the interior of the house, it should be free from the objections which are legitimately urged against the acetylene plants commonly offered for house supply. Granting that a proper plant for the supply of the acetylene can be obtained, there remains the unsettled question of how to burn the gas to the greatest advantage. This question must be answered by the manufacturers of burners, who, however, have so far not succeeded in producing a really satisfactory acetylene burner.

**Inspection of Gas Pipes and Fittings.**—In the course of a report by Mr. C. A. Ball, Inspector of Plumbing to Captain Lansing H. Beach, the Engineer Commissioner of the District of Columbia, he advocates the systematic inspection of gas pipes and fittings. As is well known, lives have been sacrificed through the use of improper appliances for the distribution of illuminating gas; and it is suggested that the Commissioners' powers should be enlarged to provide for the periodical inspection of the principal hotels and boarding-houses, to ensure safety.

**A Pocket Dictionary of Hygiene**, by Mr. C. T. Kingzett, F.I.C., and Mr. D. Homfray, B.Sc., has just been issued by Messrs. Baillière, Tindall, and Cox, of King William Street, Strand. In the compass of 104 small pages, the authors have endeavoured, as far as possible, to give concise information respecting most of the subjects comprehended in the theory and practice of hygiene. Their chief object has been to supply Medical and Sanitary Officers with a pocket dictionary for reference in connection with their work. Six pages are devoted to the subject of water and its purification; lighting and warming being dealt with more briefly. The print is small, but it is very clear.



## PERSONAL.

Mr. J. J. MAYHEW has been elected Secretary of the Southwold Gas Company.

Mr. HENRY POND has been appointed Secretary and Manager of the Marlborough Gas Company in succession to the late Mr. Joseph Phelps.

The personal estate of the late Mr. J. BARKELEY SMITH, Vice-Chairman of the Liverpool United Gas Company, whose death was recorded in the "JOURNAL" a few months ago, has been valued at £92,822; the gross value of the whole estate being put at £97,817.

Mr. T. GREAVES, the Manager of the Melton Mowbray Gas Company, is retiring after thirty years' service, on account, we regret to say, of failing health. His successor is to be Mr. GEORGE H. DUNCAN, the present Manager of the Gorebridge (Midlothian) Gas-Works.

Mr. W. H. HUMPHREY, Chief Accountant of the West Hartlepool Gas and Water Company, has been elected Secretary and City Manager of the York Water-Works Company—a post which was recently advertised in the "JOURNAL." Mr. Humphrey received his training in the office of the West Hartlepool Company, and has remained in their service; rising to the highest position in his department. His present employers highly appreciate his ability and devotion to duty; and, while they are sorry to part with him, they are highly pleased that his many excellent qualities have received recognition by his appointment at York.

Mr. WILLIAM WELCH, the Superintendent of the Aston pumping-station of the Birmingham Water Department, last Friday completed his term of service with the Corporation, and retired on superannuation. Mr. Welch entered the service of the late Water Company on July 1, 1863, as Superintendent at Aston, and has held the position continuously since that date. He was on Friday presented with a gold watch as a parting token of respect from the members of the staff and the workmen at the station. The presentation was made by the Secretary in the presence of the contributors; and Mr. Welch feelingly and appropriately acknowledged the gift, and bade farewell to his old associates.

## OBITUARY.

We regret to learn that Mrs. NORTH, wife of Mr. William North, of Stourbridge, died suddenly last week.

The death is announced of Mr. JOHN PANTON, one of the Directors of the Blairgowrie Gas Company and Chairman of the Blairgowrie Water Company.

Mr. W. G. SANDFORD, the Chairman of the Cromer Water Company and a Director of the Gas Company, died suddenly last Friday morning from hemorrhage of the brain. He was well known in the locality.

We regret to record the death, after a short illness, of the Right Hon. Sir ARTHUR B. FORWOOD, M.P., whose name will be familiar to our readers from his connection with the municipal affairs of Liverpool. He entered the Town Council in 1871, and six years afterwards he was chosen Mayor. In 1880 he was elected an Alderman—a position which he held, with a brief interval of a month, until his death. It was at his initiative that many much-needed sanitary reforms were undertaken, that Acts of Parliament were obtained for the erection of workmen's dwellings, that the city loans funding scheme was adopted, and that the tramway and electric lighting undertakings were purchased by the Corporation. Curiously enough, he was an uncompromising opponent of the Vyrnwy water scheme, on account of its great cost; and it is curious to recall the fact that, though overwhelmingly approved by the ratepayers, the project was carried in the Council by a majority of only one. Two years ago, Sir Arthur's name came prominently before our readers as the Chairman of the Lighting Committee of the Corporation, a Special Sub-Committee of which conducted a searching inquiry, with the assistance of Mr. Charles Hunt, into the relations existing between the Municipality and the Gas Company. The conclusion they came to, it may be remembered, was unfavourable to the purchase of the Company's undertaking; but this was not endorsed by the Committee. The Council adopted their report, and referred to the Committee the question of the best means of carrying out its recommendations. The further progress of the matter will be in the recollection of our readers. Sir Arthur was a keen politician, and the recognized leader of the Tory party in Liverpool. At the General Election of 1885, he was returned by a large majority for the Ormskirk Division of Lancashire, and in the following year was appointed Parliamentary Secretary to the Admiralty—having a few months previously become a member of the Privy Council. He was created a baronet in 1895. Lady Forwood and eight children survive him. At a special meeting of the Liverpool Constitutional Association, held last Thursday, the Chairman (Mr. E. Lawrence, the Chairman of the Liverpool United Gas Company), paid a warm tribute to the memory of the late Baronet, and a resolution was passed expressing the sense of the Association of his great services to the Conservative party. The funeral took place on Friday, at Childwall.

## NOTES.

## A Test for Phosphuretted Hydrogen.

A convenient test for phosphuretted hydrogen in acetylene or other gases is described by Herr J. L. C. Eckelt, in a recent number of the "Zeitschrift für Angewandte Chemie." A large test-tube or a bottle is inverted; and a cork perforated in three places is fixed in its mouth. The central perforation carries a rod bearing at its top two hooks or clips, which hold slips of prepared paper. The other two perforations serve for the inlet and outlet tubes for the gas, which is thus passed through the vessel and envelops the slips of prepared paper. The gas prior to admission to the apparatus is freed from sulphuretted hydrogen by means of the hydrate of an alkali or alkaline earth. The paper is prepared by saturating it with a solution of silver nitrate. The gas, on coming in contact with the slips thus prepared, will not affect them if it is free from any sulphuretted hydrogen and phosphuretted hydrogen. As the sulphuretted hydrogen is previously absorbed, a blackening of the paper indicates that phosphuretted hydrogen is present. Even traces of this impurity form silver phosphide, which in the presence of excess of silver nitrate is converted to gray metallic silver, which gives the paper a dark colour. The central rod, if prolonged below the cork, may fit into a suitable stand for holding the apparatus in an upright position during use.

## Gas Lighting and Fire Prevention.

The approach of the winter, with its evening entertainments, suggests that gas managers might well take the opportunity for bestowing a little attention upon the lighting arrangements of the public buildings and assembly rooms in their districts, with special regard to the question of safety in the event of fire and panic. The fashionable employment of electricity for this class of lighting in populous places, does not absolve gas from the duty of watching over the safety of audiences—indeed, it rather increases and accentuates it, by reason of the fact that corridors, staircases, and the approaches to ordinary and emergency exits are still lighted by gas. The electric light would be one of the first things to fail in the event of fire breaking out in a building; whereas gas would go on burning so long as any air remained to support combustion, or the pipes existed in serviceable condition. The ordinary gas supply of a building, public or private, is insufficient to contribute to the seriousness of a conflagration of any magnitude; while the light of the gas-flame may make all the difference as regards the saving of life. Though responsibility in this matter does not come in the first place upon a gas manager, there is a moral obligation upon gas lighting authorities to co-operate as fully as their powers and opportunities permit with those who are directly concerned in seeing that the indoor amusements of the people are as far as possible safeguarded from danger of fire. In this connection, the words of an expert are worth repeating: "Every relaxation beyond what a prudent man would consider safe is in the nature of a wager that nothing shall happen during the whole time that the building will be in existence, which will call for the particular precaution which has been injudiciously omitted. It may be that the wager will be won; but the risk is considerable, and always there."

## The Supply of Material for Incandescent Gas-Burner Mantles.

It is sometimes a matter of speculation whether the available supply of the materials required for the composition of the mantles of incandescent gas-burners will be sufficient to satisfy the demand. The suspicion that these substances may be used up in the course of a few years is apparently justified by the fact that, in the first place, the source of the incandescing material was stated to be the "rare earths;" and it is obvious that the quality of scarcity is incompatible with any large or widely-distributed supplies of these minerals. M. Truchot sets himself to prove in the "Revue Générale des Sciences" that there is no reason for fear upon this score; the sources of thorite, monazite, and zircon being really to all intents and purposes inexhaustible. The truth appears to be that the appellation "rare earths" has become a misnomer. This class of minerals was only rare, or scarce, so long as there was no industrial use for them, and they were only chemical or mineral curiosities. Monazite, the chief source of thorium, was at one time recognized as a residual of alluvial gold washings; but now the chief supply is obtained from sand banks on the coast of Brazil, where the continuous destruction of the rocks by sea action has led to a natural grading of the deposit. There is thus plenty of thorium and zirconium to be had. Valuable deposits of zircon have recently been discovered in North Carolina and Colorado, in Texas, and in Australasia, especially the latter. This notable find, which covers an area of about 105 acres, is situated on the north-east side of Tasmania. It is almost entirely composed of zircon, containing 63 to 64 per cent, of oxide of zirconium, with variable quantities of lanthanum, didymium, thorium, niobium, erbium, cerium, and chromium. M. Truchot therefore arrives at the comforting conclusion that the industry of incandescent gas lighting can never use up the enormous mass of so-called rare minerals actually in sight.

## The Efficiency of Lagging for Steam-Pipes.

All steam users are confronted with the question of lagging as a preventive of condensation; and in the United States, where steam heating is prevalent, incessant studies are directed to the



solution of the problem of preventing loss of heat by covering steam supply-pipes with non-conducting coatings. Some good general conclusions respecting this matter are formulated by M. Compère, the General Manager of a French steam users' society. As the result of prolonged and extensive experiments, M. Compère finds that in uncovered copper steam-pipes condensation is rather less than with iron pipes. An important point is that any substance used for lagging should be efficacious for a slight thickness, because the efficiency of such a coating does not always increase with the thickness of the coating, and may even decrease. This latter effect is by reason of the enlarged surface presented by an over-thick lagging, which may cause more loss than the extra thickness is competent to save by its lessened conductivity. It is generally advisable to varnish plastic coatings. For instance, with cement over cork and not varnished, a loss by condensation of 29·7 per cent. was observed, which was reduced to 21·7 per cent. when the same cement received three coats of varnish. Not only does the varnish exert a good effect as regards condensation; it also retards the disintegration of the coating material. It is a good plan to cover any non-conducting coating with a casing of sheet zinc, which invariably increases the effect. For instance, the condensation of a copper pipe covered with cork was 33·8 per cent., which was reduced to 24 per cent. by enclosing the cork in zinc. The case is summed up in the following proof: The condensation in a copper pipe lagged with cork and cemented was 29·7 per cent. This was reduced to 21·7 per cent. by adding three coats of black varnish; and, by enclosing the whole in zinc, the condensation was further reduced to 19·2 per cent.

## TECHNICAL RECORD.

### INSTITUTION OF GAS ENGINEERS.

#### The Autumn Meeting in Manchester.

The Autumn Meeting of the Institution was held on Thursday and Friday last. The first day the members were entertained with much liberality at Manchester; but there were two disappointing features, which somewhat detracted from the otherwise successful day. One was that rather less than one-fourth of the members were in attendance; and the other, that in the afternoon there was a break in the weather, and the rain which fell seemed to have a damping influence on the spirits and energies of some of the members, a few of whom quietly surrendered the privilege of visiting interesting works at Salford, and retraced their way to the city. The programme was a complete one; and it was manifest that much care had been exercised in the drafting of the arrangements, in order to give the members the maximum amount of enjoyment and instructive sight-seeing between the hour of ten in the morning and nightfall. The *rendezvous* was the Queen's Hotel; and there, shortly before the appointed time, the members were met by their President, Mr. GEORGE E. STEVENSON, who is the Chief Engineer to the Manchester Gas Committee, and has also charge of the Rochdale Road works. By omnibus the members were first conveyed, through one of the most unattractive quarters of the city, to the

#### BRADFORD ROAD STATION.

Here they were gracefully received by Mr. Charles Jennison, the Chairman of the Sub-Committee whose particular duty it is to look after these works. The President was most assiduous in imparting information to his visitors; and he was ably assisted by the Station Manager (Mr. Rodger). As Mr. Stevenson pointed out, the works are extensive, and the plant and buildings are large; but there is little about them that can be characterized as novel. However, a few general particulars may be given of these and the Gaythorn works, by way of supplement to the plans furnished to us by Mr. Stevenson, and which appear on pp. 747-8. The area of the Bradford Road station is above 53 acres; but it is not all occupied. The value of the station stands in the books of the department thus: Land, £126,032; buildings, £188,581; and apparatus, £333,334—a total of £647,947. There are two retort-houses, each containing 28 settings of horizontal through retorts, with nine retorts in a setting. The retorts are of  $\Delta$  section, 24 in. by 16 in. The total manufacturing capacity is about 8 million cubic feet. Both houses are provided with West's stoking-machines worked by compressed air; and the retort-settings are all heated by regenerator furnaces. The coal is delivered by an overhead railway; and the coke is removed by trolleys drawn by horses and running on rails. The condensing plant consists of three Morris and Cutler water-tube condensers and one "Eclipse" condenser, with vertical columns. There are two sets of twin rotary exhausters and engines combined, by Gwynne and Co., each set being capable of passing 280,000 cubic feet an hour; and two sets of twin exhausters and engines, by Laidlaw and Sons, of 240,000 cubic feet an hour capacity. The scrubbing and washing plant comprises four Livesey washers, each of a capacity of 4 million cubic feet per diem, two Kirkham and Hulett rotary "Standard" washer-scrubbers of 2½ million cubic feet capacity, and one Clapham and Laycock washer-scrubber for 3 million cubic feet per diem. The purifying-shed

is 410 feet long, and contains 22 purifiers. A wing has been added with eight additional purifiers for the carburetted water gas. The total area of the purifiers is 27,000 square feet. Some of the members made a mental note of a little "wrinkle" in connection with the purification—that was, the use of a plough for promoting the revivification of the spent oxide. There are four station meters, each of 175,000 cubic feet an hour capacity. The storage accommodation consists of five holders. Four of them are treble lift, of 150 feet diameter, and having a joint capacity of 6,800,000 cubic feet. The other, which is also a treble-lift one, is of recent construction. It is 250 feet diameter; and its capacity is 7 million cubic feet. The portion of the works' plant in which the visitors displayed the greatest interest was the carburetted water-gas installation, which was erected in accordance with the advice, and under the direction, of Mr. Corbet Woodall. The plant consists of four sets of Humphreys and Glasgow's producing apparatus, each of a capacity of 750,000 cubic feet per diem; and it is erected in a building constructed to permit of duplication. The installation also comprises three Lancashire boilers, two blowing-engines and fans, two exhausters with engines, of Messrs. R. & J. Dempster's make, and the necessary pumps, oil-meters, &c. A compensating gasholder, 80 feet in diameter, and an oil-tank are erected at a short distance from the building. At the time of the visit, only two sets of the plant were in operation—making about 1 million cubic feet of gas per day, as against the present production of about 4 million cubic feet of coal gas. Up to now the proportion of water gas to coal gas has not exceeded 25 per cent.; but in this relation we believe Mr. Stevenson's feeling is that one-third of water gas to two-thirds of coal gas would be a serviceable proportion.

Departing from the Bradford Road works, the members were transported to the opposite side of the city, where are situated

#### THE GAYTHORN WORKS.

Mr. Bowes, the Chairman of the Station Sub-Committee, welcomed them; and in the tour of the establishment the President was aided in affording information by Mr. Merrill, the Manager. The area occupied by these works is nearly 9 acres; and they are credited in the books of the Gas Committee with a total value of £250,379—divided as follows: Land, £70,474; buildings, £67,397; and apparatus, £112,508. The retort-houses were first inspected. No. 1, which has been recently constructed, is fitted with 18 settings of inclined retorts, six in each setting, with regenerator furnaces. The retorts are  $\Delta$  shaped, 20 feet long and 24 in. by 14 in. in section, and are set at an angle of 31°. The coal is broken, elevated, and conveyed into continuous bunkers by machinery; and the retorts are charged by means of the usual travelling shoots on the Automatic Retort Company's plan. Plant has been laid down by West's Improvement Company for removing the coke by a drag-chain conveyor, and elevating it into hoppers for loading into carts. At the time of the visit, this was not quite in readiness for working, as had been expected; but the visitors gave a good deal of attention to it, embodying as it does some of the latest improvements which experience has introduced for minimizing the wear and tear to which such plant is particularly susceptible.\* The productive capacity of the inclined retort installation is estimated at about 1½ millions. The second retort-house contains 41 settings of through horizontal retorts of the ordinary type, six retorts in a setting; its productive capacity being about 3 million cubic feet per diem. This house is furnished with Foulis hydraulic stoking-machinery. The condensing plant consists of one large rectangular horizontal condenser, 107 feet long by 22 feet wide and 15 feet deep; and there are three sets of twin rotary exhausters with engines combined, each set being of 100,000 cubic feet an hour capacity. The scrubbing plant comprises 18 scrubbers, 32 feet high and 10 feet diameter; and these are to be shortly supplemented by rotary washer-scrubbers and Livesey washers. There are three sets of purifiers (in all 24 boxes), with a total area of 15,000 square feet. The station meters, three in number, are each of 100,000 cubic feet per hour capacity. To some of the visitors three of the gasholders presented a feature of interest, and that was that the top lift of each is guided by wire ropes on the Pease system. The total storage capacity of the seven treble-lift holders on the works is 6 million cubic feet.

#### ROCHDALE ROAD AND DROYLSDEN STATIONS.

Time did not permit of a visit to these stations; but concerning them it may be stated that the first occupies an area of 9 acres, including the Newtown gasholder station; and the second, about 5 acres. The total value of the land, buildings, and apparatus at the Rochdale Road station is £295,547; and at Droylsden, £27,108. The total manufacturing capacity of the Rochdale Road station is 7½ million cubic feet per diem; and of the Droylsden works, 400,000 cubic feet.

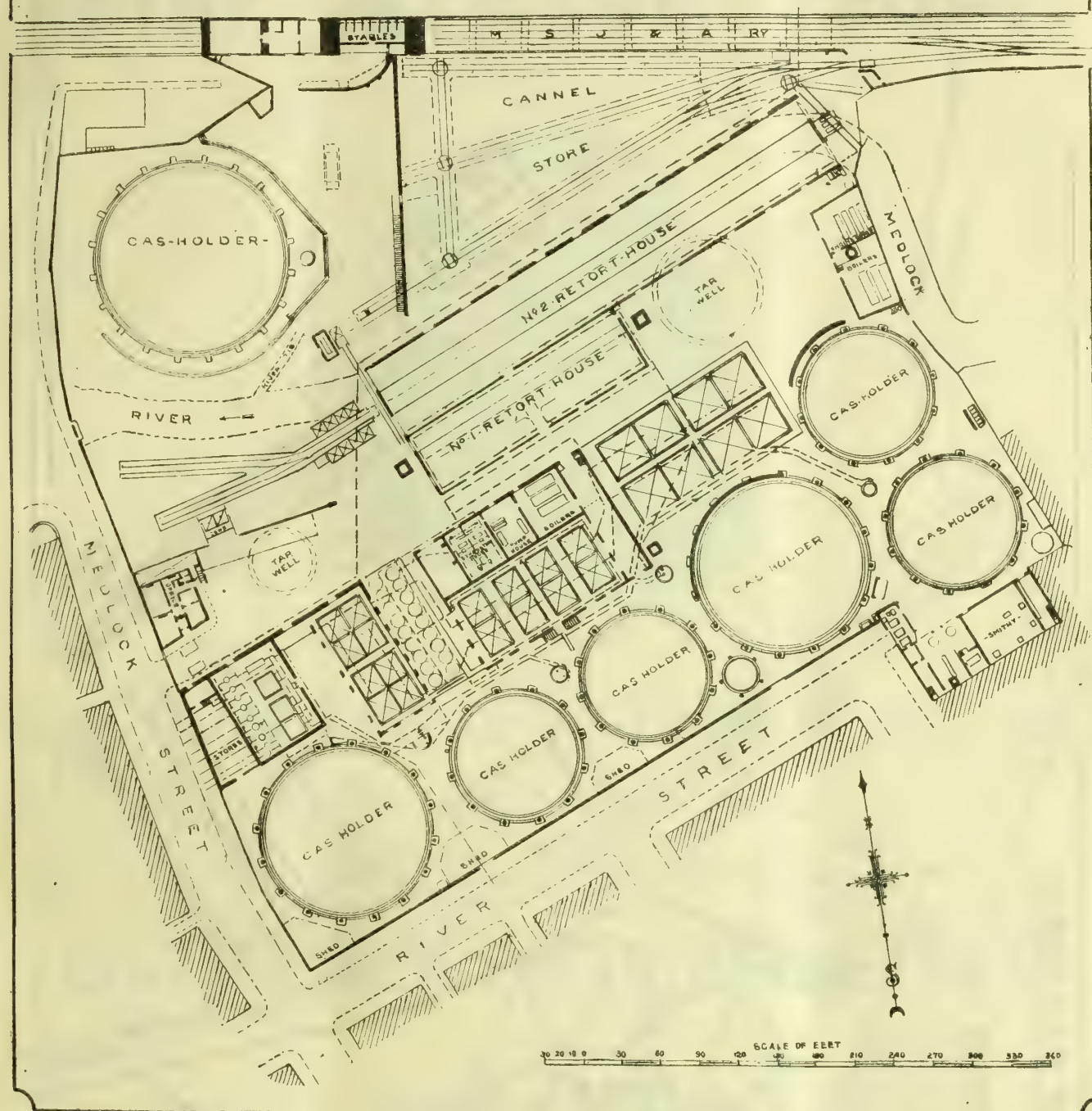
Taking the whole undertaking, the total capital (per book values) is £1,969,333; the productive capacity, 23½ million cubic feet per diem; the storage capacity, 25½ millions; the annual consumption of coal and cannel, 400,000 tons; and the greatest daily consumption of gas, 23,824,000 cubic feet. The mileage of mains is 767½; and their value, £442,101. The number of meters is 104,752; and their value, £167,197. There are 5188 stoves on hire; and their value is given as £23,991.

\* A description of the plant here referred to is given on p. 756. We understand that later in the day it was set to work, and ran satisfactorily.



## MANCHESTER CORPORATION GAS WORKS

## GAYTHORN STATION



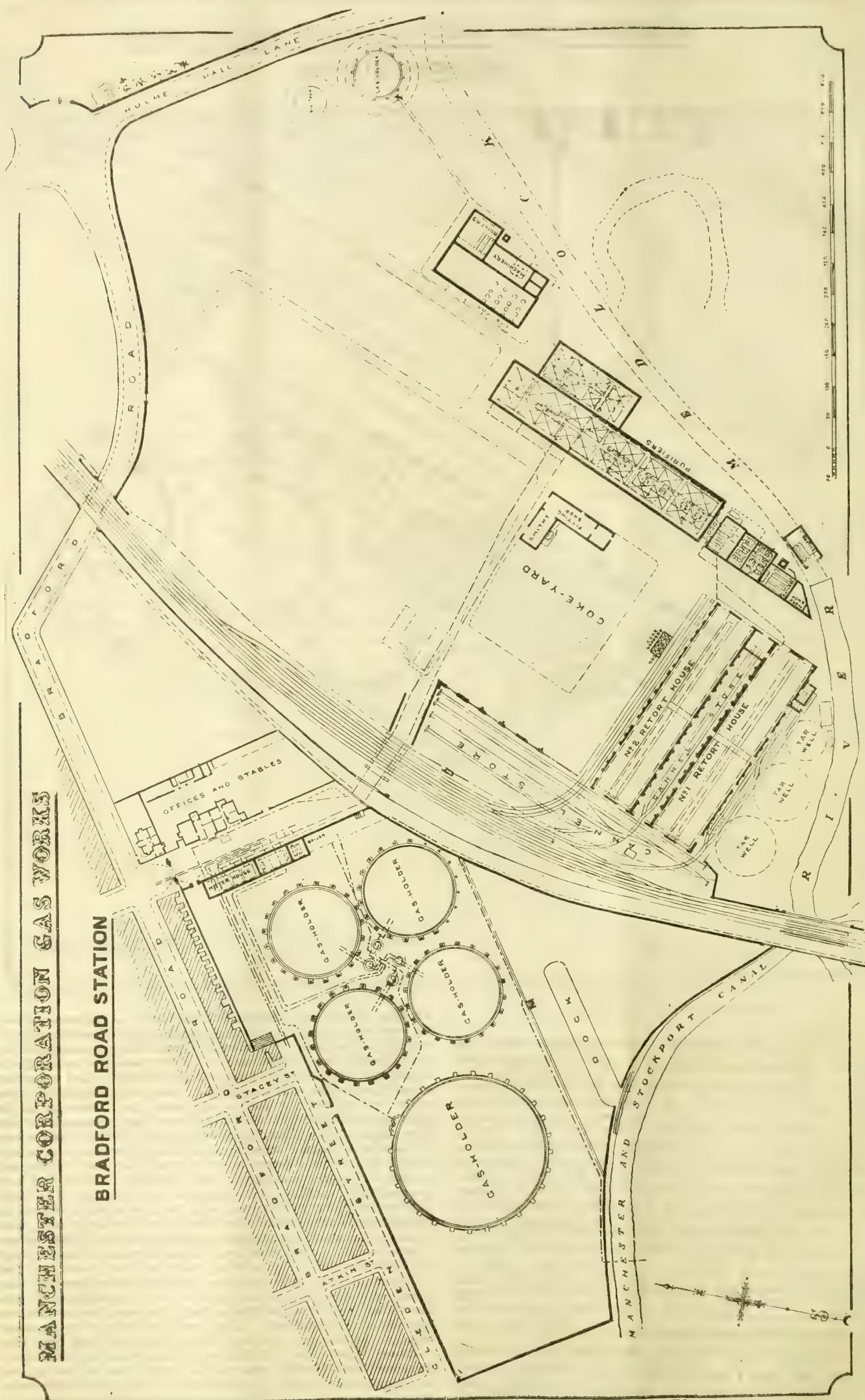
## LUNCHEON AT THE TOWN HALL.

On completing their inspection of the Gaythorn station, the members repaired to the Town Hall, to fulfil an engagement with the Lord Mayor and Chairman of the Gas Committee (Mr. Alderman Gibson), whose hospitality took the form of a luncheon served on a magnificent scale. An interesting surprise was here in store for the members; Lord Roberts, who was staying in the city for a short time as the guest of the Lord Mayor, having accepted the invitation of his host to be present at the function. On entering the banqueting-hall, the distinguished soldier was received by the assembled company with the utmost enthusiasm, which he very genially acknowledged. After luncheon, the Lord Mayor proposed the "Health of the President and Members of the Institution of Gas Engineers;" and the speech which he made indicated that his Lordship takes a genuine interest in matters affecting the gas industry. Below is a summary of his remarks, and also of those made by Mr. Stevenson in reply. Coming as the latter did from the Chief Engineer of a large gas undertaking situated in what may be termed one of the strongholds of The Gas Institute, and in the neighbourhood of Salford, they convey more than their superficial simplicity would indicate to an outside hearer.

The Lord Mayor observed that it was a great pleasure to him to be Chairman of the Corporation Gas Committee at the same time that their Chief Engineer had had conferred upon him the honour and dignity of the presidency of the Institution. He ventured to say there never was a time in the history of this

country when it was more important that gas engineers should be very much alert to the duties and responsibilities attaching to the offices they held. There was no great difficulty about making gas; it was a very simple matter. But it was not so simple to make gas of high illuminating power and quality; and when they stood face to face with that brilliant illuminant electricity, it was of the first importance that gas engineers should exercise all the intelligence, ingenuity, and brain power they possessed, so that they might not be absolutely run out of the field. It was a very extraordinary thing that, not only in Manchester, but everywhere else that he knew of where electricity had become a great and potent factor, the increase in the production of gas had kept pace with the increase in the demand for electricity. In Manchester some four or five years ago, the Corporation started an electric installation (which they then thought a large one), with a maximum capacity of something like 20,000 16-candle power lamps; and they considered it would last a decade at least. But it did not suffice for twelve months; and now he supposed they had 70,000 lamps in Manchester alone. In spite of this, however, they had had a considerable increase in the consumption of gas. He wished to refer to another matter—that was, the troublesome problem of naphthalene. They were suffering from it somewhat in Manchester—perhaps rather more this year than they had ever done before. But his experience was that they did not have so much trouble where a fair proportion of carburetted water gas was supplied. He had had to fight this carburetted water gas question in Manchester against some very powerful antagonists; and the Gas Committee so far succeeded that they







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undertaking in England, who informs Mr. Little: "I have been all over the United States, and have seen no elevators equal in design or durability to your own; and I have come to the conclusion the Americans surpass us only in electric light work." This Engineer-in-Chief supports his belief in the Smethwick manufactures by recommending his Directors to send the order for one of the largest installations of conveyors and elevators ever placed in this country to the New Conveyor Company, Limited.

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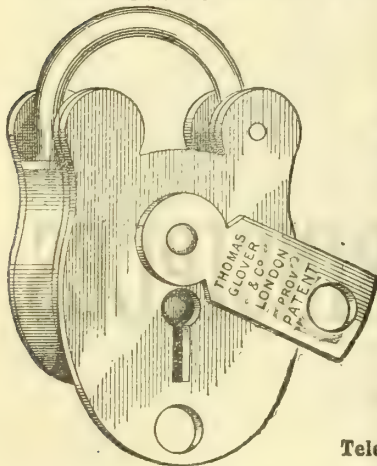
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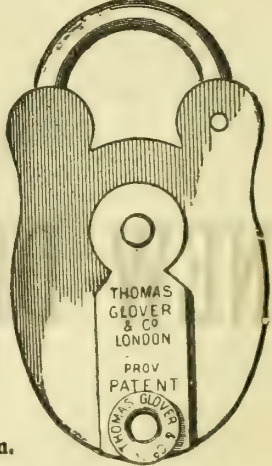
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BRISTOL:

28, BATH STREET.

Telegraphic Address: "GOTHIC."

Telephone No. 1008.

BIRMINGHAM:

1, OZZELLS STREET.

Telegraphic Address: "GOTHIC"

MANCHESTER:

37, BLACKFRIARS STREET.

Telegraphic Address: "GOTHIC."

Telephone No. 3898.

GLASGOW:

ARGYLE WORKS, KINNING PARK.

Telegraphic Address: "GASMAIN."

Telephone No. 1525 South Side.



were able to make carburetted water gas months before their opponents knew of its existence. Some of them, however, discovered great difficulties that had arisen through using water gas quite three months before the Committee commenced to make it (laughter); but they had not discovered them since. He believed that carburetted water gas would become an important factor in the gas industry in the future. The Committee had room for duplicating their present plant; and he should not rest contented until he had the building fully occupied. His Lordship concluded by expressing the pleasure it had given him to entertain the members of the Institution, who, he considered, had paid a distinct compliment to the Gas Committee by selecting Mr. Stevenson as their President.

The President, having sincerely thanked the Lord Mayor for the kind reception he had given the Institution, said it was a great gratification to him to be the President of that body, because it consisted of members whose interests were entirely those of professional men—men holding responsible offices under Corporations and Companies. The distinguishing feature of the Institution was that the members professed that they were not in any way connected with trading undertakings or manufacturing concerns. At the same time, they did not hold trading or manufacturing concerns in any contempt whatever; on the contrary, they knew full well their value. But they felt that as engineers, professionally trained for certain responsibilities and duties, they should not mix themselves up with anything which was not their affair—that they should maintain themselves in a position wholly free from outside influences; so that they might be better able to faithfully devote themselves to the duties and responsibilities entrusted to them. Therefore they made it a *sine quâ non* that the members should not be connected with any business otherwise than that of professional engineers which would give them "an axe of their own to grind." They did not believe in it. They wished to retain the confidence of those for whom they worked; and to do so they recognized that they must be perfectly disinterested. Therefore they came there that day—and he would be pleased if the Lord Mayor and the Gas Committee would so regard them—as a body of professional men who were only seeking the welfare of the undertakings of which they had charge.

#### VISITS TO OTHER INDUSTRIAL WORKS.

Luncheon ended, the members once more boarded their 'buses, and were conveyed to the extensive engineering works of Messrs. Mather and Platt, where, divided into parties, they were conducted through the several departments. It was observed by the visitors (without any visible sign of fear) that the firm were busily employed upon the production of electrical plant; and they saw, many of them perhaps for the first time, something of the fine and intricate nature of the construction of portions of the machinery. The visit was certainly both interesting and educational. Another drive—this time through rain—brought the members to the large spinning and weaving mills of Messrs. Richard Haworth and Co., of Salford. Owing to the shortness of time at disposal, the various processes—complicated to the stranger, but apparently so simple to the operatives—involved in the conversion of the raw material into calicos and other saleable stuffs could only be hastily witnessed. The establishment (like many other of the big factories in the district) is lighted by electricity generated on the premises; the number of lamps in use in this one instance being 3400.

#### THE TRAFFORD GAS TRAMWAY.

It had been arranged that the evening should be spent at the Belle Vue Gardens; but the changed condition of the weather determined a return to the city. Passing Trafford Park, however, the visitors could not resist an invitation to test the capabilities of the new gas tramway by taking a trip as far as Trafford Hall and back. They were shown the gas-compressing arrangements, the method of feeding the cylinders under the cars, and the working and action of the driving and controlling mechanism. Each car is charged with sufficient gas to propel it some 14 or 15 miles; and the amount used per mile is 23 cubic feet, which, at the price of Manchester gas, represents a cost of slightly under ½d. The members came away seemingly satisfied that gas traction has "come to stay." This concluded a fairly heavy day's programme.

#### EXCURSION TO WINDERMERE.

On Friday, a party of about thirty undertook the journey to Windermere. They set out full of doubts concerning the weather; but, though it continued dull throughout the day, there was fortunately no rain. On arriving at Windermere, they were driven in brakes to the Old England Hotel at Bowness, where a hot luncheon was provided. The afternoon was spent in making a tour by steamer of Lake Windermere. On landing again, the excursionists had tea at the hotel, at the conclusion of which Mr. William King, of Liverpool, availed himself of the opportunity of expressing to the President the members' great appreciation of the kindness he and the Lord Mayor and Gas Committee had shown them during the visit to Manchester. A few of the party continued the stay at Windermere over Sunday; and the remainder left early in the evening by train—some for Manchester, others for stations *en route*. Those who completed the journey bid their President adieu at the terminus; thus ending, and adding to the records of the Institution, another profitable and enjoyable autumn meeting.

#### NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

##### Half-Yearly Meeting at Sunderland.

The Forty-third Half-Yearly Meeting of the Association was held at Sunderland last Saturday. The offices of the Sunderland Gas Company, at the corner of two of the leading thoroughfares of the borough, was the *rendezvous*. The President—Mr. CHARLES DRU DRURY, Engineer to the Sunderland Gas Company—received the members and associates, saw them into conveyances, and drove off with them to the Company's works at Hendon. They are situated on a high bank overlooking the sea, nearly a mile to the south of the town. They were erected in 1863, on a site 17 acres in extent, to designs by the late Mr. Thomas Hawksley, whose association with them makes it almost superfluous to say that they are of massive design. Everything is on a spacious scale, particularly the outdoor areas separating the various buildings. These are of such extent that, were it not for the statement of the officials that the works have now been extended so as to practically cover the whole site, it might be supposed that there was abundance of room for extensions. The visitors were shown round the establishment without reference to the course of manufacture—beginning with the scrubbers, and passing through the purifier-house, the sulphate-house, and the retort-houses, and ending with a stroll round the gasholders. There was evidence on all hands that the works are not only managed with more than usual capability, but that the Company follow a liberal policy in regard to their maintenance. The spick-and-span condition in which everything was found, including the large amount of horticulture with which the works are interspersed, could not have been the result of a "clean-up" for the visit of the Association, but must have been the effect of careful tending, from day to day, for many years. To the visitors the chief attractions were the steam-boilers on the top of the retort-benches, which Mr. Drury explained to the Association at their meeting last April, and the sulphate plant, with which he deals in his Presidential Address, published below. With regard to the boilers, one, a Cornish, was at work, and the valve was blowing merrily; while another, a Lancashire, is being placed in position, the method of doing which is to sling up the boiler, and then to build the bench beneath it. The hasty inspection over, the visitors, before leaving the works, were invited to partake of refreshments.

On returning to the town, the meeting was held in the Boardroom of the Gas Company, in Fawcett Street. Mr. DRURY presided over a crowded gathering. On his right were Mr. J. Stokoe, J.P., the Chairman, and Mr. G. R. Booth, the Vice-Chairman, of the Company.

##### WELCOME TO THE ASSOCIATION.

Mr. STOKOE said that, as representing the Sunderland Gas Company, he had very great pleasure indeed in giving the Association a hearty welcome to Sunderland. They were glad to see them, especially as Mr. Drury was their President. They were almost disposed to take it as a compliment that Mr. Drury had been elected to this position. He might say that, so far as the Sunderland Gas Company were concerned, they had had the advantage of the very lengthened service of their Secretary and Manager, Mr. Cox. He was sure they would not be surprised to hear that the Company had not been an unprofitable one. The shareholders had never had any reason to blame themselves for having invested in the undertaking; and their success had been, in his opinion—and he had been longer on the Board than anybody at present upon it—largely owing to the management of Mr. Cox. They had the advantage, for several years, of having the services of Mr. Jolliffe, who did well for himself and well for them. He was followed by an exceptionally able and exceedingly modest young man. Providence, however, did not spare him to them. They then selected Mr. Drury, who had been with them now for several years. They had had no reason to regret their choice; nor did he think Mr. Drury had any reason to do so. He (Mr. Stokoe) might say, as the members might not all know it, that Mr. Drury had wisely chosen a Sunderland lady for his wife; and he had no doubt he would realize the blessedness of this every day.

The PRESIDENT begged, on behalf of the Association, to thank Mr. Stokoe very cordially for the particularly friendly welcome he had given to them, and for the very excellent arrangements which had been made for their comfort. He hoped the meeting would be a great success; and, certainly, to the extent which the Sunderland Gas Company had to do with it, he was quite sure that it had already been so. He also desired to thank Mr. Stokoe for his kindly references to himself.

##### APOLOGIES FOR ABSENCE.

The PRESIDENT intimated that he had received letters of apology for inability to be present from one or two members. Mr. Bower wrote that, on account of an unfortunate accident, he regretted that he would be prevented from attending the meeting. Mr. Holliday was also unable to be present, on account of pressure of business.

##### NEW MEMBERS.

The following gentlemen were admitted members of the Association: Mr. J. A. Gray, Cleator Moor; Mr. T. Norfolk, Knottingley; Mr. W. J. Mott, Selby; Mr. J. Eadington, Blyth; and Mr. E. E. J. Anderson, Ripon.



## THE LATE MR. R. WALLIS, J.P.

The PRESIDENT said that, before proceeding any further with the business, he wished to express the sorrow which they, as an Association, felt at the death of Mr. Robert Wallis, J.P., Chairman of the South Shields Gas Company, and an ex-President of the Association. Mr. Wallis died at the ripe age of eighty-nine years. He always took an active interest in gas matters. For fifty years he was a Director, and for the last forty years the Chairman, of the South Shields Gas Company. Only once, he understood, was he absent from the annual meeting during the period of his chairmanship. As a man, he was sympathetic and kindly; and he was sure he was one who left this world better than he found it.

## WORKMEN'S INSURANCE; STANDARDIZING OF METER-UNIONS.

The HON. SECRETARY (Mr. J. H. Penney, of South Shields) read the following report of what had been done with regard to insurance under the Workmen's Compensation Act and the standardizing of meter-unions:—

It will be remembered that at our April meeting you determined that this Association should confer with other Associations relative to the Workmen's Compensation Act, with a view to ultimate steps being taken for the formation of some mutual insurance society; and the President and myself were empowered to deal with the matter.

The kindred Associations were communicated with, and asked if they would be willing to join in a conference on the subject, should the Insurance Companies fail to reduce their rates in the meantime. The Incorporated Gas Institute and the Institution of Gas Engineers were also written to; but the replies were not encouraging, except that from the Incorporated Gas Institute. Mr. Dunn, the courteous Secretary of that body, replied that arrangements would probably be made for a paper to be read on the subject at the Belfast meeting. A paper was read at that meeting; a long discussion ensued; and much useful information was elicited.

Your Committee held several meetings in May and June last, when some of the best Insurance Companies were approached with a view to obtain a minimum quotation, with a sliding scale, for the North of England. Quotations were received, in due course, from tariff and non-tariff offices; but the majority of them were very high. Ultimately, the following sliding-scale quotation from a good and sound office was accepted:—

|                                    |                    |
|------------------------------------|--------------------|
| On wages not exceeding £100,000 .. | 10s. od. per cent. |
| " " 150,000 ..                     | 9 6 "              |
| " " 200,000 ..                     | 9 0 "              |
| " " 250,000 ..                     | 8 6 "              |
| " " 300,000 ..                     | 8 0 "              |

A circular was afterwards sent to all the Gas Companies and Local Authorities owning gas-works within the area of the Association's district, inviting them to insure under this arrangement; pointing out that "the larger the number of Gas Companies and Local Authorities insuring under this scheme, the lower the premium would be to each."

The result, to this date, has been, that, in round numbers, about forty Gas Companies and Local Authorities have insured up to about £125,000 in wages, at 9s. 6d. per cent.

With regard to the question of the standardizing of meter-unions, at the April meeting of this Association, on the invitation of the North British Association of Gas Managers to join them in trying to get a uniform standard for meter-unions established, you deputed the President and myself to represent this Association at any conference which might be held. We accordingly communicated with the North British Association, advising them that we had been appointed to confer with them, and requesting them to keep us informed of the progress of their deliberations from time to time. We subsequently received a reply, stating that a paper would be read upon the subject at the Belfast meeting of the Incorporated Gas Institute. A paper was read, and the matter was referred to the Council to consider what steps should be taken. We have not received any further communication on the subject.

## PRESIDENT'S INAUGURAL ADDRESS.

The PRESIDENT then delivered the following

## INAUGURAL ADDRESS.

Gentlemen,—I beg to thank you for the honour you have conferred upon me in electing me President of this important Association for the current year. Were it not that I have the valued assistance of the Committee, I dare not have undertaken the responsibility; but with their help and your kind forbearance, I trust the interests of the Association will not suffer during my term of office.

I think we may fairly congratulate ourselves on the fact that the North of England Gas Managers' Association has this year attained its majority. It was first formed on the 10th of April, 1877, at South Shields, when our highly-esteemed friend Mr. Warner was elected first President; and the first general meeting was held in Newcastle, on Saturday, Oct. 27, 1877. As a comparatively new member, I trust I may say without undue conceit that we ought to be proud of the high position that this Association holds, and of its firm numerical and financial basis. After a healthy infancy and a vigorous and sturdy youth, it has reached manhood; having I believe suffered very little, if at all, from the complaints and ailments to which childhood is subject, or from the excesses in which youth sometimes indulges. I would not, however, for a moment wish it to be imagined that we, as members, consider no further improvement is either desirable or attainable. Representative as our Association is, there are still professional brethren in its district who have not yet cast in their lot with us; and it should be our duty and privilege to invite them to do so. There is also ample opportunity for all of us, and more particularly the younger members, to make the Association one of increasing usefulness

by working for it in many ways—such as contributing papers to be read at the meetings, taking part in the discussions, and generally giving it the benefit of their experiences; and when I say experiences, I mean those of failures as well as those of successes. I must admit that it requires courage to chronicle one's disappointed hopes and abortive actions; but it will be readily conceded that a man who is able to calmly and dispassionately review his errors of judgment or misfortunes, will not rest content until matters are placed on a more satisfactory footing.

Speaking on this important occasion, the 21st anniversary of the first general meeting of the Association, I labour under the great disadvantage of being unable to claim 21 years' personal acquaintance with gas manufacture. I cannot therefore rely on my own observations in comparing the condition of things then and now. Thanks, however, to an excellent technical press, this defect can to a certain extent be overcome.

Looking back upon the period named, one thing, I think, is certain—viz., that among gases coal gas continues to hold the field as an illuminant and heating agent. In this country, at any rate, gases made from other substances than coal serve only as hand-maids to their mistress coal gas. Carburetted water gas and oil gas, useful as they no doubt are as auxiliaries and enrichers, are relegated to a very secondary position in the economy of gas manufacture. Continuing the retrospection still further back, one cannot help being struck, when considering the process of manufacturing coal gas, at the remarkably able manner in which the pioneers of our industry laid their plans and designed their apparatus; and glancing backward over the period of this Association's existence only—a period which perhaps has never been surpassed for fertile imagination, for inventive genius, and for the harnessing of nature's forces for the service of mankind—is it not wonderful that, in their essence, the production, purification, storage, and distribution of coal gas have not undergone any fundamental change? Improvements in details there have, of course, been; but the methods remain the same. Broadly speaking, all economies effected have been obtained by means of improved methods of handling material—such as machine stoking, inclined retorts, conveying machinery, and labour-saving appliances generally. Unfortunately all the genius of the gas profession during the past 21 years has not yet satisfactorily disposed of two great annoyances to which gas managers are subjected—I mean stopped ascension-pipes and naphthalene deposition—and that these two matters are a source of endless worry and bother, few will be inclined to dispute. I know, of course, that cures for stopped pipes have been tried and found more or less successful in certain cases, and that the formation of naphthalene can be prevented by the use of oil vapours. But do these remedies in either instance go to the root of the matter? I fear not.

Turning to the efficiency of coal gas as an illuminant, what a revolution in the candle duty has been brought about in the last two decades—or, as a matter of fact, in far less time than that. Who among us, even a few years ago, would have ventured to prophesy a duty of nearly 30 candles per cubic foot of gas for burners consuming as little as  $\frac{3}{4}$  cubic foot per hour, and upwards? To Dr. Auer von Welsbach the gas industry owes an incalculable debt of gratitude; and may we hope the gratitude is of that quality which conveys a lively sense of favours to come in the shape of a more robust mantle.

Here perhaps I may be allowed to touch a weak point in our methods, and one which it is high time that we remedied. I refer to the supineness of gas undertakings in popularizing the use of gas. Are not consumers left to themselves far too much in the application of gas as an illuminant and heating agent? Do not they (the consumers), through ignorance or want of thought, squander the wealth of hydrocarbons contained in their supply of gas by the use of ancient and unprofitable burners, niggardly service-pipes, and badly-arranged fittings? Where are the officials appointed by the gas undertakings whose duties it should be to educate the popular mind on these subjects? I am afraid in the very large majority of cases, echo still answers "Where?"

Twenty-one years ago, electric light was just beginning to make itself felt as a force to be reckoned with; and everyone remembers the scare produced among gas shareholders about that time. Prophecies were heard on all sides that the reign of gas was over, and that it, and all its works, would very soon be relegated to the limbo of oblivion. Time, as less hasty judgments foresaw, has proved otherwise; and the electric light, with all its improvements and cheapened production, has not yet ousted us from our position. There is a vast and ever-increasing field for both commodities; and the electric light, though not to be despised or underrated as a rival, is not feared, but rather welcomed as a pioneer of improved lighting, and a creator of a desire for yet more light.

The past twelve months have not been devoid of topics of exceptional interest to us. A year of great national commercial prosperity, the cost of raw materials has naturally gone up by leaps and bounds. Manufacturers of gas, however, feel the bad effects of such general prosperity; for coals, iron, bricks, and labour are dear, and often bad at the price, and, except in districts containing an unusually large proportion of factories and workshops, there is no commensurate increase in the consumption of gas. Very few householders or shopkeepers burn less gas because times are bad, or more because they are good.



As I have said, the general tendency of prosperous times is to send prices up; but in the matter of gas our interests are all the other way. Unfortunately, we are beginning to associate good times with labour troubles; and, though now both have happily terminated in peace, it will be many years before the disastrous effects of the great engineers' strike and of the Welsh coal strike cease to be felt. So much interest has been centred in these two industrial wars, that it would be only waste of time for me to mention any of the details connected with them. But when one realizes the time wasted—seven months in one case, and five in the other—and also the immense sums of money lost to the community at large, one is appalled. In the case of the coal strike, I saw it mentioned a few days ago that the ascertainable loss due to it was estimated at £7,000,000.

Most of us will have asked ourselves what is the remedy for these suicidal misunderstandings. Is the prosperity of the country to be imperilled and wasteful strikes and lock-outs indulged in right up to the close of this so-called enlightened nineteenth century? Of one thing, however, I feel sure, and that is the absolute futility of compulsory State intervention, for which, in crises like those mentioned, certain sections of the public are so ready to clamour. Whatever might be done in Germany and in other semi-despotically ruled countries, no government in our country will be able to compel a man to sell his labour for any less price than he may think fit to put upon it, or, on the other hand, to force an employer to pay more for labour than he can afford to do, or to run his business at a loss. No; in my opinion there must be a better understanding between employer and employed before disputes can be settled in a more satisfactory manner. There appears to be a want of confidence between labour and capital—the men mistrust the masters and the masters the men.

Workmen as a rule have no interest in a business beyond getting as much out of it as they can with as little effort as possible; and increased energy on their part does not, directly at any rate, bring them any advantage. Surely then, if this be the case, the cure for strikes lies in the direction of co-operation in some form or another. Under this system, employer and employed have the same interests, and will pull together instead of against one another. In so doing the mutual confidence, which is now so lamentably deficient, will be restored, and disputes (if any) arising will be amicably settled. Fortunately we are not left entirely to speculate on what the results of such a cure would be. We have many examples of co-operation around us; and one especially interesting to us, in the form of profit-sharing, is seen in the case of the South Metropolitan Gas Company, of London, where, under the fostering care of Mr. George Livesey, its success is beyond all doubt. We shall watch with interest the result of the latest development of the South Metropolitan scheme—the Workman Director. This move appears to be the logical conclusion of the system; but the carrying out of the idea presents many difficulties.

A great deal has been written and said of the probable effect on the industries in this country of the Workmen's Compensation Act, which came into force on the 1st of July last; but there is no doubt that the disastrous results which in many quarters were predicted have been found to be very much exaggerated. Mr. Chamberlain stated that the principles of the Act were: That every workman is entitled of right to moderate and reasonable compensation for all accidents happening to him in the course of his employment, unless caused by his wilful default; that this compensation should be a charge upon the employment in which the accident occurs; and that it is not a fine upon the employer, but a recognition of the just claim of the workman. Many people insist that the tendency of the Act is distinctly socialistic; but, as Lord Salisbury observed in the House of Lords, it was the late system that was socialistic, inasmuch as it threw upon the rates the charge of maintaining the sufferers from industrial accidents. In any case, few will deny the justice of making reparation to a workman who, while in the pursuit of his calling, meets with a serious accident—thereby, at one stroke perhaps, losing possibly the whole of his capital, invested as it is in health, muscle, and activity. Manufacturers who use machinery must be prepared to make good any defect which may arise in it or mishap which may occur to it through neglect or some unforeseen cause; and, in the same way, I think this Act provides for accidents to the flesh and blood machines to which we owe so much. The passing of the Act produced something akin to a panic in many of the centres of commerce in this country, notably in the coal and iron trades; but, to show that such a state of things was not warranted, I may perhaps be allowed to quote from an article in "The Times" of Aug. 12 last: It says—

The arrangements which colliery owners have already made, either mutually *inter se* or by insurance with public companies, have justified the belief that a penny per ton all round will be likely to fully meet the provisions of the Act; and this sum applied to the whole coal industry of the country will work out to an annual expenditure of £840,000. Now in some districts the provision already made for meeting accidents, &c., is so considerable that this burden, if merged in that already borne, will not be nearly so serious as it would otherwise have appeared to be. It was, at one time, anticipated that the Compensation Act would add about sixpence per ton to the cost of producing pig iron; and it was grimly prophesied that this last straw on the top of dearer minerals and foreign competition would completely break the camel's back. Fourpence of the amount stated was expected to be added through the increased

cost of coal; and the other twopence was expected to take the form of insurance premiums for the pig-iron industry itself. It now turns out that some districts have been able to effect insurance with public companies at as low a rate as one halfpenny per ton of pig iron produced, and that the increased charge made through coal does not exceed another three-halfpence; so that twopence per ton of pig is an outside figure—being one-third or less of the amount originally talked about. It comes in short to this—that the Compensation Act of 1897, like the Employers' Liability Act of 1880, has been much less harmful to our great industries than was expected.

In our own case, alarm was felt at the almost invariable quotation by the Insurance Companies of a 25s. per cent. rate for gas-works; but, thanks no doubt in a large measure to the action of this Association on the initiative of Mr. Bower, any gas undertaking may through it obtain relief from the risk and annoyance of the Act on the payment of an annual premium of not more than 9s. 6d. per cent. on their wages bill. All the larger gas undertakings, however, will probably be justified in taking their own risk; in which case Mr. Chamberlain's estimate of 5s. per cent. will possibly be found to be over, rather than under, the mark. One cannot blame the Insurance Companies for looking after themselves, especially where the risk is to a great extent a very uncertain quantity. But they will probably have themselves discovered by this time that the chances of accident in gas-works are much less than those in iron-works, ship-yards, &c.; and that there is no extra danger to life and limb in the proximity of a gasholder or two. In considering its scope, it must not, however, be forgotten that the Act is experimental, and at present embraces only half the labouring population of the kingdom.

Probably there are few gas undertakings in the country which are not now beginning to feel the effects of the large increase in the cost of coal. For a long time prices have ruled so low that we have been in danger of thinking they would never get up again. Fortunately our bye-products, with the exception of tar, are commanding fair prices. Sulphate of ammonia is now higher than it has been for a number of years; and it is sincerely to be hoped that the market will continue to improve. The Sulphate of Ammonia Makers' Committee, formed about a year ago, has been busily at work, and may possibly have had a share in bringing about this result. Its object is to encourage the use and application of sulphate. It has offered prizes for the best grown crops of various sorts raised with the aid of sulphate; has disseminated literature on its fertilizing properties; and is about to offer a prize of £500 for the best essay on the utility of sulphate as a fertilizer. Such a society should be patronized by all gas concerns; and though the report of the first year's working is not very encouraging, the continual bringing of such information before the farming and agricultural classes must make itself felt in time. Whether or not the address of Sir William Crookes to the British Association last month on the importance of nitrogenous manure for wheat-growing will increase the demand for sulphate, it is difficult to say; but it very possibly may result in diverting for the use of this country many of the thousands of tons of this article which are annually exported to the Continent.

In connection with the manufacture of sulphate, makers who have hitherto simply burnt the waste gases and passed the products up a chimney are being impressed by the inspectors under the Alkali Acts with the fact that the law enjoins that they must take the "best practical means" to render the sulphuretted hydrogen evolved from the still innocuous. I believe I am correct in stating that the inspectors acknowledge three "best practical means," which are as follows:—

- 1.—Conversion first into sulphurous acid, and finally into sulphuric acid in vitriol manufacture.
- 2.—Conversion into sulphur by means of the Claus kiln.
- 3.—Absorption in oxide of iron.

Of these three processes, the first is decidedly the best, and, in the long run, the most economical. But it entails a large amount of supervision and even a skilled staff of its own; and the plant is costly and occupies considerable space. The Claus process is much less intricate, and is said to require very little attention; but the product, which should realize a sufficient sum, if pure, to at least pay the interest on the cost of the plant, is, in the case of sulphur produced from gas liquor, of such a bad quality that, unfortunately, it is almost unsaleable. One of the inspectors, when reporting on the manufacture of sulphate in his district, stated that he knew of no case in which the Claus process showed a profit. Both these processes are suitable for large gas-works; but when we come to small ones, there is no doubt that the oxide purifier, with revivification *in situ*, is the simplest and the best. It is stated that this method deals very satisfactorily with sulphuretted hydrogen from sulphate plants turning out not more than 300 tons of sulphate per annum; but when this amount is exceeded revivification becomes very patchy and irregular, the oxide often fires, and the purifier becomes unmanageable. If, on the other hand, the purifier is emptied every time it is fouled, and the oxide laid out to revivify, the cost of labour is very serious.

Another method which has the approval of the inspectors is now coming into use, and is finding favour in gas-works which are too large for the absorption by the oxide method, and where the other means are considered undesirable. I mean what is known as the "limestone tower" process—an installation of which has just been erected at the Sunderland Gas Company's Hendon



works. In it the sulphuretted hydrogen is first converted into sulphur dioxide by complete combustion in a furnace specially designed to retain its heat. The gases are then cooled and led into the bottom of a tower filled with tiers of limestone, through which the gases pass. The sulphur dioxide combines with the limestone, forming bisulphite of calcium, which, being soluble, is washed out by a shower of water from the top, as in an ordinary scrubber; and as the limestone wastes away fresh is supplied through suitable openings in the tower. In this process, there is no bye-product or residual, and there is a charge on the manufacture of sulphate for limestone and labour; but the simplicity of the apparatus and the comparatively small first cost quite counterbalance these disadvantages.

As to tar, the outlook seems hopeless indeed, and prices have, I believe, never been lower than those quoted lately. We must not, I fear, expect much, if any, benefit from Dr. Lilienfeld's discovery of the means of artificially producing albumen from tar products; for, as was stated in an article in the "JOURNAL OF GAS LIGHTING" a few weeks ago, with the discovery of more and more useful products obtained from it, the value of tar gets less and less. If, then, there is anything in the Vienna Professor's discovery, tar distillers may well cry out to be saved from their friends.

I mentioned a few moments ago the existence of a Sulphate Makers' Committee; and this reminds me that another society has been very recently formed, or rather re-formed, which should prove of great assistance to the gas-making fraternity. It is the Gas Companies' Protection Association; the aims of which are to protect the property, revenues, rights, and privileges of gas companies, to secure united action, and generally to keep members informed of all parliamentary and other proceedings affecting their interests. Such an Association is surely worthy of support.

A feature in the present-day methods of gas manufacture is the variety of means to our hands of enrichment. Only a few years ago canal coal was the almost universal agent for this purpose; but this commodity becoming scarce, and consequently expensive, necessity became the mother of invention, and we now have at least half a dozen processes as substitutes—such as the Peebles oil and the oxy-oil processes, enrichment by benzol and petroleum vapours, and by admixture with carburetted water gas of high candle power, &c. Acetylene, that most brilliant of gases, may some day perhaps be used for enriching; but carbide of calcium will have to become very much cheaper than it is at present before this gas can be so employed. I understand that the cost of enrichment by means of acetylene is about 6d. per candle per 1000 cubic feet; and, in addition to this, it is very difficult to mix the two gases, owing to their different densities.

The use of carburetted water gas as an auxiliary in the manufacture of coal gas is coming more and more into favour; and quite a large proportion of the gas undertakings in the kingdom are now supplying 25 to 30 per cent. of it. The advantages of having a plant for the production of such a gas are so well known to the members of this Association that I will not venture to recapitulate them. The outcry against the increased percentage of carbonic oxide in the mixed gas supply is largely a matter of sentiment, and has been shown to be without any serious or substantial foundation; but since a Home Office Committee has been appointed to look into this matter, I fear that another instance of grandmotherly legislation may result. Should the proposal of the Committee as to the restriction of the amount of carbonic oxide during the hours of night ever assume legal force, the lot of the gas manager, who has to guarantee not more than a certain percentage of this gas in the outskirts of his district at stated times of the day, will not be a happy one.

Before bringing my remarks to a close, I should like to make a short statement on the consumption of gas in this town. Sunderland was first lighted with gas on March 9, 1824; and after some years of competitive supply in the shape of two rival Companies, the undertakings were amalgamated and formed into the Company at present existing. The Sunderland Gas Company has for the past ten years enjoyed the distinction of supplying gas at a price lower than almost any other in the kingdom. The charge ranges from 1s. 11d. to 1s. 6d. per 1000 cubic feet, according to the individual consumption; and the average price works out at 1s. 8d. The cheapness of the gas has naturally encouraged manufacturers in the district to use it very largely as a source of motive power; and at the present time there are over 300 gas-engines in use in the town of all sizes ranging from  $\frac{1}{2}$  to 50 horse power nominal. The engines of very small size are used principally for driving sausage machines, coffee grinders, lathes, printing and mineral water machinery, hoists, &c.; while the largest are found chiefly in ship-yards and engine shops, in many of which no other motive power is used. One or two firms on the Wear have each as many as ten gas-engines, with an aggregate of fully 450 indicated horse power; and in a great many works steam is being rapidly replaced by gas.

Mr. H. H. Wake, M.Inst.C.E., the Chief Engineer to the River Wear Commission, a few years ago introduced gas-engines for driving the pumps in connection with two large graving docks under his charge; and the installation has been an unqualified success. Five 40 nominal horse power gas-engines—two for No. 1 dock and three for No. 2 dock—are employed for this purpose; each connected direct to a 22-inch centrifugal

pump, with 66-inch disc, and capable of discharging upwards of 2600 tons of water per hour. The pump and engine are both contained on one base plate. In order to show the efficiency of the installation, I may say that at the trial of one set of these pumps, 10,238 tons of water were pumped out in 1 hr. 58 min.; the pump starting against a head of 1 ft. 11 in., and finishing against a head of 20 ft. 3 in., with a consumption of 6695 cubic feet of gas, and a cost of 10s. Mr. Wake was the first to introduce direct gas-engine driving with centrifugal pumps; and the result has been so satisfactory that the method has since been adopted in several other parts of the country. Besides all this, gas-engines are used at the docks for revolving a swing railway bridge and for opening and shutting a pair of dock gates; also for working a 20-ton travelling crane, the gas supply being conveyed to it by means of a 3-inch flexible hose-pipe.

Taking into consideration the amount of gas used by all the engines in the town, and also that consumed for cooking and heating, it will cause no surprise when I tell you that the day consumption of gas in Sunderland is not inconsiderable. During the week ending July 9, 1898—which is taken as being a typical summer week—the quantity of gas delivered between the hours of 6 a.m. and 6 p.m. amounted to 43 per cent. of the total consumption. This, I venture to think, will be considered a very satisfactory state of affairs; and I may say that this percentage would have appeared even higher had it not been that in many works at that time night shifts were being worked owing to briskness of trade.

And now, in conclusion, I must apologize for the absence of anything original or striking in my remarks. Presidential addresses become every year more and more difficult to prepare, and one finds oneself forestalled in every direction. I trust, however, I have not wearied you; and should anything I have said prove helpful to any of the members of the Association, I shall feel that my efforts have not been in vain.

#### THE POLICY OF DISCOUNTS.

A paper to be read by Mr. J. HOLLIDAY, of Scarborough, on "The Policy of Discounts," was on the agenda. The President explained that, as had been intimated, Mr. Holliday was unable to be present, but that Mr. Williams, of Scarborough, was with them, and he had kindly consented to read Mr. Holliday's paper. He had no doubt that Mr. Williams would be able also to answer any questions regarding it. The paper was accordingly read by Mr. ALFRED C. WILLIAMS, the Accountant of the Scarborough Gas Company, as follows:—

When our esteemed Honorary Secretary wrote me to the effect that all his applications or invitations for papers for this meeting had unfortunately proved abortive, it occurred to me that, although the question of the policy of a gas company allowing a discount on the gross price charged to private consumers of gas for prompt payment, is not by any means new, yet a few general remarks, together with some notes giving details of the working of, and general results obtained from, two systems of discounts from actual experience, might be of interest. Moreover it is a subject discussable from many points by all sections of the Association.

It may be as well to state here that the paper relates *only* to discounts for prompt payment, and does not touch upon the question of differential rates or discounts for quantities consumed.

I must admit I was rather surprised, on taking out from the latest issue of the Board of Trade Returns for Authorized Gas Undertakings (other than those of Local Authorities), to find that, out of a total of 60 towns in the United Kingdom where 20,000 tons of coal per annum and upwards were carbonized, in only 11 cases had the principle of discounts for prompt payment been adopted.

The system of cash payments in businesses outside gas supply is becoming more general throughout the country, especially in the larger business towns, and has much to recommend it both from the side of the seller and of the purchaser. It is evident the producer, or seller, under competition, is in a position to afford to give a much better article, under ordinary conditions, for 20s. if he receives cash down than he would be if his customer required a six months' or longer credit. Or that, if he does give equal value knowing that credit will be required, he must charge a somewhat higher price for the article in order to cover the necessary clerical costs incurred, loss of interest, risk of bad debts, &c.; and I think logically the same argument may well be applied to the sale of gas. To supply the best article we can produce at the lowest price is undoubtedly the idea to be followed; and every point in the administration of a concern, on working, distributing, clerical, and subsidiary charges must be watched and taken full advantage of, so as to reduce the total cost to the lowest possible minimum, compatible, of course, with efficient work.

With this idea, my Directors some years ago decided upon the introduction of a system of discounts for prompt payment; and recently, after having had a most successful experience with their initial system, they decided to amend it somewhat for the mutual benefit of the consumers and the undertaking itself.

It is my intention, in the first instance, to describe briefly the main principles of these two systems, and afterwards give a few figures showing the results obtained from them respectively.



The first system adopted was to allow a discount of 3d. per complete 1000 cubic feet of gas consumed, if the amount was paid within six weeks of the end of the quarter. The following is a specimen of the notice which was inserted on the demand-notes:—

DISCOUNT FOR PROMPT PAYMENT.—Discount at the rate of 3d. per complete 1000 cubic feet of gas consumed will be allowed if this account be paid not later than Tuesday, the 11th of August next, after which date the discount cannot be allowed.

The system answered very well, on the whole, with the following exceptions:—

- Some consumers had the benefit of a notice extending practically the full discount period—viz., six weeks—which was an undoubted advantage to certain classes (particularly small consumers), while other consumers had only a few days' notice in which to provide between the date of the delivery of the account and the termination of the discount period.
- Considerable dissatisfaction, and even friction, caused through no allowance being granted on the odd hundreds; that is, a consumer naturally felt somewhat "hit" when he examined his account and found he had consumed (say) 10,900 cubic feet of gas in the quarter, and was only going to be allowed discount on 10,000 cubic feet.
- On the last two days for discount each quarter, the strain on the clerical staff at our town offices, as I will show later, was considerable, and had a tendency to lead to errors in entry, mistakes in change, &c.
- A further objection bearing upon this point was the fact that, owing to the large number of accounts received during the last few days for discount, the greater part of a week was occupied in entering, posting, and totalling the items, which made it impossible to check each day the payment into the bank with the daily total of cash received.
- It was noticed that, among the accounts outstanding after the termination of the discount period, those consumers who had had the shortest period between the delivery of the account and the last day for discount preponderated to a considerable extent.
- We experienced considerable difficulty, and I may add unpleasantness at times, especially in the June and September quarters, with consumers who, through having probably let their houses for the holiday season, and leaving no address with the Company, did not receive their accounts in time to enable them to participate in the benefit of the discount.

It may be as well to state that the Directors laid down a firm rule to the effect that under no circumstances whatever could an exception be made to anyone missing the final discount day; and this rule was strictly adhered to, with advantageous results.

The foregoing system was in operation for some thirteen years; but a short time ago, upon a reduction in the price of gas taking effect, it was decided, in order to obviate, as far as possible, the difficulties I have set forth, to amend it as follows: Discount to be allowed at the rate of  $7\frac{1}{2}$  per cent. (1s. 6d. in the pound) on the money value of the gas consumed, if the account is paid within one calendar month from the date of its being rendered. The notice on the demand-notes now appears thus:

DISCOUNT ON GAS ONLY.—The above charge for gas is subject to  $7\frac{1}{2}$  per cent. discount (1s. 6d. in the pound), on condition that this account be paid within ONE CALENDAR MONTH from the date of its being rendered.

The benefits derived from the introduction of this alteration of systems are as follows:—

- The better distribution of the work in the office,
- Consequent on this, much less danger of clerical or cash errors arising.
- Allows cash-book to be posted daily throughout the year. (This has now become one of the fixed rules of the office.)
- Each consumer now has a precisely equal period between the date his account is rendered and the expiration of the time allowed for discount.
- The discount allowed being at the rate of  $7\frac{1}{2}$  per cent. prevents the frictions which arose over the odd hundreds under the initial system.
- Previously the collectors could not commence their "second" round, to call in outstanding accounts until at least one week after the expiration of the all-round fixed discount period. This meant that they had to face the whole of the accounts which had missed discount at one time. Under the amended system, the outstanding accounts fall in in sections; and this we find permits of their receiving better individual attention.

I now have pleasure in submitting a statement which I think speaks for itself as to the better distribution of the work.

STATEMENT showing the Number of Accounts Received each Day from July 1 till the Last Day for Discount under the New and Old Systems respectively.

| NEW SYSTEM (4859 Consumers),<br>[7½ per cent. discount if account be paid within one calendar month of delivery.] |                              | OLD SYSTEM (4703 Consumers),<br>[3d. per complete 1000 cubic feet allowed if account was paid within six weeks from July 1.] |                              |
|-------------------------------------------------------------------------------------------------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| 1898.                                                                                                             | Number of Accounts Received. | 1896.                                                                                                                        | Number of Accounts Received. |
| July 1                                                                                                            | 63                           | July 1                                                                                                                       | 39                           |
| 2 (Sat.)                                                                                                          | 35                           | 2                                                                                                                            | 33                           |
| 4                                                                                                                 | 59                           | 3                                                                                                                            | 22                           |
| 5                                                                                                                 | 52                           | 4 (Sat.)                                                                                                                     | 4                            |
| 6                                                                                                                 | 49                           | 6                                                                                                                            | 15                           |
| 7                                                                                                                 | 78                           | 7                                                                                                                            | 14                           |
| 8                                                                                                                 | 41                           | 8                                                                                                                            | 42                           |
| 9 (Sat.)                                                                                                          | 47                           | 9                                                                                                                            | 27                           |
| 11                                                                                                                | 114                          | 10                                                                                                                           | 43                           |
| 12                                                                                                                | 91                           | 11 (Sat.)                                                                                                                    | 14                           |
| 13                                                                                                                | 113                          | 13                                                                                                                           | 43                           |
| 14                                                                                                                | 97                           | 14                                                                                                                           | 33                           |
| 15                                                                                                                | 117                          | 15                                                                                                                           | 39                           |
| 16 (Sat.)                                                                                                         | 55                           | 16                                                                                                                           | 69                           |
| 18                                                                                                                | 114                          | 17                                                                                                                           | 76                           |
| 19                                                                                                                | 80                           | 18 (Sat.)                                                                                                                    | 13                           |
| 20                                                                                                                | 70                           | 20                                                                                                                           | 67                           |
| 21                                                                                                                | 82                           | 21                                                                                                                           | 80                           |
| 22                                                                                                                | 79                           | 22                                                                                                                           | 80                           |
| 23 (Sat.)                                                                                                         | 69                           | 23                                                                                                                           | 69                           |
| 25                                                                                                                | 134                          | 24                                                                                                                           | 68                           |
| 26                                                                                                                | 118                          | 25 (Sat.)                                                                                                                    | 31                           |
| 27                                                                                                                | 132                          | 27                                                                                                                           | 93                           |
| 28                                                                                                                | 115                          | 28                                                                                                                           | 130                          |
| 29                                                                                                                | 116                          | 29                                                                                                                           | 106                          |
| 30 (Sat.)                                                                                                         | 84                           | 30                                                                                                                           | 71                           |
|                                                                                                                   | ..                           | 31                                                                                                                           | 67                           |
| Total at end of July, 2204                                                                                        |                              | Total at end of July, 1388                                                                                                   |                              |
| Aug. 1                                                                                                            | Bank Holiday                 | Aug. 1 (Sat.)                                                                                                                | 47                           |
| 2                                                                                                                 | 104                          | 3                                                                                                                            | Bank Holiday                 |
| 3                                                                                                                 | 83                           | 4                                                                                                                            | 115                          |
| 4                                                                                                                 | 45                           | 5                                                                                                                            | 104                          |
| 5                                                                                                                 | 67                           | 6                                                                                                                            | 113                          |
| 6 (Sat.)                                                                                                          | 54                           | 7                                                                                                                            | 124                          |
| 8                                                                                                                 | 130                          | 8 (Sat.)                                                                                                                     | 82                           |
| 9                                                                                                                 | 73                           | 10                                                                                                                           | 480                          |
| 10                                                                                                                | 75                           | 11                                                                                                                           | 607                          |
| 11                                                                                                                | 106                          |                                                                                                                              |                              |
| 12                                                                                                                | 99                           | Total                                                                                                                        | 3060                         |
| 13 (Sat.)                                                                                                         | 74                           |                                                                                                                              |                              |
| 15                                                                                                                | 91                           |                                                                                                                              |                              |
| 16                                                                                                                | 55                           |                                                                                                                              |                              |
| 17                                                                                                                | 37                           |                                                                                                                              |                              |
| 18                                                                                                                | 50                           |                                                                                                                              |                              |
| 19                                                                                                                | 23*                          |                                                                                                                              |                              |
| Total . . . 3373                                                                                                  |                              | Greatest Number of Accounts Received in One Day.                                                                             |                              |
| New system . . . 134                                                                                              |                              | Old system . . . 607                                                                                                         |                              |

You will observe that the largest number of accounts dealt with in one day was only 134, against 607 on the last day for discount under the old system. This, as you will all appreciate, was a very great point in our favour. It will also be noticed that the number of accounts received up to the end of July under the new system was greater by nearly 60 per cent. than that received under the old. This improved state of things is partly due to the fact that many of those consumers who had made a practice of paying their accounts on the last days for discount now "take time by the forelock," and pay soon after the delivery of the demand-notes, lest procrastination shall result in the "calendar month" slipping by, and their losing the much-desired discount.

Five years prior to the introduction of a discount system, the amount of bad debts per 1000 cubic feet of gas sold (excluding public lighting) averaged 0.34d. During the succeeding five years, the average decreased to 0.24d.; and the average of the past five years was 0.13d., while for the twelve months ending June 30, 1898, it had fallen to 0.10d. per 1000 cubic feet sold.

At the close of the discount period on the past quarter's accounts—Aug. 19 (the delivery of the accounts having been completed by the 19th of July)—the amount outstanding was £559, or 8.7 per cent. on the total amount due on the 1st of July. Two years ago the discount period expired on the 11th of August, when £760, or 13 per cent., was outstanding. Giving the old system the benefit of the receipts from Aug. 12 to 19, the amount outstanding was to £672, or 11½ per cent., against the figure of 8.7 per cent. quoted above.

Taking the question on the whole, I have no hesitation in supporting the statement of Mr. Newbigging, who in the last edition of his "Handbook" (p. 460) says, on the question of "Discount for Early Payment of Gas Bills," "The practice, wherever adopted, has been found highly beneficial, saving labour in collecting, and reducing the percentage of bad debts."

#### Discussion.

The PRESIDENT hoped the paper would lead to an animated discussion. There were differences of opinion upon the subject; and they ought to have samples of each that day.

Mr. H. TOBEY (Malton) said it appeared to him that the principle of the discount system was this, that they allowed something off accounts for present payment, instead of letting

\* Last day for discount.



payment be deferred to a future period. When they looked at the discounts given by gas companies—from 5 up to, in some cases, 25 per cent.—and considered the apparently light risk, it was evident that no business man would give them. A discount of 25, or even of 10 per cent., was vastly in excess of the advantage to be gained by taking present instead of future payment. Most gas companies issued their accounts quarterly; and the consumer was probably called upon by the collector, in the ordinary way. If he did not then pay, he was allowed to run to the end of the three months—that was all. He (Mr. Tobey) thought it was a general rule that a gas bill was to be paid before the next quarter became due. If a consumer were granted discount for payment within four weeks, he thought it was evident that the company were giving more than the equivalent. Suppose the account were £100, and the consumer got £5 of discount for payment within four weeks, it was a very considerable sum to allow for receiving cash two months earlier than it would otherwise have been got in. The gas company might have gone into the market and borrowed the money, or they could have raised the money as capital to much better advantage. He supposed that a company, in giving discount, wanted to have cash in hand, so that they might work with less floating capital than they could if they allowed longer credit. But a company who allowed 5 per cent. discount was certainly making a great mistake, from his point of view. If they raised capital at 7 per cent., £100 for three months only amounted, in dividend, to something like 35s.; and thus an allowance of £5 appeared to him to be vastly in excess. It was beyond all the rates of commercial trading to give 5 per cent. discount for payment in one month, instead of in three months. Perhaps these heavy discounts were allowed more as a differential rate to large consumers. In this case it was really not a discount for cash paid promptly, but a differential rate with the condition attached that the parties who wished to take advantage of it should pay promptly. In regard to sliding-scale gas companies (he believed that the Scarborough Gas Company was a maximum-price Company) whose dividend was regulated in proportion to the price they charged, it appeared to him that discount was altogether a false method to go upon. Suppose they took 3d. per 1000 cubic feet off as discount, they would not be allowed to calculate their dividend upon the price after taking off the 3d.—they would be obliged to take their invoice price. They would not certainly be allowed to take advantage of a decrease in price by discount, because all the consumers would not be getting the benefit of it. It appeared to him there was very little advantage in a company which had a good working district, allowing a discount at all. He was rather inclined to think that they might collect their accounts—and many did so collect them—with very little trouble, in the ordinary way. The company were the only people supplying the article in the district; and if it were known among the consumers that they would not be allowed to go beyond a certain date without paying their accounts, they would pay them. There was no need for the inducement of a discount to urge people to pay their accounts, because, if they got a limited time, and knew that they would not be allowed to go beyond, they would pay up. There was another point in the paper which he noticed. It was one of the difficulties which Mr. Holliday said arose under the former system, and which he did not appear to have got rid of under the new system. That was with reference to people who let their houses. He thought they were not more likely to get payment from them under the new plan than under the old one.

Mr. E. H. MILLARD (Durham) said that, having been associated with a discount system in more places than one, he should like to bring a few points before the meeting. In the first case, the discounts allowed ranged up to 10d. per 1000 cubic feet, on a selling price of 2s. 10d. He was certainly disposed to agree with Mr. Tobey that this was out of all due proportion to the amount received. In another case, the discount was 9d. off a selling price of 4s. 6d. This was not such a high proportion; but still the disadvantage was there. When he went to Durham, no discount system was in vogue; but now there was. Anybody taking up the discount system must make a point of keeping firmly to the day allowed, even if the consumer should be one of his own directors. He remembered a friend of his who had an account owing, and who had gone a day beyond the time allowed for discount. His friend asked for the discount; and he allowed it. Unfortunately his friend did not keep the matter to himself; and the result was that others made similar applications. He had been exceedingly careful since then, no matter whom, not to allow discount if the time was exceeded by even a single day. The system followed at Durham was to stamp the account with the date of delivery, and also with the last date at which discount would be allowed, so that no mistake could be made by the consumer. He found that many people came in and said that they had lost their account, but that they knew it was due on a certain day. They might be prepared for this by keeping a sort of diary of the dates; and they would thus probably find these lost accounts to be, not one day, but three or four days, behind the time. They had gone largely in for posting the invoices, in order to get rid of the difficulty of some people having longer time than others. It was also much cheaper to post them, under a halfpenny stamp, than to deliver them. Another point was that where a heavy discount was allowed people were much inclined to think that the gas was dear. They

would look at the 2s. 10d. per 1000 cubic feet; but not at the 10d. off. His experience of the discount system was that the very people who were behind with their payments in ordinary circumstances, were also the people who were behind when discount was allowed. They were practically the same people; and he certainly thought that, from the amount of trouble these people gave to the collector, they ought to be penalized in some form or other. He thought that a discount system was a very good one for that, provided they did not exceed a moderate amount. One of the reasons they had for adopting the discount system at Durham was the cost of collecting the money received through penny-in-the-slot meters; and he might say that they had been enabled to deal with something like 1000 slot meters, in addition to other duties, without increasing the office staff, simply by introducing the system of posting the accounts and allowing discount to the people who brought their money into the office. By sending out a certain number of bills day by day, the office work was kept very regular.

Mr. W. J. WARNER (South Shields) said it appeared to have been overlooked that the discount system was not entirely in the hands of the gas companies. In his own case, there were some large manufacturers who made their own gas; and on approaching them with a view to their becoming consumers of their gas, these manufacturers said: "What price will you supply us at?" Then, of course, they had competition between these works and their own. In some cases they made arrangements which were satisfactory to both parties. Subsequently, when the Company went to Parliament, some of the manufacturers who had not joined them—people of considerable influence in the town—said: "Now, we have not given your terms nor accepted your conditions, because we have our own plant at work, and can therefore make gas at a cheaper rate than you can supply us at; but it may so happen that our plant may not be sufficient for our purposes, or it may require renewal, and then the question might be whether we should not come to you for our supply. The price should thus be somewhat approximated to the cost at which we have been making gas." Hence, a scale of discounts was forced upon them by the authorities—discounts of from 5 up to 30 per cent. Fortunately for them, they had to go to Parliament again; and they then got these rates to some extent limited. Still, their rates were high rates; they were too high—at least, so they thought. He gave them these facts in reference to South Shields because it appeared to have been overlooked that gas companies were not masters, in the matter of discounts.

Mr. J. H. COX (Sunderland) said that they had discounts in Sunderland—varied in order to get into their net those large consumers to whom Mr. Warner had alluded. They allowed from 1d. up to 6d. per 1000 cubic feet. A man who burned half a million cubic feet of gas per quarter got it for 1s. 6d. per 1000. By these means they were enabled to fight against electricity to a certain extent, and also against other modes of producing gas for the purpose of propelling dynamos. He was inclined to think it was not a question of payment at all, but of giving a bonus to the person who used a larger quantity of gas than did small consumers. With small consumers, they had a large amount of trouble. They had four accounts to make out for them every year; they had eight or twelve inspections of the meters every year; and they had a separate service pipe, and a separate meter, for each. They had other consumers, who used £2000 worth of gas a year; and in their case they had probably only about fifty calls a year to get in this sum; and they had a very small proportion of service pipes and meters. To get £2000 from small consumers they would require some 2000 meters, 2000 service pipes, about 8000 calls of the inspector every year, and about the same number of calls of the collector. Mr. Holliday's method of giving a fresh date to every consumer appeared to him not to be a simple arrangement. He knew that it acted very well; but, as Mr. Millard said, the very people who did not pay under one condition, would not pay under another. There were a lot of people who would not pay unless there was some threat hanging over them. He found no difficulty at all in getting money under his present system, at the proper time.

Mr. HERBERT LEES (Hexham) said that he had had some little experience in the matter of allowing discounts for prompt payment. They should not lose sight of the fact that Mr. Holliday's paper dealt simply with that; it did not deal with the question of discounts for large consumers. He thought that Mr. Tobey, in his criticism, had overlooked the main point for which these discounts were allowed. Mr. Tobey spoke as if the discounts were made in order to get in cash promptly, which was not the only reason. They were allowed for the purpose, also, of inducing consumers to pay their accounts at the office, and thus save the cost of collection. He took it that no such discounts as 5 or 10 per cent. would be allowed for prompt payment only. There was no doubt that by the adoption of a discount system, a saving in the cost of collection was effected, and that the saving was a considerable one. He was free to admit that the system had its disadvantages. One of these was pointed out by Mr. Millard—that the gross price of gas was always quoted as that at which they sold it, and the net price never was. It was very difficult to convince people if the gross price were 3s. 4d., that they were selling at 3s. per 1000 cubic feet. This might appear to be a sentimental, rather than a practical, difficulty; but, in his opinion, it was a difficulty which



they had. It was, for each of them, a question of the advantages or disadvantages which they would have by the system, and they would have to consider it, each for himself. His Directors had not such a strict rule as had been mentioned, as to allowing discount after the time had expired; but he dealt with cases as well as he could, using his discretion, and he never made an enemy.

Mr. J. T. JOLLIFFE (Ipswich), on being invited to address the meeting, said there was one point which struck him in regard to the matter of discounts, and that was that they could not lay down any hard-and-fast rule upon it. Personally, he was opposed to discounts. He never could see the reason for giving any discounts—beyond 5 per cent. certainly. He took it that in all their undertakings the cost of collection did not exceed 0.30d. per 1000 cubic feet; and he took it also that in most undertakings it did not exceed 0.25d. So that it appeared to him that if they gave a discount of 5 per cent., or, as Mr. Holliday did, of  $7\frac{1}{2}$  per cent., upon the gross price of the gas, they were giving considerably more than any saving in the cost of collection they could make by giving discount. Of course, there might be some particular case in which it would be desirable to make these large concessions; but it appeared to him that it was manifestly unfair to the bulk of their consumers, who used gas for lighting purposes only, if they gave such an enormous allowance as 5 or 10 per cent. to those who were users of gas for power only. He knew that he might be speaking upon points on which the meeting would disagree with him, because his views might seem to discourage the day consumption which they had all been trying to obtain; but it seemed to him to be forgotten that where gas was used for power or heating purposes (especially in the depth of winter), there was a considerable amount of overlapping of the heating with the lighting consumption; and they would have to make provision for this extraordinary demand upon them in the depth of winter. Therefore, their apparent gain was, as it were, swallowed up.

The HON. SECRETARY remarked that, although discounts were forced upon them at South Shields, they worked very satisfactorily. He rather admired the system; and he thought they got very good, practical benefit from it. He had looked at their accounts a day or two before, and he found that their collectors, up to the last day of the discount, collected about 40 per cent. of the rental; that on the last day of the discount they got about 55 per cent. of it, leaving a residuum of about 5 per cent. He thought it was a great saving in collection. They got a good balance at the bank four times in the year, which was very useful. Of course, there were difficulties on the last day of the discount, if 55 per cent. of their consumers called upon them on that day; but then, they could provide for this—they could put the whole of the staff on to the work. There were people—it was very tantalizing, of course—who came without their accounts, and someone had to make out the accounts afresh. Then, perhaps, the worst difficulty was with the people who came, after the last day, with all possible excuses. They generally tried to clinch their argument with the remark: "Your neighbours are not so strait-laced as you are, for my three or four days." But they had a last day; and they stuck to it. He was sorry to say that a great many of their consumers thought that the last day was *the* day. They gave six weeks to pay; and they never allowed discount after that period, because it would not be fair to those who had paid before.

Mr. JOLLIFFE asked if Mr. Penney would tell them what was the cost of collection per 1000 cubic feet.

Mr. PENNEY said he did not know that he could tell them, but it was very small.

Mr. W. FORD (Stockton) said in Stockton they had always had a uniform discount of 20 per cent. to all consumers—the largest and the smallest; and they had found the system worked very well. In a considerable number of cases the discount was lost; but it was very gratifying to know that in no case during the last 30 years had the rule as to the last day been broken through. With a gas revenue of something like £40,000, they had only one collector. About 60 per cent. of the amount due was carried to the office long before the last day for payment. The balance, he should say, was not more than 5 per cent. on the last day of the account being due. Consequently, they had, he was sorry to say, not a large balance at their bankers; but they had the satisfaction of knowing that they had the use of the money four times in the year, when they received it. Otherwise they might have to pay 6 or 7 per cent. if they overdraw their account at the bank. His opinion was quite in favour of discounts—not, perhaps, so large as they had been giving; but 10 per cent. would be found to be most serviceable to any corporation or gas company who might try it.

The PRESIDENT thought that, as time was getting on, they, perhaps, ought to bring the discussion to a close, although they could have gone on a little longer. He thought that the policy of discounts must very largely depend on the character of the consumption. What was found to be suitable in the one case, would not, necessarily, be suitable in another. Where the users of gas were of a very diversified character, a large discount was probably advisable; but, on the other hand, where the uses of gas were more general and uniform, smaller discounts ought to serve.

Mr. WILLIAMS, in replying to the discussion, said that the remarks which had been made had not been so much in the nature of direct questions as criticism of the general question.

Therefore he had no questions to answer; but he thought that he might be able to clear up one or two points which did not appear to be clear. If the actual amount of discount allowed were a charge on the undertaking, and appeared on the debtor side of the accounts, as carbonizing wages or the like did, it would be a serious matter. But this was not a charge on the undertaking, in the sense that the quantity of gas used was increased by the discount. If there were no discount claimed in Scarborough, they would probably be able to sell their gas at 2s. 7½d. or 2s. 8d. per 1000 cubic feet at the outside, and still make exactly the same profits as at present. The main benefit of discounts, in his opinion, was that it brought in the money promptly; and, perhaps chief of all, they had much more pleasant relationships with their consumers. There was, in human nature, a liking to have something back, and when the consumers came and paid their money, they smiled, and left the office in good temper, on finding that there was something to get back. He had had experience of both systems; and he could speak in the highest terms in support of the discount system. As to the details of the system, they might have a fixed date for all accounts to be in by; or they might give each consumer the same length of time, which was, of course, by far the fairer method. But the principle was the same; and it would be found, he thought, to work extremely well. At Scarborough, they had not very much in the way of manufactories. Their consumers were comparatively small ones; and they had not such difficulties to deal with as Mr. Warner and Mr. Cox had referred to. They had no differential rate, because their consumers were much of the same size. In regard to the sliding-scale, which Mr. Tobey referred to, he was not able to give them an opinion upon it; but he should certainly think a fair method would be to take the price at the net rate, because, in the case of Scarborough, 92 per cent. availed themselves of the discount. But no doubt a clause in an Act of Parliament would put this right. As to the letting of houses, they found that the new system did improve matters to this extent—that in the case of those who let their houses the accounts might be delivered, and while under the old system they might only have a fortnight from the date of delivery to pay, under the new method the account might be delivered about the beginning of the month, and they might have returned to Scarborough before the month had expired. It was their experience that they required to be firm as to the final date. They had a printed form which they sent out to all, treating everyone alike, on which was the date of delivery and the calendar month; and in this way there could be no mistake as to the terminal date. As to posting the invoices, they had had the subject before them several times, but had not yet introduced the system. Mr. Cox spoke of the arrangement as to the expiry of the discount period not being a suitable one; but in his opinion it was very convenient. A note was made in the gas ledger of the dates when the accounts were delivered; and when anyone came to pay, they could easily refer to the ledger. But they found that probably not one in a hundred came without their bills; because they had on the top of the bill a printed notice that it must be produced at payment. The expense of collection was certainly reduced by the discount system; but a great deal depended upon what they took as the cost. Of course, the clerks at the counter who received the money were virtually collectors; and a portion of their time was a charge upon the collection. He thought there was no great trouble in getting to know the net price of the gas, and that it was the actual money paid, and not the amount stated in the invoice, which should be the comparative figure. He did not know that there was anything more to say, especially as time was getting on; but Mr. Penney spoke of the last day of discount being a difficulty. Well, they had this system of fixed dates; and, as they would see, they received payment of not less than 1000 accounts in two days, out of a total of 3000. After introducing the system of allowing a calendar month, the accounts fell due at various times during the month. The average number received was about 80 per day; the highest being 134, as against 607 on the last day under the old system. This, also, enabled the cash-book to be posted up daily, and the payment to the bank checked before it was made. He highly supported the discount system; and he thought that those who had once adopted it, would not go back to the system of no discounts.

#### VOTES OF THANKS.

Mr. H. LEES said it afforded him great pleasure to propose a vote of thanks to Mr. Holliday for having written his paper, and to Mr. Williams for having come there to read it. They were all very sorry at Mr. Holliday's absence; but they welcomed Mr. Williams as his substitute. The way he had replied to the discussion had been most gratifying to everyone. They were greatly indebted to him.

Mr. MILLARD seconded. They felt, he said, that Mr. Holliday had done his duty manfully. They were also indebted to Mr. Williams for coming forward to read the paper. He hoped that his experience on this occasion would induce him to come forward and read a paper on his own account another time.

Mr. WILLIAMS, on behalf of Mr. Holliday, expressed thanks for the kind vote.

Mr. WARNER said he was going to step a little bit out of the ordinary current of their business, in proposing a vote of thanks



to the President. The President had told them of the large number of gas-engines in use within the district of Sunderland. Some of the older members of the Association would at once go back with him, mentally, to the year of the gas exhibition in South Shields. On that occasion, they had two comparative toys of gas-engines exhibited. One they had some little trouble to get started, and to do its work, which was sawing a deal. The other they were not quite so successful in starting; and, in fact, he did not think it started at all. They put, or attempted to put, different kinds of work upon it, from a little water-pump to the operation which the other engine was performing. This was the introduction of the gas-engine to gas manufacturers. It was the year when their Association had its birth. The exhibition was a very successful one; and it was exactly the power which gave gas cooking and heating that push which it just at that time required. It was so successful that it was followed in other towns. Why he referred to this was that in one part of the address of the President he seemed to look back, to a certain extent, and to be of opinion that they had not made any great amount of progress within the 21 years of their existence. But, if they looked a little deeper, it was not so. They would see that many momentous questions had been raised since then. They were met on an auspicious occasion. He, as their first President, wished their present President God-speed in his year of office. The manner in which he had conducted their business that day was a proof that the gathering would be looked back upon as a very successful one. He had great pleasure in asking them to recognize the services of the President by a very cordial vote of thanks.

Mr. J. HEPWORTH (Edinburgh) said that he was permitted—as being, he believed, the second President of the Association—to second, as he did most cordially, the vote of thanks. Unfortunately for him, the President's address was always, by some unwritten law, supposed to be a matter not for discussion; but he could assure the President—having once been in the chair himself—that however true this might be while in the meeting, the moment they got outside they should begin discussing it in all ways. He ventured to say, in regard to the address at all events, that there would only be one conclusion at the end of their discussion, which would be that it had been one of the ablest addresses they had ever had from the chair.

The PRESIDENT thanked the members very much indeed for the extremely kind acceptance of the motion, as well as for the way in which it had been proposed. It was most gratifying to find that his efforts had been so successful. He could only feel that he did not deserve half the flattering remarks which had been made about him.

This terminated the meeting.

The members and their friends were afterwards entertained to dinner by the Sunderland Gas Company at the Palatine Hotel, in the Borough Road; Mr. Stokoe, the Chairman of the Company, presiding.

#### COAL AND COKE CONVEYING MACHINERY AT THE GAYTHORN GAS-WORKS, MANCHESTER.

In the course of our report upon the visit of the Institution of Gas Engineers to Manchester last week, reference is made to the new coal and coke conveying machinery which has been laid down, in connection with the inclined retort installation at Gaythorn Gas-Works, by West's Gas Improvement Company Limited; and we give below a few further details. The coal conveying plant has been running about two months; and the coke machinery was completed last Thursday.

The coal-handling plant consists of a powerful cannel breaker, capable of dealing with 25 tons of cannel per hour, and fed by a shoot leading from an overhead railway to a hopper fixed above the breaker. After the coal is broken, it is raised by an elevator, and conveyed by a band conveyor to a point opposite the gable-end of the retort-house fitted with inclined retorts. At this point, the coal is delivered into a scraper conveyor, which carries the coal the entire length of the house, depositing it at suitable intervals through outlets to the hoppers which hold the supply of coal ready for supplying the travelling charging-shoot. Below these hoppers there is a railway, on which runs the travelling charging-shoot for the several tiers of retorts.

After the coke is drawn from the retorts, it falls direct into a coke-conveyor extending the whole length of the retort-house, which contains 108 retorts, and is 186 ft. 9 in. long between the walls. This conveyor is of West's latest pattern, and is constructed with Hunt's patent roller chain, which, it is claimed, is the most suitable chain for dealing with coke and other materials which prove destructive to ordinary chains and chain wheels.

In the floor of the retort-house is set a U-section trough, 2 ft. 3 in. wide by 9 inches deep; and in the centre of this there is a renewable slide-bar, which supports the chain throughout its entire length. The chain itself has, at suitable distances apart, arms or scrapers on which the coke is carried to a point outside the retort-house; and the return chain is borne by brackets and rollers carried overhead by the buckstays supporting the retort-bench.

After the coke is removed from the retort-house by the conveyor, it is fed through shoots to an elevator having buckets fitted with anti-friction rollers, which roll up and down the elevator frame, and raise the coke and deliver it on to a screen. The conveyor itself is 220 feet long; and the elevator 62 feet.

After the screen separates the breeze from the coke, it is either delivered into a series of overhead hoppers for filling carts, or is conveyed to the coke yard. It is here delivered to another series of overhead coke hoppers, or else conveyed farther on to another portion of the coke yard. The overhead conveyor is 167 feet long; and it is provided with suitable apparatus for delivering the coke from it at any desired point.

Great care has been given to the designing of the whole of this coke apparatus, bearing in mind that the material to be conveyed is of a very destructive nature to mechanical appliances. The whole of the bearings and wearing parts have, therefore, exceptional surfaces to meet the severe conditions to which a coke-conveyor is applied; and those parts which are liable to excessive wear are renewable at a moderate cost. The driving of the coke conveyors and elevator, it may be remarked, is performed by one vertical engine. The whole of the apparatus here described was designed by Mr. John West, M.Inst.C.E.

#### REGISTER OF PATENTS.

**Mantles for Incandescent Gas-Lights.**—Scriwan, E., of Vienna. No. 23,287; Oct. 11, 1897.

The patentee proposes to replace the platinum wire used for suspending the mantles of incandescent lights by a cheaper material, and has carried out a number of experiments with specially spun or twisted asbestos and metal wire—such as iron, nickel, copper, silver, and their alloys. Spun or twisted asbestos has been found to partly serve the purpose; but it is not durable enough, and renders the transit of the mantles (particularly when placed upon wire frames) impossible, "all the more as the gelatine used to stand transit injures the asbestos." He therefore proposes using metal wire with a covering of asbestos "wrapped, spun, or plaited" around it, and which, it is said, "perfectly resists the temperature generated by the bunsen flame, and prevents the cracking of the gelatinized asbestos."

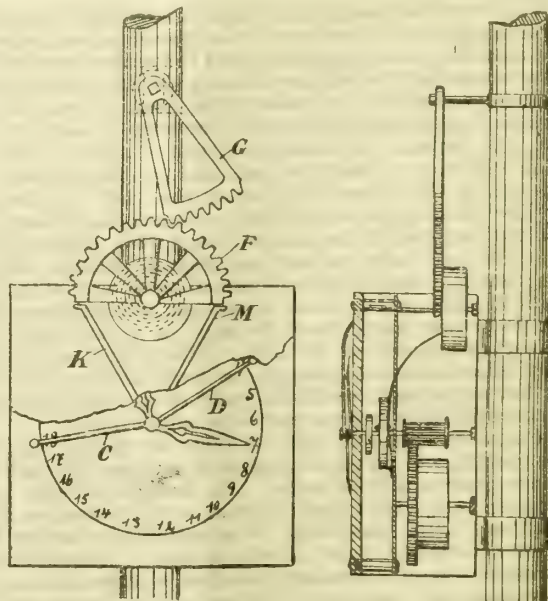
**Self-Lighting Gas-Burners.**—Grundy, F. B., of Palmer Street, Westminster. No. 25,127; Oct. 29, 1897.

This self-lighting burner is so arranged that, on turning on the gas, it becomes ignited by playing on platinum or other suitable material. The stopcock has passages so arranged that in one position it cuts off the gas supply; and in another position it allows the gas to pass to a jet at the side of, and somewhat below, the main burner. Above this jet is situated the platinum or other material, on which the gas plays. On the jet becoming ignited, the cock is turned farther, so as to pass gas to the main burner; and, on it being ignited, the cock is turned to such a position as to maintain the main light but to extinguish the jet light. In this way the platinum or other igniting material is not subject to the action of gas, except when requiring to ignite it in the first instance.

**Self-Lighting and Extinguishing Devices for Gas-Burners.**—Landauer, R., of Berlin. No. 30,652; Dec. 28, 1897.

This is a device, says the patentee, making it possible "for a lantern having been lit by self-action at a certain time in the evening or night to be extinguished in the same manner in the morning."

For this purpose two regulating devices are provided—one to open the gas-jet, and the second to close the jet and extinguish the light. Both devices work in connection with a toothed half-wheel, which gears with a sector rigidly connected with the pivot of the gas jet. C is the device for lighting and D for extinguishing the light. The works of the clock



actuate the toothed half-wheel F. G is the sector referred to above; while K is the checking device for lighting, and M the device for extinguishing the light.

This "time-gas-jet opener and closer" has the following action: The regulating hand C, which determines the time of lighting, is turned on to

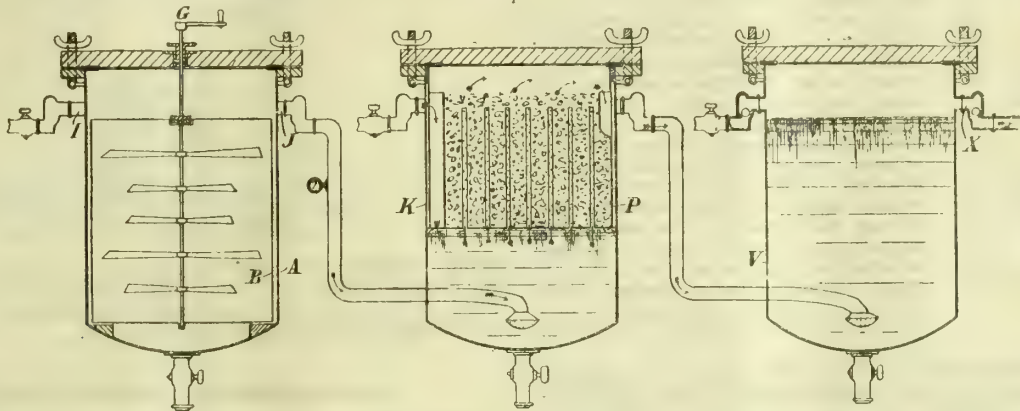


the hour at which the gas is desired to burn—for instance, 6 o'clock, or the eighteenth hour of day—and the extinguishing hand D is put on the hour at which it is desired to extinguish the light. As soon as the hour for lighting is reached, the checking device K will be discharged, and the toothed half-wheel F is rotated. At the same time the sector G is rotated, compelling the cock to turn on the gas. The sector remains in the same position until the extinguishing of the light is desired, say, at 4 o'clock in the morning. As soon as the hand reaches this hour, the checking device M is released, so that the toothed half-wheel F rotates again—this time making a backward motion—by means of a spring, counterweight, or similar device. The sector is then again taken along, compelling the gas-jet to close, and the flame to be extinguished.

**Producing and Purifying Acetylene Gas.**—Walker, H., of Dublin. No. 4352; Feb. 22, 1898.

This invention relates to apparatus for the simultaneous production of acetylene and carbonic acid gases and their purification.

The patentee proposes to use a vertical and lead-lined generating cylinder



calcium carbide, chalk, or equivalents, and a suitable dry acid (such as oxalic acid), or calcium carbide and a dry acid only in proper proportions, are placed. The purifier K is packed with sulphate of iron (green vitriol) or other suitable material, or with a mixture of sulphate of iron and copper filings. On turning on water to the generator, the gas will be produced and pass to the purifier, and then into the cylinder V containing water, "which may or may not be impregnated with any substance for the better purification of the gas."

**Controlling Bye-Pass Burners.**—White, C., of Blaenavon, and White, T. H., of Cwmbran. No. 5342; March 4, 1898.

This invention refers to self-lighting burners in which a jet of light is formed by means of a bye-pass which opens as the main supply closes, and closes while the main burner is alight. It consists of an inlet-nozzle, above which is a gas chamber; and a horizontal flexible diaphragm divides the chamber from the air chamber above it. Through the diaphragm, and attached to it, passes the open lower end of a tube, which rises vertically through a second flexible diaphragm (much smaller than the first) over the air chamber, and ultimately penetrates a fixed horizontal plate, and is closed at its upper end. This tube is so attached to the two flexible diaphragms that it rises and falls with them according to the pressure of the gas. At the upper end of the vertical tube are holes for the escape of the gas; and above and below the holes are fixed two cone-shaped stops which engage alternately with the horizontal plate. The plate closes the entrance to the main burner; and the stops are so arranged that when the gas is turned on, and the diaphragms rise, the perforated part of the vertical tube rises above the horizontal plate, and so allows the gas to pass upwards to the burner. When the gas is turned off and the diaphragms fall, the perforated part of the vertical tube sinks below the horizontal plate, and the gas passes only to the tube leading to the flash-light. A bye-pass in the tap permits sufficient gas to flow to feed the flash-light. An air-hole, the size of which may be regulated, is formed in the air chamber, and allows the lower diaphragm to work as slowly as is required to ensure the necessary time for the transfer of the ignition from the flash-light to the burner and *vice versa*.

**Making Gas.**—Liddle, J.; a communication from L. O. Triebel and D. Whiteis, of Oconto, Wis., U.S.A. No. 7427; March 28, 1898.

This invention relates to apparatus for making gas—more particularly intended to be set up for use in dwellings, office buildings, and the like. Among the objects contemplated are: (1) The provision of an improved construction to secure a uniform pressure of the gas in the distributing holder. (2) The automatic regulation of the quantity of gas admitted to the holder. (3) The arranging of the pump mechanism and gas-generator within the initial water-tank, "whereby compactness in the arrangement is secured. (4) Provision for securing an even temperature of water within the initial water-tank. (5) Provision of an improved construction of gas-generator. (6) An improved combination between the pump mechanism and the initial holder. (7) An improved form of construction of the initial water-tank, wherein an interior wall is provided, forming an annular chamber for the reception of oil.

**Composition for Automatically Lighting Gas**—Rosinski, S., and Ducreux, E., of Paris. No. 7280A; March 25, 1898.

This invention relates to a product which "possesses the property of being rendered incandescent by the action of a jet of gas directed upon it—the incandescence being due to the condensation in its pores of a considerable proportion of the gas, the heat thereby developed being sufficient to ignite the gas." The product consists, essentially, of gelatinous alumina impregnated with platinum chloride; the invention "being particularly characterized by the employment as a support for the platinum salt of the gelatinous alumina, which has the property of possessing very

A, having within it a bucket B, in which is a mixer or agitator of any suitable kind—such as a vertical rod or spindle having paddles thereon. Provision is made at G for rotating the spindle either by hand or power. At the bottom of the cylinder is a suitable outlet for emptying it; and near the upper end (and on the opposite sides) are pipes—one I for conveying into A the water to be used in the process of making the gas (and also for flushing when required), and the other J for the exit of the gas to the purifier K—provided with check-valves to prevent the gas flowing back. The pipe J enters the purifier K near the bottom.

The purifier consists of a vertical cylinder containing water at the bottom. About one-third up is a ledge, on which is a ring to prevent the gas from passing up the sides. On the ring rests a copper bucket P, containing upstanding perforated copper tubes (sealed at the top) surrounded with sulphate of iron or any other suitable crystal. At the top of the bucket is another rubber ring, so as to compel the gas to pass through the tubes and come in contact with the crystals. From the upper part of K leads off a pipe conveying the gas to a cylinder V containing water, and thence by the pipe X to the gasholder.

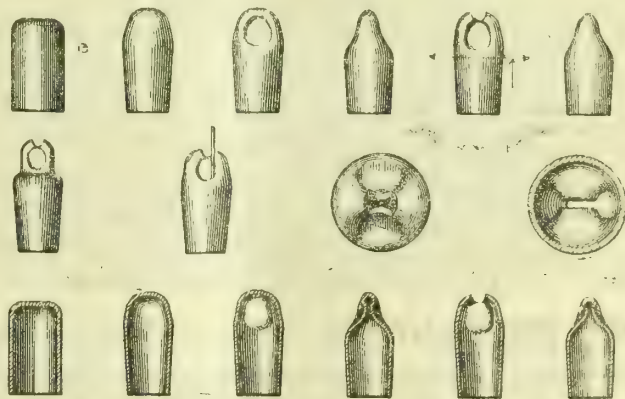
The apparatus is charged as follows: In the generating cylinder A

great power of condensation." The product is prepared by immersing gelatinous alumina in a solution of platinum chloride, in the proportion of 1 gramme of platinum chloride to 4 grammes of alcohol. After having been steeped in the platinum chloride solution, it is brought to a temperature of about 120° C., and is then ready for use.

The composition, owing to the rapidity with which it can be rendered incandescent under the action of a jet of gas, may be employed for the manufacture of gas lighters in the form of matches, but capable of being used over and over again. For this purpose, the match-stems are tipped with a small quantity of the material; and, in order to light a gas-jet, it is only necessary to turn on the gas, and hold the tip of the lighter in the jet of gas. The composition then at once becomes incandescent, and develops sufficient heat to ignite the gas.

**Gas Tips or Burners.**—Porter, W. H., of New York. No. 12,227; May 31, 1898.

In explanation of his invention, the patentee says: "Heretofore it has generally been the practice to provide tips or burners with two classes of openings for the passage of the gas—one in the form of a slot extending transversely across the top of the tip to a greater or less extent, and the other in the form of two holes usually set opposite to each other; and one of the objects of the present invention is to provide an improved form of opening for the gas, which is neither a simple slot nor two holes, but which may be said to comprise in a general way a combination of these two forms, in that there are practically two holes connected by an intermediate slot or (otherwise expressed) a continuous transverse slot having



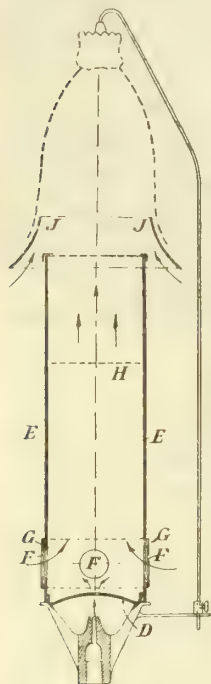
enlargements at its ends. The enlarged portions are arranged at any desired angle to the connecting transverse slot; and they preferably extend above it. The opening also is preferably formed out of a right line—that is, the holes or enlarged portions are arranged opposite to each other at a greater or less angle, and extend above the connecting transverse slot. Again, the tip is formed so that the opposed openings or enlarged ends of the slot are in communication with what may be termed "conveying channels" extending from the chamber or body of the tip; and these channels communicate with this chamber at all points throughout their length—being what may be termed open channels with their ends or openings facing each other.

The making of the burner—from the metal thimble from which it is drawn to the finished and pierced tip—is illustrated in the accompanying engraving reproduced from the specification.



**Incandescent Gas-Burner.**—Boult, A. J.; a communication from G. Delin, of Brussels. No. 14,454; June 30, 1898.

This invention relates to an incandescent gas-burner "characterized by the improved position of the inlet for the gas relatively to the mixing chamber, whereby air is drawn in a rotary manner, producing a richer and more powerful mixture."



The gas enters through a jet of cylindrical shape, and passes through a central aperture made in the arched cover D, which closes the bottom of the tube forming the mixing chamber. This tube E is provided at its lower end with perforations F for the admission of air, and closed or opened to a greater or less extent by the movement of a regulating ring G, also provided with openings. It is provided with a metal netting or perforated plate H at the top forming a cap.

The novelty of the arrangement consists chiefly in the arched bottom D, called "a suction plate," provided with a central orifice through which the gas enters the mixing chamber. It is essential that the diameter of this orifice should be larger than that of the gas-outlet, in order to produce a rotary motion in the lower part of the mixing chamber, and consequently considerable suction of air through the orifices F. The mantle does not rest directly on the top, and does not lie close to it, but on or over a funnel-shaped part J of larger diameter than that of the tube E. The mantle is suspended by a rod secured to a bracket of the tube E.

It will be seen that the burner chiefly differs from others hitherto known by the arrangement of the gas-outlet relatively to the tube E constituting the mixing chamber; the escape of gas taking place in a cylindrical jet in front of a suction plate provided with a central hole of a larger diameter than that of the gas-outlet—the air-inlet holes being arranged above the plate. The result of this construction is "a considerable reduction of the consumption of gas, and a phenomenal increase of illuminating power."

**Treating Calcium Carbide so as to Retard the Production of Acetylene Gas.**—Dillberg, G., of Sydney, New South Wales. No. 15,212; July 11, 1898

The aim of this invention is to dispense with any mechanical contrivance for the production of acetylene from calcic carbide, and to use the calcium "in its most simple and effective form"—viz., by simply immersing it in water. Instead of using mechanical devices for this purpose, a "calcium carbide admixture" is employed to retard the liberation of the gas. To make the admixture efficient, it is necessary for it to be intimately combined with the calcium carbide, by introducing the foreign substance evenly among the particles of which the solid calcium carbide is composed—an operation which necessitates bringing the solid calcium carbide into granulated or powdered form, so that minute portions of the foreign substance are interposed between the carbide particles. The "foreign substance" must, of necessity, be of a more or less adhesive nature, either in its normal state or when heated or liquefied, so that "when all the ingredients are intimately mixed, a plastic composition of even and semi-solid consistency is obtained." This plastic composition, if left for a time, solidifies; but before such solidification occurs it is placed in a mould and considerable pressure is exerted upon it, whereby it is moulded into "a cake of smooth and glossy appearance, and of great hardness and even consistency."

Though many substances may effect this purpose with a more or less good result, either singly or combined, the patentee prefers a mixture of naphthalene and resin, the proportions of which depend upon the quality of the ingredients employed, as well as upon the size and number of burners used and pressure of gas required. Where a burner consuming (say)  $\frac{1}{2}$  foot of acetylene per hour is used, the proportions of the mixture are (approximately): 10 naphthalene, 3 resin, 45 calcium carbide. To obtain the ultimate mixture, the naphthalene and resin are reduced to a liquid form by heat; and into this liquid the crushed carbide is stirred until the composition attains a semi-solid consistency. It is then placed in a mould and compressed. When removed from the mould, it is ready for use, and may be dropped into any receptacle containing water; the only essential feature with such a receptacle being that it must be furnished with a tight-fitting cork or stopper, supplied with a hole to take either a burner direct or a pipe communicating with a burner or burners.

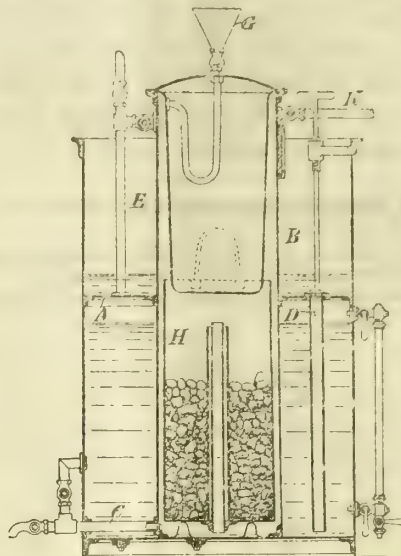
**Acetylene Generating Apparatus.**—Henriquez, E., of Brussels. No. 15,020; July 8, 1898.

This invention relates to the class of apparatus for generating acetylene from calcic carbide in which water is supplied to the carbide and an excess of gas pressure stops a further supply of water, so as to reduce or stop the production of acetylene.

The annular water-tank (formed with a central well B) is divided by a partition A into a lower gas-tight compartment and an upper compartment which may be open. From the lower portion of the compartment a pipe C leads to the inside of the well; a branch-pipe being arranged to discharge water from the compartments or well into a drain. From the partition plate, a pipe D descends to near the bottom of the compartment, and a valve is arranged by which the inlet to the pipe can be closed. A pipe E ascends from the partition, leading to the gas-main or holder, if one is used, and a branch-pipe connects the rising pipe E with the inside of the well.

The well B forms the generator. It is closed by a gas-tight cover made hollow and very deep, for the purpose of reducing the air-space in the

generator. To the top of the cover a cock is fixed, surmounted by a funnel G, and communicating through a syphon-pipe with the inside of the generator. Below the cover a pipe K is fitted to the side of the well leading outside the building in which the generating apparatus is placed,



or into a chimney flue. Into the generator a bucket H is placed fitted with handles to lift it by. A stand-pipe passes water-tight through the bottom of the bucket, and is surrounded by a perforated pipe; the carbide being contained in the annular space round it.

#### APPLICATIONS FOR LETTERS PATENT.

- 19,829.—POMEROY, B. H., "Coin-meters." Sept. 19.  
 19,838.—STRACHAN, J., "Hydrant with radial disc-valve, for street water-mains and the like." Sept. 19.  
 19,845.—MINTRE, C. S., "Generating acetylene gas." Sept. 19.  
 19,849.—SCHRÖDER, W., "Process for obtaining yellow prussiate of potash as a bye-product in the destructive distillation of coal." Sept. 19.  
 19,951.—SEILER, E., "Electrical gas-lighters." Sept. 20.  
 19,986.—BROWN, A. O., and ALLEN, W. A. G., "Recuperative gas-lamps." Sept. 21.  
 20,017.—PIERON, L., "Automatic ignition of gas issuing from burners furnished with incandescent mantles." Sept. 21.  
 20,057.—WALLIN, B. H., and WENDEL, Count R. de, "Improvements relating to carbide cartridges." Sept. 21.  
 20,122.—WALLIN, B. H., and WENDEL, Baron R. de, "Generating acetylene gas." Sept. 22.  
 20,127.—JACOT, L., "Manufacture of acetylene gas." A communication from E. Pellaton. Sept. 22.  
 20,273.—BOULT, A. J., "Bunsen burners." A communication from E. Verbeke. Sept. 24.

**High Wycombe Gas Company, Limited.**—At the recent half-yearly general meeting of this Company, the Directors reported that the profit realized in the six months ending June 30 justified them in recommending a dividend of  $5\frac{1}{2}$  per cent. for the half year on the ordinary shares (making  $11\frac{1}{2}$  per cent. for the year), and of 4 per cent. on the additional shares (making  $8\frac{1}{2}$  per cent. for the year), free of income-tax. They remarked that the period of abnormally high temperature which commenced in December, 1897, and extended throughout January and February of the present year, did not depreciate the half-year's working results; but that, on the contrary, the net increase in the gas manufactured was 4,216,100 cubic feet, or nearly  $10\frac{1}{2}$  per cent., as compared with the corresponding six months of 1897. The Company have now out on hire some 435 gas-cookers and 557 slot meters, which accounts for the above-mentioned results. The extensions, for which new capital was raised, are now completed and at work, giving the anticipated results. The Directors expressed their pleasure in stating that the difficulties arising from the pollution of the river and private fisheries had been settled. In moving the adoption of the report, the Chairman (Mr. T. Marshall) referred to the satisfactory completion of the new works and to the improved condition of the plant generally under the supervision of the new Manager and Secretary, Mr. J. F. Wicks.

**Gas Workers' Wages at Leeds.**—In pursuance of a resolution passed at a mass meeting of gas-workers in Leeds last Sunday week, the Secretary for the district (Mr. J. E. Smith) has sent the following letter to the Corporation Gas Committee: "I am instructed by my Executive Council to ask your Committee for the following alterations in wages and conditions desired by your workpeople: 4d. per day advance for stokers, firemen, purifiers, coal-wheelers, yardmen, and cinder-throwers; an eight-hour day for pipe-layers and men engaged in the meter department. I wish to point out to your Committee that certain sections of men working under the above heads have not received any advance for over twenty years—for instance, the stokers. It may be urged that if the stokers have not received an advance, they have secured a reduction in hours. But they have to work at far greater pressure now than when they were working a twelve-hour day. We are extremely desirous of settling this matter amicably if possible; and we respectfully ask you to call a special meeting of your Committee to consider this application. We are prepared to meet you, accompanied by a deputation of the men, to discuss the above points, if your Committee are desirous of having any further information in connection with this matter. I may add, in conclusion, that your Committee have many times expressed their desire to pay as much wages as other places doing similar work; and if you take comparisons, I think you will agree we are asking nothing unreasonable."



## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### "Induced Current" Incandescent Burners.

SIR,—Referring to the paragraph in your issue for Sept. 20 (p. 635), on the subject of "Patent Rights in 'Induced Current' Incandescent Burners," I should like to say that the patent of Mr. Willis for the use of gas under pressure to produce an induced current or currents of air to mix with the gas in its passage to an incandescent platinum wire gauze mantle is a totally different thing from the special burners designed and more recently in use to improve the incandescent light obtained from the Welsbach mantle. No comparison, therefore, is possible between the rough work necessary to bring a platinum basket to a state of incandescence (which requires very high pressures and large quantities of gas) and the scientific utilization of the ordinary pressures with much less gas and a more delicate mantle. Indeed, neither special injectors nor mixing cones are needed with the gas under high pressure such as would be given by the gasholders used by Mr. Willis; and the jets of gas under pressure issuing from his nozzles do not induce a flow of air in the same way as is done in either Bandsept's or Kern's burners.

Although Mr. Willis dealt with jets of gas (and sometimes air) under pressure, he did not think of an atomizer, as both Bandsept and Kern do. Now it is just this introduction of the atomizer, creating a certain resistance at the top of the burner, which necessitates an efficient injector; and Bandsept was the first to adopt this arrangement of the two together. The most perfect form of compound injectors and mixing cones would not do without a final atomizing of the gases; consequently, burners without atomizers cannot be compared with the Bandsept and Kern burner, any more than those assisted by exterior motive power can be compared with burners which only use the ordinary town pressures.

C. E. MASTERMAN.

Denayrouze Light Syndicate, Limited,

28, Victoria Street, Westminster, S.W., Sept. 26, 1898.

## LEGAL INTELLIGENCE.

### Liability for Damage to a Gas-Main.

At the Totnes County Court, on Tuesday last, the Totnes and Bridgetown Gas Company brought an action against Messrs. Hancock and Co., proprietors of "merry-go-rounds," to recover damages for the breakage of a gas-main. A traction-engine belonging to the defendants was hauling trucks along one of the roads of Totnes on the 29th of August, when the weight fractured one of the mains. It was stated that the loss of gas was 10,000 cubic feet, the value of which, with the cost of renewing the main, was placed at £2 19s. 10d. His Honour Judge Woodfall gave judgment for the Company for the amount claimed.

**Littleborough District Council and the Gas-Works.**—The Littleborough District Council have decided to ask the Directors of the Gas Company to state the terms on which they are prepared to sell their undertaking. The acquisition of the works is not a new proposal at Littleborough; and many have advocated it for a long time. It is thought probable that the Council would not have taken this step just now had they not wished to put themselves in a better position for opposing any extension scheme which might aim at adding Littleborough to Rochdale. The concern is a profitable one; the shareholders having received 10 per cent. dividends for many years.

**Brynmawr Water Supply.**—The water supply of Brynmawr has been a vexed question for a long period; and time after time attempts have been made to improve matters, but with little success. A disastrous fire in the latter part of last year, however, stirred the District Council into activity; and application has now been made to the Local Government Board for sanction to borrow £5000 for improving the water-works—including an increase in the storage capacity of the reservoir of 22 million gallons, which will give 40 gallons per head per day to 6000 people for 91 days. It is also proposed to build an additional filter-bed and to substitute 9-inch main-pipes for the existing 5-inch ones.

**Abingdon Gas Company.**—At the recent half-yearly meeting of this Company, a dividend at the rate of 4 per cent. on the "A" shares, and £2 16s. per cent. on the "B" shares was declared, and £14 was carried forward. The dividend compares unfavourably with the distribution at the same time last year, when it was at the rate of 5 and 3½ per cent., and a balance of more than £300 was carried forward. The Directors in their report stated that they were unable to recommend a larger dividend, owing to their late Manager having over-estimated the stock of coal and stores, &c., in hand during his management, in consequence of which it had been necessary for the purpose of the present balance-sheet to write off a considerable sum in respect of these two items.

**Effect of the Use of Gas-Stoves on the Character of Dustbin Refuse.**—Mr. Charles H. Lowe, the Surveyor to the Vestry of Hampstead, in reporting on the work done by his department during the past year, says: "The character of the contents of the domestic dustbin is undergoing a change, attributable to a large extent to the general adoption of the gas-stove. In the summer months, the bin receives every description of refuse except ashes—paper, cardboard boxes, tins, and vegetable cuttings being most in evidence. In the days of the kitchener, a large proportion of this was burnt. With the gas-stove, it cannot be so dealt with; and it is no uncommon experience, particularly in a high-class district, for the men to load up without having a particle of dust in their cart. This means, of course, an increase in that which is useless, and a decrease in that which has a money value." As the Vestry of Hampstead removed upwards of 27,320 tons of refuse during the year, this statement of the Surveyor is a striking testimony to the increased popularity of gas-stoves; and that such testimony should emanate from a district where electric lighting is now making such strides, must be encouraging to the Gas Company's shareholders.

## MISCELLANEOUS NEWS.

### MORLEY GAS-WORKS TRANSFER ARBITRATION.

Monday, Sept. 26.

(Before Mr. JAMES MANSENGH, M.Inst.C.E., Umpire.)

This was an arbitration to fix the price to be paid by the Corporation of Morley (Yorks.) for the undertaking of the Morley Gas Company, under an Act obtained last session. Mr. CORBET WOODALL was Arbitrator for the Corporation; Mr. THOMAS NEWBING, for the Company.

Mr. BALFOUR BROWNE, Q.C., and Mr. FRANK BALFOUR BROWNE appeared for the Corporation; Mr. PEMBER, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., represented the Company.

Mr. PEMBER, opening the case, said this was a compulsory purchase. In the present year the Company went to Parliament for further powers; but the Corporation, having decided that they could with advantage purchase the undertaking, successfully promoted a Bill to give them the power to do so. The Company were in so prosperous a condition that the payment of maximum dividends was practically certain. The sound position was shown by the fact that such dividends had been declared for a considerable time; that the surplus of income over the amount required for this purpose was ample; that the business was increasing; and that the price charged for gas was low. The works, too, were in excellent condition. The only points to be considered really were the amount of the maintainable income, and then what number of years' purchase should be paid for it. In connection with the latter point, the question of stability of income was involved; but there was also another matter which had become in recent times of increasing importance—viz., that the value of money had been falling, and probably would continue to decrease. Having regard to these facts, the witnesses would contend that the income should be capitalized on the 3½ per cent. table, or at 30-77 years' purchase. The stability of the income was indicated by the fact that in the last ten years the business had grown at the rate of 5 per cent. per annum; and the increase would doubtless have been greater if the Company had introduced prepayment meters and let out fittings on hire. The works were substantially built and in good repair; and the site was ample for the construction of additional appliances to meet any moderate increase that might be expected. The greatest day's make of gas was 517,000 cubic feet; yet the retort-house was capable of producing nearly 700,000 cubic feet, the purifiers could deal with 640,000 cubic feet, and the gasholder capacity was 900,000 cubic feet, which at a very moderate expenditure could be increased to 1,180,000 cubic feet. Roughly, the works could supply 25 per cent. more gas than the present requirement. The total share capital was £46,100. The first Act obtained was that of 1848, authorizing £5000 to be raised in shares at 10 per cent., with borrowing powers of £2500. The latter sum was subsequently converted, under the Companies Clauses Act of 1845, and became share capital. A second Act, obtained in 1868, gave the Company power to raise £3600 of stock at 5 per cent., and £35,000 at 7 per cent.; and this money was duly obtained. A third Act, of 1889, conferred further money powers, which, however, had not been exercised; and also authority to create a reserve fund of £5000. The total dividend payable on the existing share capital was £3380. There was a mortgage of £2800, £1800 of which was in connection with the original capital; the remaining £1000 referring to the £35,000 raised under the Act of 1868. The Company were entitled to convert the first-named sum into 10 per cent. shares, and the second into 7 per cent. shares; and, for the purposes of the accounts, the Company would ask the Umpire to assume that what they had power to do in this respect they had done. This conversion would mean that the amount the Company would have been entitled to divide would have been increased by £166. There was also a temporary loan of £1800 which they could pay off and re-issue, under the Act of 1868, as share capital at 7 per cent. In the same way this would have made a difference of £126 to the divisible income. Further, the Company, instead of investing the reserve fund, had spent it on the works. This sum, they said, should be considered as replaced, and, together with certain floating balances, supposed to be issued as share capital under the Act of 1868, it would make a further difference of some £406. These amounts of £3380, £166, £126, and £406 made a total of £4078 as the sum divisible among the shareholders. This figure capitalized at 3½ per cent., gave £125,480 which, plus 10 per cent., or £12,548, the allowance for compulsory purchase, made £138,028. But the Company were not entitled to take away with them the temporary loan of £1800, and the £5800 of reserve fund and floating balances, because, as they had paid their maximum dividend for some years, the Corporation would be entitled to the reserve fund; and inasmuch as the Corporation would have to pay off the temporary loan, they should be allowed this also. Subtracting this £7600—£5800 and £1800—left £130,428. Then it was matter of agreement that the Company were to be allowed the expense of re-investment.

The UMPIRE: In addition to the 10 per cent.?

Mr. PEMBER: Yes.

Mr. BALFOUR BROWNE: We say not in addition, but in substitution.

Mr. PEMBER (continuing) said this cost was put at 2½ per cent., or £3260, which brought the total up to £133,688, the final figure of the valuation. Further dealing with the 2½ per cent., Counsel said that early in the parliamentary proceedings the Corporation agreed that the provisions of the Lands Clauses Act should be inserted; then subsequently came the decision of the Committee, saying that besides what was given under the Act the Company should have the cost of re-investment.

Mr. Samuel Wood, of the firm of Messrs. Alfred Lass, Wood, and Co., presented a series of tables relating to the position of the Company, which he had compiled from the books and accounts.

In cross-examination by Mr. BALFOUR BROWNE, witness said that at the present time the Company had only to pay dividends on £46,100, which required £3380. As to converting certain loans into share capital, this would be useless unless they had revenue to pay interest or dividend on it when converted. On Dec. 31 last, the Company had overdrawn their capital account by £4955. Witness had taken the accounts to the close of 1897, because the Company's year ended on the 31st of December. The £4955 was in the works. If this sum were reserve fund, it ought to



have been separately invested, in which case it would have had to be replaced by borrowed money, and interest paid upon it. The item for repairs of works and mains and services came out at 2.13d. per 1000 cubic feet of gas sold, which was very small. Asked by Counsel if he would be wrong in saying that, instead of 2.13d., 5d. was nearer the ordinary amount, witness replied that he would prefer not to answer the question. The total income in 1896 was £10,611, and £10,304 in 1897—a decrease of £307. Figures were put to witness showing that as between the receipts for the half years from 1895 to 1897 there was some considerable falling off.

By Mr. CORBET WOODALL: The insurance fund had been abolished; but this amount could not be carried to the reserve fund because it would have made it too great. It had been carried to the profit and loss account.

Mr. BALFOUR BROWNE: What did you do with it when you got it there?

Witness: We could not do anything.

Therefore this fund, instead of being applied to the reduction of the price of gas, still remains in the hands of the Company, and stands there undivided and illegal?—Yes; it is invested in the works.

In re-examination by Mr. PEMBER, witness said the accounts showed a surplus of £1209 above what was wanted for the payment of the maximum dividend in 1897, an excess of £887 in 1896, and of £607 in 1895—showing that the surplus had been growing.

Mr. PEMBER: If the conversion were made, these figures for interest on debenture stock and loans would disappear. In lieu of them dividends would be paid on the shares, and the surpluses would be proportionately increased?

Witness: Yes.

The stability is further increased by the fact that the charges for income-tax are included in the dividend. If these have been improperly paid, it is obvious that there is a slight further surplus?—That is so. The Company have paid full dividends, free of tax.

Mr. E. Hardwick, of Leeds, said he had been a Director of the Company for 46 years, and Chairman for 17 years. The Company had been successful for a long time; but at the commencement it was not well managed. The population of Morley consisted largely of working men employed in mills; and though some might take the electric light from the Corporation, they were not likely to do so generally. Certain of the mills had adopted electricity; but they still took gas for generating purposes. In several cases, owners of mills who had taken electricity talked of returning to gas on account of the excessive cost. The main street of Morley was already electrically lighted. The gas consumption had recently decreased, owing to a decline in trade. If electricity were generally adopted for public lighting, it would not mean a serious loss. If the Company had continued trading, they would have made a reduction in the charge for gas as from July.

Cross-examined by Mr. BALFOUR BROWNE: Generally the town was dependent on the cloth, coal, and stone trades. The supply of gas to mills was very remunerative, because they were sometimes going all night. In certain cases the supply of gas to mills which used it for generating electricity was more expensive than gas at the previous cost. It was not true that the collieries in Morley were becoming exhausted, as fresh beds of coal were being opened up. The district was of a mining character, which led to subsidences, with consequent drawing of pipe-joints and rather large leakage of gas. He could not say how many of the 3684 meters which the Company possessed had been stamped after inspection by the inspector appointed under the Act of 1869.

Re-examined by Mr. PEMBER: Some of the mills which supplied their own electric light were the best consumers the Company had. He did not regard the depression at Morley as permanent, because deeper beds of coal were being opened out.

Mr. PEMBER: Do you regard the desire of the Corporation to purchase your works as a symptom that they think the town is going down hill?

Witness: No; I do not think so.

Mr. H. J. Hemingway, Secretary to the Company, said the price of gas had steadily decreased from 1880 to the present time—falling from 3s. 4d. to 2s. 4d. per 1000 cubic feet; and if the Company had gone on they would have been able to make a further reduction. The 2s. 4d. was alike in excess of what was received owing to allowances that were made. With one trifling exception, he had never had a complaint from the Corporation. The illuminating power of the gas had been 17 candles for years past. The stock of the Company, which was held by 127 shareholders, was not quoted; and there were very few transfers.

Mr. E. H. Stevenson, examined by Mr. BAGGALLAY, said he had gone into the history of the Company for the last twenty years, as far as he could, and found that the business had been very steadily growing. Taken over this period, the increase had been more than 6 per cent. compound ratio, which was far above the average. Even in the last ten years it had been upwards of 5 per cent. The use of prepayment meters and the hiring of fittings would have considerably accelerated the increase. In another case, where these meters had been pushed, an advance of 10 per cent. in one year had resulted. The use of these meters would cause a new body of consumers, who would not pay half yearly, to take gas. Even if the Company had collected their accounts quarterly and not half yearly, he believed the consumers would have been more numerous. Moreover, by prepayment meters, capital was very advantageously employed; and with a low price of gas, as in the present case, the gain would have been higher than usual. The works of the Company were very substantially built—practically the whole of them having been erected since 1875. The only portions that were old were a holder and tank. The works were in first-class condition, and in excess of present requirements. There were only one or two small things which he should recommend to be done. The boiler was a new one, but it ought to be duplicated, and a new engine ought to be provided; but the cost of the two would only be about £400. The scrubbers were more than able to deal with the present make of gas. There were two exhausters—one with a capacity of 30,000, the other of 15,000 cubic feet per hour. The present retorts, allowing 10 per cent. as a margin, would easily make 792,000 cubic feet of gas per day, or 53 per cent. in excess of the maximum daily make hitherto. With very slight alteration, they could easily be made equal to the production of 922,000 cubic feet. The condensers were sufficient, but not much in excess of requirements. The tar and liquor storage was very large—equal to something like 130 days'

maximum make. The purifiers, which were very spacious, were five in number, and equal to a daily make of 640,000 cubic feet. The oxide purifiers were changed about twice a week in mid-winter; and the lime purifiers about once a month. The works were well equipped in every way. The small works had an area of 1½ acres; and there was a further 6½ acres, with an intermediate space which could be used for storage, but not for manufacture. This area was very conveniently situated for gas-works purposes.

Mr. BAGGALLAY: There is no further expenditure needed on works to supply a very much larger consumption of gas than at present?

Witness: No; I think an engine and a boiler, and an increase in the condensers, would easily furnish another 25 per cent.

And with small further expenditure you could supply a very long way ahead?—For an expenditure of £7000 or £8000, you could make a million cubic feet of gas a day.

Examination continued: The undertaking was in as good a position as one could be. It was almost unique, having regard to its margin in price. In his valuation, he had considered that the reserve fund was not invested. If it had been, there would have been a further income of £127. Then the Company had always paid the income-tax, which should have been deducted from the interest. This gave £152 which ought to be added to the surplus profits. He commenced his valuation with the figure of £3380, the dividend payable on the existing share capital. To this he added £166 in respect of the conversion into share capital of the £2800, bearing 3 per cent., £1800 at 10 per cent., and £1000 at 7 per cent. Treating the temporary loan of £1800 in the same way gave a sum of £126. Then there was the further sum which he held they ought to have raised, and which, in fact, somebody must raise, to reinstate the reserve fund, which would give a further £406 of additional income. Adding these four figures together produced £4078—a sum which would have been the annual income if the concern had remained in the hands of the Company. The additional interest they would have had to pay was amply covered by the surplus profits.

Mr. BAGGALLAY: Is the income, in your opinion, amply secured?

Witness: I think it is absolutely secured—as amply secured as any trading company's income can be. The £4078 is the maximum profit they can make. I think it is absolutely maintainable; and it is the maintainable profit with which I deal in this case.

Examination continued: The multiplier was based on the 3½ per cent. table, which gave 30.77 years. He took this figure because he considered any company working under a maximum price and a fixed rate of dividend had their income better secured than was the case with one working under a standard price and a sliding-scale. The slightest change in the latter case altered the income. A great variation in the price of gas in the former case might occur without any alteration of income; and therefore he thought the income in this case was worth certainly another ½ per cent. beyond what was ordinarily allowed. Multiplying the £4078 by 30.77 gave £125,480, which, plus 10 per cent. allowance for compulsory sale, gave £138,028. From this, however, he deducted £7600 capital which was not raised, but for which credit had already been taken; leaving £130,428. To this sum he added £3260, being 2½ per cent. for the cost of re-investment, which brought out his final figure of £133,688. This 2½ per cent. beyond the 10 per cent. for compulsory sale he thought he was justified in adding under section 5 of the Act.

Tuesday, Sept. 27.

Mr. Stevenson, in further examination by Mr. BAGGALLAY, said the mains and pipes were all in very fair condition, considering that the district was undermined. The expenditure on repairs and maintenance in the last year was low; the year before, it was high. It varied from year to year. The surplus profit of the Company last year, over what was required to pay maximum dividends, would have been £1500 or £1600 if the Company had not paid income-tax, and if they had invested their reserve fund as they ought to have done. After allowing for the increased sum divisible among the shareholders after the conversion, there would still have been a large margin to provide for any increased annual expenditure on repairs. The introduction of the electric light was not at all likely to affect the prosperity of the Company. A number of people who had taken the electric light had gas-stoves and gas-fires; and even where electricity was used, it was only partially taken. It was not his general experience that the introduction of electricity materially affected gas sales. He believed there was only one undertaking that had been affected by it; and that was The Gaslight and Coke Company, who stood in a peculiar position, as they only supplied the cream of London. Many of the people in Morley who had electric light used gas to generate their electricity. If electricity affected the sale of gas, the price charged for gas was so low that a small addition—say, to 2s. 6d. per 1000 cubic feet—could be made without affecting the consumption in the slightest. With the exception of four companies, the Morley Gas Company supplied gas more cheaply than any other in Yorkshire. This cheapness was largely due to the exceedingly low capital of the Company in proportion to the make—£5 11s. per ton of coal carbonized. Having regard to the large working-class population, he not think there was an undue proportion of 2-inch mains. The fact that the meters were not stamped was of no importance to this arbitration. The great number of 2-light meters was consequent on the large proportion of small consumers; but these small consumers added to the stability of the Company. There were 3338 small consumers, out of 3684; leaving only about 350 medium and large consumers.

Cross-examined by Mr. BALFOUR BROWNE: The superficial area he should allow in any condenser per day per 1000 cubic feet of gas made depended on the type of condenser. With the pattern in use at Morley, he should allow probably 5 feet superficial area for the condenser and the foul main. He should allow 4 feet of cubical contents per 1000 cubic feet of gas per day for scrubbers. If washer-scrubbers were used, the cubical contents through which the gas would pass, half of which was water, would be about 0.4. The cubical contents of the scrubber was 3000 feet, or about 5.8 feet per 1000 cubic feet. The box area he should use for oxide and for lime entirely depended on the coal used; it would be about 0.4. Taking the area of the purifier, and dividing by 0.4 gave the amount of gas it would purify. At Morley, the area was nearly 0.5. The retorts were capable of making 7000 cubic feet of gas per mouthpiece; if they made less, it was because they had more retorts than they wanted.



The works, with the expenditure of £400, could be put in condition to earn more than the required revenue. The number of premises in Morley might be about 5000, of which about 1000 did not take gas. This, he considered, allowed a large margin for future increase. Supposing they all took gas by prepayment meters, and on the average at Manchester—viz., 8000 cubic feet per meter—this would add another 8 million cubic feet to the consumption. But this was not the limit of possible expansion, because he did not think the town was going to cease growing. In his valuation, he put the total expenditure on repairs and maintenance of works, mains, and meters at 3-21d. per 1000 cubic feet. A number of other cases were put to him in which he had allowed a much larger figure under this head; but he alleged that in each case, as at Chesterfield and Ystrad, the circumstances were special. The sum of £698 which he included in the divisible profits, depended on the principle of the conversion of loans into shares; and capitalized at 30-77 years' purchase, it accounted for over £21,000 of the claim. The amount of the reserve fund was £4609; the insurance and contingent fund, £1000; and the accumulated balances, £4178—a total of about £10,000.

Mr. BALFOUR BROWNE: Suppose the accumulation of these funds is illegal?

Witness: That I cannot suppose.

I assume that a properly conducted company would have required this money?—Yes; it is being used as working capital.

If you had not got the working capital from this source, you would have had to raise it?—Yes.

If you had raised it in the cheapest form, it would have cost you 3 per cent.?—Yes.

And this would have been a deduction from your net profits?—Yes; but I cannot admit that the carrying forward of a balance is illegal.

In further cross-examination, witness said the multiplier depended entirely on whether the income was maintainable or not. He agreed that in many previous cases he had not put it so high; but this was because the present Company's income was so well secured. The difference between a statutory and a non-statutory company he had usually put at about 1 per cent., or 5 years' purchase.

Counsel was proceeding to question witness respecting the 10 per cent. allowance when argument arose as to whether it was allowable or not. Mr. Pember read from the proceedings before the Parliamentary Committee, from which he contended it appeared that the Committee deliberately passed the Bill on the understanding that the Company should be allowed the full 10 per cent. Mr. Balfour Browne dissented; but the argument was not prolonged.

By Mr. NEWBIGGING: The trunk mains, for a Company of this size, were very large.

Mr. Rayner, Stockbroker, of Leeds, expressed the opinion that 2½ per cent. was a reasonable sum to allow for the cost of re-investment and to recompense the shareholders for loss of income while the money was being paid and a new investment found.

Mr. Kirkby, another Leeds Stockbroker, thought 3 per cent. should be allowed.

Mr. W. R. Chester said the Morley works were admirably situated for the supply of gas, the obtaining of coal, and the disposing of residuals; being beside the railway, in a low part of the town, and adjoining a public road. The new portion of the site was well adapted for extension of the works; and the surplus land was sufficient for the next fifty years. The buildings were in excellent condition, substantially built of stone, and in good repair; and, in general, the same might be said of the apparatus. He agreed largely with Mr. Stevenson, but thought he had under-estimated the capacity of some of the apparatus. He agreed that if the system of prepayment meters were introduced there would be a considerable increase of consumption. The increase per prepayment meter ranged from 10,000 to 20,000 cubic feet per annum. It was over 10,000 cubic feet in Nottingham. The average net receipts amounted to 2s. 1½d. per 1000 cubic feet, which was very low as compared with other similar neighbouring undertakings. The maximum price which the Morley Gas Company could charge was 4s. per 1000 cubic feet; and the present price, 2s. 2d. There was therefore a margin of 1s. 10d. per 1000 cubic feet to work on before there need be any reduction of dividend. As regarded stability and prosperity, the Company stood in quite an exceptional position owing to this margin. Concerning the electric light, he said the universal experience was that its introduction had not diminished the growth of the consumption of gas, but that it caused an increased demand. The increase of income from prepayment meters and the letting out of fittings was likely to be much in excess of any decrease due to electric light. The expenditure on wear and tear in the year 1897—3-21d. per 1000 cubic feet—was insufficient to adequately maintain the works in proper condition. He should say for works of this character the average figure should be 5d. per 1000 cubic feet, or 1½d. more, which would mean a further expenditure of £647. In his valuation, he started with £3380 as the maximum dividends payable on the existing capital. He then supposed that the £4600 of loan capital at 3 per cent. had been converted into share capital; but he had treated it a little differently from Mr. Stevenson. He believed these loans were held by existing shareholders; and therefore he had simply taken the difference between the actual dividend paid on the amounts, and the dividend which would be payable after conversion. Treating the £4600, the £1800, and the £2800 in this way, gave a sum of £238 to add to the divisible income—making it £3618. The next item of £406 in connection with the reserve fund and floating balances, he arrived at in the same manner as Mr. Stevenson. This increased the £3618 to £4024. This he capitalized at the high figure of 30-77 years' purchase, because he knew of no case in which there was the same stability of income; and this gave £123,818, to which he added 10 per cent. for compulsory sale, making £136,200. He thought the Committee of the House of Lords fully intended the 10 per cent. to be given. He next deducted from the £136,200, £5800 in respect of capital authorized, though not actually raised, but for which credit had been taken earlier, leaving £130,400. To this sum he added 2½ per cent., or £3260, for re-investment, which he held to be fully authorized by the Act, thus bringing out £133,660 as the total value of the undertaking. He was satisfied the income of the Company was more than sufficient to meet the amount divisible—to provide for the conversions, to pay full dividends on the share capital thus produced, and to leave a surplus more than enough to cover the extra allowance for wear and tear he had mentioned. There

was a surplus income beyond what was required to pay the maximum dividends of £1291, to which had to be added £138, which would be produced from the reserve fund if invested at 3 per cent., and £151 in respect of income-tax which the Company had erroneously paid—a total of £1580. Then, in respect of raising the wear and tear allowance to 5d. per 1000 cubic feet, they would have to deduct £647; and for the conversion scheme, £644—leaving £289. This, however, did not take any account of increase arising from prepayment meters or other growth of business.

Cross-examined by Mr. BALFOUR BROWNE: He assumed that £138 was what the reserve would have produced if invested in Consols. To get this, the reserve would have had to be withdrawn, and replaced by money bearing interest, which interest would have to be set against the £138. Similarly the two items of £644 and £647 would have caused the remainder of the surplus to disappear, leaving only as surplus the income-tax paid in error.

Mr. BALFOUR BROWNE: Have you ever in your life put on a higher multiplier than 30-77?

Witness: No; and I have never come across an undertaking where the income was so well secured. I do not think much is to be feared from the introduction of the electric light.

Re-examined by Mr. PEMBER: He had made a mistake as regarded the £138, when replying to Mr. Balfour Browne, because lower down in his valuation he had made a deduction in respect of the replacing of the reserve fund, so that the £138 should stand as a surplus. Even if the whole of the surplus were wiped out, it could be at once replaced by increasing the price of gas 1d. per 1000 cubic feet; and with so large a margin as 1s. 10d., this could very well be done. An increase of 1d. would yield £370.

By Mr. CORBET WOODALL: He preferred supplying a number of small consumers to one large one, because the latter could squeeze the Company as to price or exact a heavy discount, whereas the small consumers could not. He thought he was quite justified in regarding the income-tax as a surplus, seeing that the Company had paid both the full dividend and the tax as well. It would not go in reduction of the price of gas till a certain point had been reached.

Mr. Wood was re-called for the purpose of explaining certain small adjustments which increased the apparent profit for the year 1897 from £4624 12s. 8d. to £4913 15s. 9d.

Cross-examined by Mr. BALFOUR BROWNE: One item of the difference was the income-tax which had been paid erroneously.

Mr. BALFOUR BROWNE: Suppose they are not entitled to pay the income-tax beyond the 10 per cent. of dividend, should not every farthing paid as income-tax over 10 per cent. be brought back into account and handed over to us when we purchase?

Witness: If they were only entitled to 10 per cent. on their share capital, then they have had a little more than 10 per cent. As a matter of debtor and creditor, it should be brought back. Altogether the accumulated income-tax might amount to £4000 or £5000.

Mr. Robert Porter gave evidence agreeing with that of Mr. Stevenson and Mr. Chester as to the situation and construction of the works, which were well maintained and in excellent condition throughout. In his valuation he started with £3380, the dividend payable on the existing share capital. To this sum he added £180 for the conversion of £1800 loan capital into 10 per cent. share capital; £196 for the conversion of the £2800 debenture stock; and £406 in respect of the replacement of the reserve fund and floating balances, at present invested in the works and stocks, and the issue as share capital of £5800 which the Company have power to raise at 7 per cent. These three sums made the total amount divisible £4162, which, capitalized at 3½ per cent., gave £128,064, and plus 10 per cent. (£12,806) brought the total up to £140,870. Deducting £10,600, the amount of capital not raised, left £130,470; and adding 2½ per cent. for re-investment (£3261), gave the final figure of £133,731 as the net value of the undertaking. He considered the concern exceedingly well secured; and he thought that the Company would be well able to pay their maximum dividends in future.

This closed the case for the Company.

(To be continued.)

## COMMERCIAL GAS COMPANY.

### The Half-Yearly Report and Accounts.

The following is the report of the Directors of this Company for the half year ending June 30, which, with the accounts for this period, will be presented at the meeting of the proprietors on Thursday:—

The Directors submit the accounts for the half year ended June 30, 1898. The revenue account shows a net profit for the half year of £53,958 11s. 1d. Deducting therefrom £4768 13s. 7d. for interest on debenture stock and loan, there remains standing to the credit of the net revenue account a balance of £49,189 17s. 6d. available for dividend. The Directors recommend that dividends be declared at the rates of 13½ per cent. per annum upon the old stock of the Company, and of 10½ per cent. per annum upon the new stock, both less income-tax. The balance of the net revenue will be carried forward to the next half year. Resolutions will be submitted to the proprietors authorizing the raising of further capital, in conformity with the Company's Act of 1875, as and when the Directors may deem advisable.

The accounts accompanying the report consist of the usual statements. They show that stock to the amount of £750,750 has been raised out of the total of £830,000 authorized; and that £200,750 has been borrowed out of £300,000 sanctioned. The receipts on capital account amount to £951,500; and there is £24,229 of premium capital—together, £975,729; leaving a balance of £9764. The expenditure on capital account in the past six months (£24,938) comprised £16,791 for new and additional buildings, plant, &c.; £2116 for mains and services; £2075 for meters and stoves; and £3949 for "coin" meters and fittings, less £1319 written off for depreciation. The total expenditure to June last amounted to £1,010,471; showing that the capital account has been overdrawn to the extent of £34,742. The reserve fund at the above-named date stood at £42,093, and the insurance fund at £28,652. The



balance-sheet shows that the value of the stores in hand at the close of the half year was as follows: Coals and oil, £21,715; coke and breeze, £139; tar, ammoniacal liquor, and sulphate of ammonia, £4787; and

sundries, £16,268—making a total of £42,909. The revenue and profit and loss accounts, together with the statements relating to the working, are given below.

## REVENUE ACCOUNT.

|                                                                                                                  |                |
|------------------------------------------------------------------------------------------------------------------|----------------|
| To Manufacture of gas—                                                                                           |                |
| Coals and oil, including dues, carriage, unloading, and trimming                                                 | £70,588 2 6    |
| Salaries of Engineer and Officers at works                                                                       | 2,313 10 0     |
| Wages (carbonizing)                                                                                              | 18,300 9 2     |
| Purification, including £2904 19s. 0d. for labour.                                                               | 4,707 14 8     |
| Repair and maintenance of works and plant, materials and labour (less £962 15s. 10d. received for old materials) | 16,945 19 1    |
| Distribution of gas—                                                                                             | £113,855 15 0  |
| Salaries and wages of Officers (including Rental Clerks)                                                         | £1,696 15 9    |
| Repair, maintenance, and renewal of mains and service-pipes, including labour                                    | 2,498 17 10    |
| Repair and renewal of meters                                                                                     | 1,772 0 4      |
| „ „ stoves                                                                                                       | 1,456 9 2      |
| „ „ coin meters and fittings                                                                                     | 1,819 13 7     |
| Public lamps—Lighting and repairing                                                                              | 8,743 17 8     |
| Rents, rates, and taxes                                                                                          | 3,154 7 9      |
| Management—                                                                                                      | 6,798 4 2      |
| Directors' allowance                                                                                             | £1,250 0 0     |
| Company's Auditors                                                                                               | 75 0 0         |
| Salaries of Secretary, Accountant, and Clerks                                                                    | 1,129 10 10    |
| Collectors' salaries and commission                                                                              | 1,584 5 7      |
| Coin meter collection                                                                                            | 276 14 1       |
| Stationery and printing                                                                                          | 598 13 5       |
| General charges                                                                                                  | 425 16 4       |
| Bad debts                                                                                                        | 5,340 0 3      |
| Law charges                                                                                                      | 548 3 10       |
| Superannuation                                                                                                   | 97 13 2        |
| Official Officers                                                                                                | 126 0 0        |
|                                                                                                                  | 125 13 1       |
|                                                                                                                  | £137,789 14 11 |
| Balance carried to net revenue account                                                                           | 58,958 11 1    |
|                                                                                                                  | £191,748 6 0   |

## By Sale of gas—

|                                                        |               |
|--------------------------------------------------------|---------------|
| Common gas, per meter, at 2s. 6d. per 1000 cubic feet. | £141,461 10 1 |
| Public lighting and under contracts, common gas.       | 10,131 10 11  |
|                                                        | £151,616 1 0  |
| Rental—                                                |               |
| Meters                                                 | £2,358 16 1   |
| Stoves                                                 | 1,273 13 2    |
| Coin meters and fittings                               | 2,124 10 2    |
|                                                        | 5,756 19 5    |
| Residual products—                                     |               |
| Coke, less £4132 15s. 9d. for labour                   | £21,182 8 6   |
| Breeze, less £811 13s. 8d. for do.                     | 397 15 4      |
| Tar                                                    | 6,435 11 8    |
| Ammoniacal liquor and sulphate of ammonia              | 6,027 10 9    |
|                                                        | 31,013 6 3    |
| Miscellaneous receipts—                                |               |
| Rents receivable                                       | £301 19 4     |
| Transfer fees                                          | 80 0 0        |
|                                                        | 331 19 4      |
|                                                        | £191,748 6 0  |

## PROFIT AND LOSS (NET REVENUE) ACCOUNT.

|                                                          |              |                                                                                                                |              |
|----------------------------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------|--------------|
| Interest on debenture stock                              | £4,516 17 6  | Balance, Dec. 31, 1897                                                                                         | £45,288 12 0 |
| Interest and dividend balance                            | 251 16 1     | Amount brought from reserve fund                                                                               | 2,174 15 2   |
| Balance available for dividend, carried to balance sheet | 49,189 17 6  |                                                                                                                | £47,463 7 2  |
|                                                          |              | Less dividend paid for half year ending Dec. 31, 1897, £47,461 7s. 2d., and forfeiture for defective power, £2 | 47,463 7 2   |
|                                                          |              | Balance from revenue account                                                                                   | £53,958 11 1 |
|                                                          | £53,958 11 1 |                                                                                                                | £53,958 11 1 |

## STATEMENT OF GAS MADE, SOLD, Etc.

| QUANTITY SOLD.  |                                                | Total Quantity accounted for. | Number of Public Lights. |
|-----------------|------------------------------------------------|-------------------------------|--------------------------|
| Quantity Made.  | Public Lights and under Contracts (estimated). |                               |                          |
| Meter Register. | Private Lights (per Meter).                    |                               |                          |
| Thousands.      | Thousands.                                     | Thousands.                    | Thousands.               |
| 1,292,324       | 69,406                                         | 1,362,754                     | 1,214,251                |
|                 |                                                |                               | 5,665                    |

## BRITISH GASLIGHT COMPANY, LIMITED.

The Half-Yearly General Meeting of this Company was held on Wednesday last, at the London Offices, No. 11, George Yard, Lombard Street, E.C.—Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. H. B. Chamberlain) read the notice convening the meeting, as well as the report of the Directors and the accounts for the six months ending June 30. The report stated that the balance of profit was £21,026, after deducting the following items, and adding £75 from the Trowbridge reserve fund; the parliamentary interest at that station not having been realized by this amount. The deductions were: Income-tax, £816; Hull excess profit, £793; Potteries excess profit, £1337; Norwich debenture interest, £918; Potteries debenture interest, £386—total £4251. The gas-rental at Hull showed an increase of £2143, as compared with that of the corresponding period of 1897—the price of gas having been the same at each period. Coke and tar were about the same. Tar distilling and ammoniacal liquor exhibited a decrease of £528; and sulphate of ammonia an increase of £631. Coal had cost 10s. 6d. per ton, as against 9s. 11d. before. Coke had realized the same price—viz., 8s. 1d. per ton. The quantity of gas sent out was 423,303,604 cubic feet, as against 406,031,610 cubic feet—an increase of 17,271,994 cubic feet (4.25 per cent.). The profit realized was £793 in excess of the parliamentary interest allowed. This sum had been invested in Consols; making the reserve fund at this station £34,382. The gas-rental at the Norwich station showed a decrease of £2862 as compared with that of the corresponding period of 1897, owing to the reduction in the price of gas from 3s. 6d. to 3s. per 1000 cubic feet from Jan. 1. The sum realized for coke, tar, and ammoniacal liquor showed a decrease of £693; the quantities made being much less in consequence of the introduction of carburetted water gas. Coal had cost 14s. 3d. per ton, as compared with 15s. 11d. Coke had realized 7s. 7d. per chaldron, as against 6s. 1d. The gas sent out was 149,709,000 cubic feet, as against 149,855,000 cubic feet, or a decrease of 146,000 cubic feet (0.09 per cent.). The profit realized was £4288 less than the parliamentary interest. The decrease in the consumption of gas having been arrested, the Directors trusted that the former prosperity of the station would be resumed at no distant period. The gas-rental at the Potteries station showed an increase of £459; the price of gas having been the same as at the corresponding period of 1897—viz., 2s. 3d. per 1000 cubic feet. The sum realized for coke, tar, and ammoniacal liquor showed a decrease of

## STATEMENT OF COALS.

| Description of Coal. | In Store, Dec. 31, 1897. | Received during the Half Year. | Carbonized during the Half Year. | Used and Sold during the Half Year. | In Store, June 30, 1898. |
|----------------------|--------------------------|--------------------------------|----------------------------------|-------------------------------------|--------------------------|
|                      | Tons. Cwt.               | Tons. Cwt.                     | Tons. Cwt.                       | Tons. Cwt.                          | Tons. Cwt.               |
| Common.              | 15,742 0                 | 102,466 6                      | 100,130 16                       | 391 10                              | 17,726 0                 |
| Cannel.              | 8,826 0                  | —                              | 72 0                             | —                                   | 8,754 0                  |
|                      | 21,698 0                 | 102,466 6                      | 100,202 16                       | 391 10                              | 26,480 0                 |

\* 934,849 gallons of petroleum spirit used as a substitute for cannel.

## STATEMENT OF RESIDUAL PRODUCTS.

|                                | In Store, Dec. 31, 1897. | Made during the Half Year. | Used during the Half Year. | Sold during the Half Year. | In Store, June 30, 1898. |
|--------------------------------|--------------------------|----------------------------|----------------------------|----------------------------|--------------------------|
| Coke—tons                      | 7,417                    | 61,330                     | 18,105                     | 59,502                     | 140                      |
| Breeze—chaldrons               | 2,400                    | 10,658                     | —                          | 12,628                     | 430                      |
| Tar—gallons                    | 366,490                  | 1,180,302                  | —                          | 1,251,192                  | 235,600                  |
| Ammon. liq.—butts of 108 gals. | 13,931                   | 33,243                     | 42,105                     | —                          | 5,074                    |
| Sulphate of ammonia—tons       | 222½                     | 1,260                      | —                          | 1,286½                     | 295                      |

£305; and sulphate of ammonia, an increase of £260. Coal had cost 8s. 4d. per ton, as against 8s. Coke had realized 4s. 6d. per ton, as compared with 4s. 9d. The gas sent out was 159,420,000 cubic feet, as against 151,046,000 cubic feet, or an increase of 8,374,000 cubic feet (5.54 per cent.). The profit realized was £1337 in excess of the parliamentary interest allowed; and this sum had been invested in Consols—making the reserve fund at this station £17,101. The gas-rental at the Trowbridge station showed an increase of £175; the price of gas having been the same at each period—3s. 2d. per 1000 cubic feet, with discounts. Coal had cost 13s. 8d. per ton, as against 13s. 3d. Coke had realized 5s. 10d. per chaldron, as against 6s. 10d. The quantity of gas sent out was 23,087,953 cubic feet, as against 22,147,100 cubic feet, or an increase of 940,853 cubic feet (4.24 per cent.). The profit realized was £75 less than the parliamentary interest; and this sum would be taken from the reserve fund—leaving a balance of £2943 to the credit of that account. The profit from the Holywell station was £336. Adding the total profit to the previous balance of profit and loss made £44,684, from which the Directors recommended a dividend at the rate of 10 per cent. per annum, clear of income-tax. This would amount to £21,000, and leave a balance of £23,684.

The CHAIRMAN said it was now his duty to move the adoption of the report and accounts; and, in doing so, he would make a few remarks on the business of the half year, which he trusted might be of interest to the shareholders. He would first take their most important station—Hull. It would be remembered that at the last meeting he informed the shareholders that the Directors were entering into an agreement with the Corporation for lighting the district of Kingston-upon-Hull, which had been taken over from a local Company. He need hardly say that, in making an agreement covering so large a business, there had been many difficulties—though not of a very important nature—which they had had to discuss with the authorities. But he was glad to be able to inform the shareholders that these difficulties had been overcome. He did not think the agreement had yet been absolutely signed and sealed; but it was practically settled between them, and showed exactly what the Company had to do, and what the Corporation had to pay. The latter were still in negotiation with the North-Eastern Railway Company, with regard to the construction for a big subway underneath the dock, which subway was to carry the gas-mains into the Kingston-upon-Hull district. Therefore the Directors did not anticipate having to light the district before next spring—he thought it would probably be about May or June. This was of some advantage to the Company, because



it would enable the Directors and Engineers to go very carefully into the matter, to learn what extensions, if any, would be required in connection with the manufacturing plant and gasholders, and various other details. He was glad to say the Board found the Corporation, the Engineers, and the staff generally at Hull very friendly towards them; and everything had been settled in a most amicable manner. The business at Hull during the last six months had progressed very favourably. With coin meters alone they had had an increase of 437; and the total number now fixed there was 4221. They had also had an increase of above 200 in the number of stoves on hire; and the total now stood at 2573. The new retort-house (No. 4) which was built about a year ago had been fitted entirely upon the regenerative systems of Hislop and Winstanley—principally by the system of the latter; and they were working in a most satisfactory manner. The result was a very large saving in the wages bill. The Directors had now before them the question of reconstructing, in the immediate future, No. 1 retort-house, which was the oldest on the works. Their Engineer was at present engaged upon the plans; but the Directors had not so far decided as to whether they would again adopt regenerative furnaces or put in inclined retorts. He now came to the next station—Norwich—which he might say at once was responsible for the “knocking off” of the bonus which the shareholders had been enjoying for so many years. They would remember that he informed them at the last meeting that the Directors had decided upon a very drastic alteration in the price of gas at Norwich. Their business had been very much cut into by the electric light; and there appeared to be a reluctance among the people to take their gas on account of the high charge. But the Company were burdened there with a system of discounts, which, in his (the Chairman's) opinion, interfered with the consumption of gas. People only looked at the price of 3s. 6d., and never considered the matter of discounts. The Directors accordingly reduced the charge for gas at one step from 3s. 6d. to 3s. per 1000 cubic feet, and did away with the discounts. This, of course, was, as he had said, a drastic measure; and the Company were suffering from it at the present time. They felt, however, it was the only course to pursue. The Norwich accounts were made rather worse this half year by the inclusion in them of the sum of £733 for discounts. Under the old system of book-keeping, the discounts were not taken off the amount of the gas bills at the end of the half year, but were brought into the half-year's accounts when they were absolutely collected and allowed to the consumers. The consequence was that, though they were crediting themselves this half year with gas at 3s. per 1000 cubic feet, they were debiting themselves with discounts really appertaining to the previous six months. If they had debited the half year with its own discounts, the accounts would have contained the discounts for an entire year. Therefore the present accounts were £733 worse off than they really ought to be. Another item had been exercising the minds of the Directors—that was the enormous burden of rating. They had, however, determined to appeal against it. The amount they had had to pay in the half year for rating was £1132; and in addition to this the authorities had increased the rates from 8s. 4d. to 8s. 6d. in the pound. This burden had become so intolerable that the Directors had determined to apply for a large reduction of their assessment. His colleague, Mr. Corbet Woodall, had thrown himself heartily into the matter, and had advised the Board so clearly on the point, that they had gone before the Assessment Committee and demanded a heavy reduction; and if they won their case, as they had every prospect of doing, the Company would save a large amount on that account alone. These were two items in which the Norwich accounts could be improved; and, besides, he was glad to say that he believed the decrease in the consumption of gas at Norwich had been arrested. They had placed at the Norwich works a very energetic and capable Engineer from the Potteries station (Mr. John Young); and he certainly had been doing all he could to promote the Company's interests there, and with a certain amount of success. They had had a considerable increase in the consumption of gas during the last two or three months; and they must give Mr. Young time. One could not expect him to grip fresh business all at once. He (the Chairman) had sincere hopes that they had turned the corner at Norwich; and he really did believe they would soon show a better state of affairs there. At the Potteries, the business was still progressing favourably, both with regard to the profit earned and the consumption of gas. They had for some time been very much hampered there for office accommodation. It had been insufficient, not only for the clerical work, but also with respect to show-rooms. An opportunity had, however, occurred of securing, for a very moderate figure, excellent premises—a corner site, almost in the centre of Hanley. They had purchased the place at a cost of £4500; but this did not appear in the present accounts, because they did not pay the money in the past half year. He was told by people connected with Hanley that they had made a very good purchase indeed, which they would never have to regret. With regard to the other two small stations—Trowbridge and Holywell—everything had gone on satisfactorily. The Engineer at Trowbridge (Mr. H. Sainsbury) had had a serious illness, which he (the Chairman) was sorry to say had laid him up for some time; and he sincerely hoped he would soon recover. He did not think there was anything to say with regard to the general policy of the Company. The Directors had exercised themselves in the consideration of the Workmen's Compensation Act; but, like many other Companies, they were at present holding their hands with regard to the matter. The Insurance Companies were asking very high rates of premium. The Directors considered, looking at the small amount of the liability they had incurred during a great many years, and the extraordinary liberality with which they had treated their workmen when accidents had overtaken them, that they were entitled to ask the shareholders to allow them to be their own insurers in this respect, and, even if they did not absolutely set aside a certain amount of money, to permit them to continue in the same way as they had hitherto done, and deal with the cases as they arose in the ordinary way. It would be remembered that at the last meeting he particularly pointed out to the shareholders that they would probably have to drop the bonus on this occasion. They had done so simply because they had not earned it; and the reason they had not earned it was the transition state of affairs at Norwich. He hoped that at some future date they would be able to resume the bonus, the discontinuance of which affected Directors and shareholders alike—indeed, the Directors were very considerable shareholders. It would be the earnest endeavour of the Board to lay before

the proprietors a more favourable statement with regard to the Norwich station next half year.

Mr. FREDERIC LANE LINGING seconded the motion, which was unanimously carried.

On the motion of the CHAIRMAN, seconded by Colonel J. WILKINSON, a dividend at the rate of 10 per cent. per annum was declared.

On the proposition of the CHAIRMAN, seconded by Mr. J. B. COULSON, Mr. Corbet Woodall was re-elected to his seat on the Board.

Mr. WOODALL, having responded, moved the re-election of Mr. Linging; remarking that it had been a great satisfaction to have him bringing his long accumulation of knowledge of the Company back to its service; and they all heartily hoped he might long stay with them in the capacity of a Director.

Mr. R. STEVENS seconded the motion, which was agreed to.

The retiring Auditor (Mr. E. Yardley) was also re-appointed, on the proposition of Mr. STEVENS, seconded by Mr. R. S. GARDINER.

Mr. LEONARD WILKINSON moved a hearty vote of thanks to the Chairman and Directors. He referred to the confidence the shareholders had in the Board, and said that if any of them came to the meeting with doubts as to their affairs at Norwich, these doubts had been set at rest by the eloquent speech of the Chairman.

Mr. COULSON seconded the motion; and it was carried unanimously.

The CHAIRMAN having briefly responded,

A similar compliment was paid to the Secretary and officers of the Company; and an acknowledgment by Mr. CHAMBERLAIN concluded the proceedings.

### ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

#### Appointment of Mr. W. F. Cotton as Managing-Director.

The Half-Yearly General Meeting of this Company was held last Friday, at the Offices, D'Olier Street, Dublin—Mr. C. LAWLER, J.P., in the chair.

THE SECRETARY and MANAGER (Mr. W. F. Cotton, J.P.), having read the notice convening the meeting, the report and accounts, dealt with in the “JOURNAL” last week, were presented.

THE CHAIRMAN, in moving the adoption of the report, remarked that there had been only a slight augmentation in the quantity of gas sold, which was accounted for by the past unprecedentedly mild winter. The increase, which was about 9 million cubic feet, might be attributed to the use of additional cooking appliances and penny-in-the-slot meters. The Directors were glad to be able to say that the general public of Dublin were at last beginning to use gas-cookers and prepayment meters. What surprised him was that while in London and all the cities and towns in England gas cookers and heaters were largely used for cooking, the employment of them in Dublin was comparatively small. If the householders knew the advantages to be derived from using them, they would soon give up that worst and most expensive form of cooking apparatus—the close range. The Board had every year, for some time, engaged qualified professors of cookery to give lectures on cooking by gas. The charge for these lectures was only a nominal one; and no lady should neglect attending them. At the present time there were upwards of 800 cookers and 2000 prepayment meters in use—in fact, they were scarcely able to complete the orders. During the past half year, the market for residuals had remained depressed; and prices were gradually getting worse, with the exception of sulphate of ammonia, which had slightly improved. To give the proprietors an idea of the serious depression, he might state that for the year ending June, 1895, coke produced £30,176, as compared with £27,415 last year, although they sold a much larger quantity. Tar in 1895 brought in £8693; last year, only £5150. Sulphate of ammonia produced £9307 in 1895; last year, £6627. This made a total decrease of about £9000. These reductions had seriously affected the income of the Company. They were all well aware that coals had made considerable advance in price. After waiting some time in the hope that prices would fall, the Directors were obliged to make contracts at about 1s. per ton in advance of former rates. Having regard to these circumstances they were considering the advisability of making a slight increase in the charge for gas. However, as the market price for residuals had taken an upward turn, they had decided to postpone the question until the end of the Christmas quarter, in the hope that the market would continue to improve. The Directors had to record the lamented death of their colleague, Mr. E. Fottrell, who had been a member of the Board for thirty years, for twenty-five of which he filled the position of Chairman. He had a kindly manner, and was courteous to all; and his death was regretted by every official of the Company. By his removal, each member of the Board felt that he had lost an old and a valued friend. Referring to the proposed retirement of Mr. Cotton from the position of Secretary and Manager, the Chairman said: I shall have the pleasure of proposing to you a resolution in reference to our Secretary and Manager, Mr. W. F. Cotton; and in order that you may understand his position, I will go back to the beginning of his connection with the Company. In 1873 the Company was in a very bad way—I might say on the verge of bankruptcy. The shareholders were two years without dividends; and the consumers were dissatisfied, not alone with the price of gas, but also with its quality and the scarcity of the supply. The shares were selling at £8 10s.; and £10,000 of the revenue had been spent for capital purposes. A Committee of Shareholders, including myself, waited on Mr. Cotton, and begged of him to take up the position of Secretary and Manager, which, after some time, he consented to do. At that time he had been ten years an official of the Corporation of Dublin, every member of which held him in the highest esteem. The early part of his life he spent with the Hibernian Company, which then lighted the city. What was the position of the Company when he joined? There were no funds available for any purpose. Look at our position to-day. Including reserve, contingent, and insurance funds, we have a sum of £57,000. At the time of his appointment, the consumers were charged 5s. 6d. per 1000 cubic feet for gas; to-day the price is 3s. 5d. The second half year after he took office, the shareholders received a dividend of 6 per cent.; the third, 7 per cent.; the fourth, 8½ per cent., besides paying back to the capital account the £10,000 overdrawn. The next year we reached a 10 per cent. dividend, and subsequently 10½ per cent. Every shareholder will be pleased to



bear that Mr. Cotton is not going to sever his connection with the Company. On the contrary, he has given the Board an undertaking that he will continue the management, so that the shareholders may have the benefit of his services. The Directors abstained from filling up the vacancy on the Board in order to co-opt Mr. Cotton, who will act in the capacity of Managing-Director. From the number of proxies received, it is quite clear the shareholders as a body are in favour of the Directors' proposition.

Mr. JOHN R. WIGHAM, J.P., seconded the motion; and it was carried unanimously.

Dividends for the half year at the rates of  $10\frac{1}{2}$  and  $7\frac{1}{2}$  per cent. per annum having been declared,

The CHAIRMAN said the next resolution was that to which he had already referred; and the terms of it were as follows: "That, in consideration of the valuable services rendered to the Company by Mr. W. Francis Cotton during his connection of twenty-five years with the Company as Secretary and Manager, he be granted, on his retirement from his position of Secretary and Manager, a retiring pension of £1500 per annum, to continue during his life, and to be payable to him quarterly from the date of his retirement, out of the revenue of the Company; and that an agreement by, and under seal of, the Company be entered into with him for the purpose of carrying this resolution into effect."

Mr. J. E. FOTTRELL said he had great pleasure in seconding the resolution. He said he had the good fortune to be in the confidence of his father, the late Chairman, and could say he was in touch with Mr. Cotton from the day that gentleman entered the services of the Company; and he felt certain that, had his father been spared, nothing would have given him greater pleasure than to propose the resolution which the Chairman had placed before them. Besides that, he himself had opportunities of knowing the business capability of Mr. Cotton—in fact, this was known to them all. Of course, it would be a loss to the shareholders that he should now retire from the position of Secretary and Manager; but he (Mr. Fottrell) felt certain this loss would be more than compensated for by the assistance he could give the Board as Managing Director. He had perfect confidence in recommending the adoption of the resolution.

Mr. G. CREE, as a shareholder of the Company from the time of its formation, said he should like to bear testimony to the fact that, after passing through many vicissitudes, the fortunes of the Company began to revive from the day Mr. Cotton became an officer. As one of the Auditors, he had had some experience of the inner working of the Company; and he felt bound to say its success was mainly due to the great talents, business capacity, and immense energy of the Secretary and Manager. In the absence of his colleague, he desired to express the great pleasure he felt in adding this tribute of respect and approval on the part of the shareholders to the election of Mr. Cotton as Managing-Director of the Company.

The CHAIRMAN, in putting the resolution, said that, with regard to the observations which had fallen from Mr. Fottrell and Mr. Cree as to the loss of Mr. Cotton's services, it should be remembered he would now be Managing Director—that he would practically continue the same work of supervision as in the past, for he was one of those who could not give up labour. He thought on this question he ought to read a letter which had been received by the Directors from Mr. Cotton. It was as follows: "I have to thank you for the generous manner in which you have dealt with the question of my approaching retirement from the office of Secretary and Manager of the Company, and for the proposals you are placing before the shareholders as to my pension for the future. I can only say, if the Directors, on my retirement from my present position, will do me the honour of co-opting me to the vacant seat on the Board, I shall, so long as health permits, and the Board wish to avail themselves of my services, without fee or reward, as Managing Director, devote myself, to the best of my ability, to the interests of the Company."

The motion was then put, and cordially adopted.

Mr. COTTON, who was received with applause, said: Mr. Chairman and gentlemen, need I say that I feel deeply indebted to you for your kind consideration of my past services, and to you, Mr. Chairman, in particular, for the impressive way in which you stated my case. I may assure the shareholders that it was never intended by me to sever my connection with the Company so long as my services are appreciated by a Board of Directors with whom it has been the pleasure of my life to work for your benefit. No words of mine could convey to you the kind consideration I have experienced from them, especially during the troublous times, of which we have had many; and you may attribute a great deal of the success of the Company to the good feeling which has existed between the Board and its officers.

The CHAIRMAN said he had now to move that Mr. Francis T. Cotton be appointed Secretary of the Company. Mr. Cotton had filled the office of Assistant-Secretary since the death of his late lamented brother, and he was a gentleman fully qualified to fill the position. He was an engineer, with a knowledge of gas making, and also of electricity; so that he was most suitable for the appointment. He (the Chairman) did not think any better selection could be made; and he had great pleasure in moving the adoption of the resolution.

Mr. J. M'BRIDE, J.P., seconded the motion, which was unanimously carried.

Mr. W. ANDERSON proposed a vote of thanks to the Chairman and Directors for the manner in which they had conducted the business of the Company in the past year. He desired to join in the expression of regret by the Board regarding the death of Mr. Fottrell, and said he was glad to see that Mr. Lawler had been elected to succeed him. With regard to Mr. Cotton, his election as a member of the Board was the reward of merit; and he would say, from a close, intimate knowledge of Mr. Cotton, that no reward was ever more deserved than his.

Mr. SPRING seconded the motion.

Mr. BROOKS, in putting the resolution, said he could not lose this opportunity of expressing his personal regret for the loss the Board had sustained by the removal of Mr. Fottrell. With regard to Mr. Cotton, he should be neglecting his duty if he did not express his personal feeling that he was thoroughly and absolutely the man to fill the office which he was now by their approval called upon to fill. As to their new Chairman, he was glad to offer his testimony to the excellent qualities possessed by Mr. Lawler.

The motion was carried unanimously.

The CHAIRMAN briefly returned thanks, and the proceedings closed.

## LEICESTER CORPORATION GAS AND ELECTRICITY ACCOUNTS.

At the Meeting of the Leicester Town Council last Tuesday, the Gas and Electric Lighting Committee reported that the accounts of the gas undertaking for the half year ending June 30 last had been submitted to them, from which it appeared that the net profit, after paying interest on the capital of the undertaking, was £11,653. Out of this had been paid £409, being the half-year's amount of the sinking fund; leaving a balance of £7559 to be applied at the end of the financial year (the 31st of March next) as the Council might direct. The Committee also reported that the accounts of the Electric Lighting Department had been submitted, from which it would be seen that the result of the working of this department for the above-named period was a net profit, after charging £581 17s. 4d. to the sinking fund account, of £46 8s. 4d. The total amount which had been paid on account of the sinking fund was £4207.

Alderman LENNARD, in moving the adoption of the first portion of the report, said there had been expended, out of the amount borrowed, up to the end of June last £844,602. There was an increase in revenue of £3515. The total expenditure on revenue account was £72,047, against £67,320 in the corresponding period of 1897—an increase of £4727. It showed a bad start towards making a profit when the increased receipts were less than the increased expenditure by a little over £1200. Last year they paid 6d. per ton more for their coal; and this year there had also been an advance of 6d. The extra expenditure was for coal, repairs and maintenance, and stoves. The other items on the expenditure side remained about stationary, with the exception of there being a decrease of £256 in the expenditure on purification. The additional receipts from gas engines and stoves represented just 10 per cent. of the increase. Considering that they had raised the number of engines from 661 to 680, and of stoves from 9401 to 10,789, this seemed surprising. It was due to the phenomenal weather this year. The Committee calculated that the increased consumption, if the weather had been normal, would have made their profits £1500 more. They had received 50 per cent. of the cost of the coal back again in residuals. One of their difficulties had been the advance in the price of their raw material. The tar products also formed a serious difficulty; and with some of the principal products down to half price, and no signs of an early recovery, it was not an easy matter to forecast what the results with respect to this matter would be. One of the most serious obstacles to making profit last year had been that they had been increasing their works and spending a large amount of money on extensions which, up to the present, had been unproductive, and which he hoped this year they would be able to use and make reproductive. He estimated that they had £120,000 of capital laid out which had not yet brought them in a penny. Some of these works had existed six or seven years. They had to provide for maintenance, although the part of the work in question had not brought them in a single penny. Their works, however, were now absolutely complete; and it was his intention to ask the Council early in December to make a general inspection of them, and see how things were carried on. He believed that they had come to the end of the chapter in the matter of extensions and expensive maintenance, and to the bottom of the depression in their profits; and he thought that from now their profits would considerably increase, especially if favoured with a cold winter or two, when they would see them go up by leaps and bounds. The number of men employed in the department during the last half year had ranged from a maximum of 1300 down to a minimum of 1000. Comparing their gas-works with others, and taking all circumstances into consideration, he was quite sure they had done as well as they had ever done before.

Mr. ROWLETT seconded the motion.

Mr. CLARKE asked whether there was any intention of reducing the price of gas to users of slot meters; also whether the Committee intended to lower the charges made for the electric current.

Alderman VINCENT said the pleasantest portion of the Chairman's remarks was where he said that the profits of the gas-works were likely in future to continuously and rapidly increase. He (Alderman Vincent) regretted that during the past few years they were a gradually decreasing quantity. In the past half year, they had sold the largest quantity of gas, and made the best price for residuals; but the profits had gone down 20 per cent. With regard to the charges for repairs and maintenance, he quite believed in keeping the plant in excellent order, and making every requisite provision for depreciation; but when they were paying more than £8000 a year into a sinking fund which would purchase the whole fee simple of the undertaking in an allotted time, they would acknowledge that some consideration was due to the present ratepayers, and that such charges should not be placed to revenue, but should fairly be charged to capital. They were face to face with very large necessary expenditure for various public works to which the Corporation were committed. They were undoubtedly under the necessity of providing an additional water supply for the borough; and altogether their rates were likely to keep up. He was glad, therefore, to hear that the profits from the gas undertaking were likely to increase, and he hoped it would be so.

Alderman LENNARD, in reply, said a gas undertaking could not be provided in penny numbers—they had to establish complete and efficient plant to begin with; and altogether a sum of £16,000 a year might be put down as necessarily unproductive. About £3000 of this was caused by the abolition of meter-rents three years ago; and £2500 had been paid yearly for interest, for which there was no return. Their coal account had also gone up. In reply to Mr. Clarke, it was true they charged to users of slot meters a rate which worked out to 2s. 9d. per 1000 cubic feet, which was slightly in excess of that charged to other consumers; but they did not get anything like the same profit out of them that they did out of the others. They had to provide a special meter and a staff of collectors, so that the extra expense more than swallowed up the difference. He knew how easy it was to get up an election cry; but he could assure the Council that the Committee were as anxious as anybody to reduce the price of gas, if they could see their way to do so.

The report was adopted.

Alderman LENNARD next moved the adoption of the second part of the report. [In the course of Alderman Lennard's speech, the electric light in the Council Chamber suddenly went out.]

Mr. BOOTH thought it was too bad that the electric light in the Council Chamber should go out while the alderman was speaking.



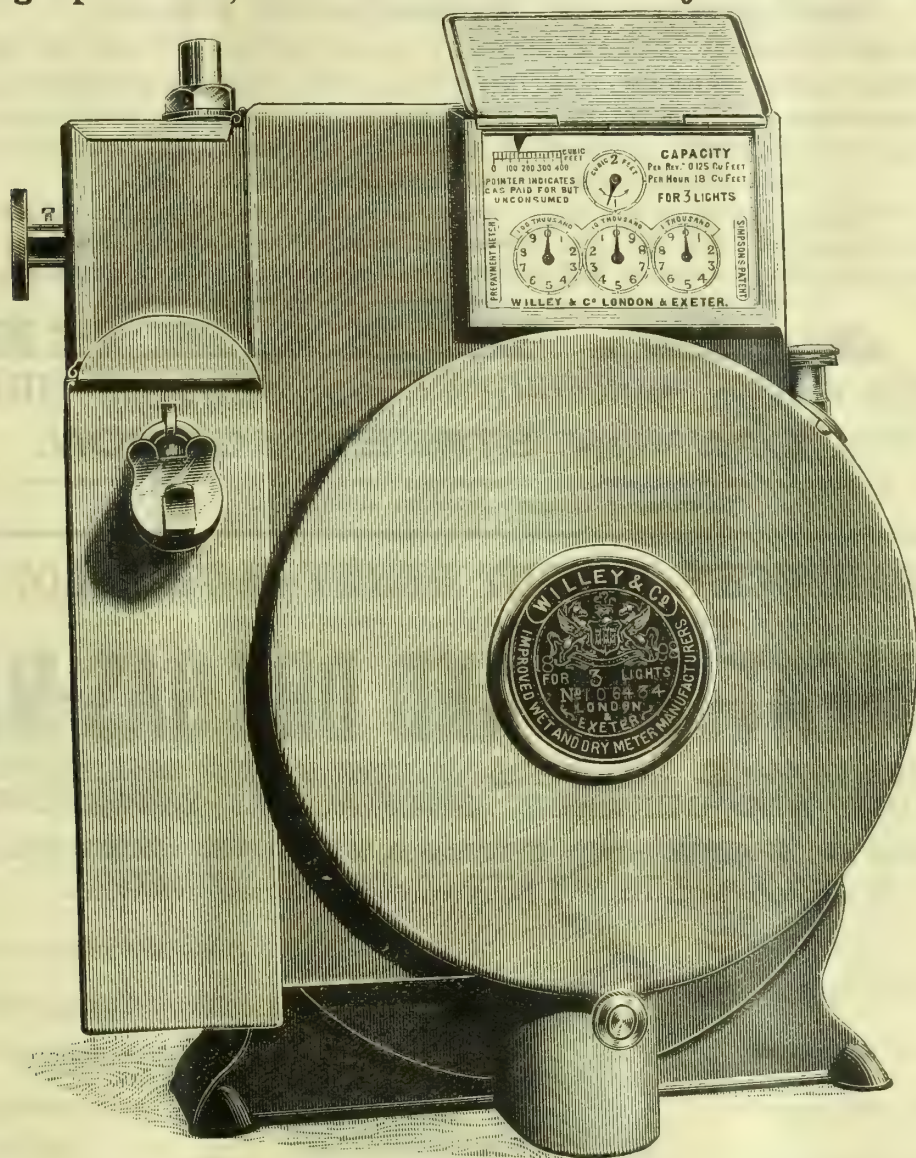
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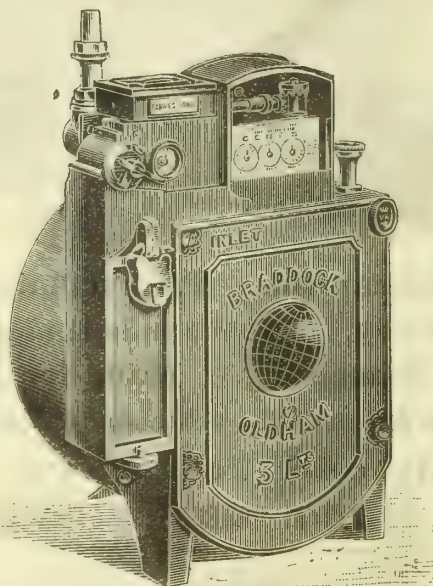
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Alderman LENNARD said he believed this was the first time such a thing had occurred under the circumstances. It was caused by a fuse having gone wrong in the immediate neighbourhood, and had nothing to do with the machinery at all. Every year since they had had the electric light their business in this direction had been increasing 50 per cent. Other towns in competition with each other had shown big profits, but piled up their capital account to double that of Leicester. In reply to Mr. Clarke, he might remark that it was easy to make reductions in the price if they were prepared to forego a profit. There was, however, one thing he would say on behalf of the Committee, and that was that a considerable reduction could be made in the price if consumers would take electricity in the daytime. He might say that the day price could be reduced nearly one-half, and still leave a profit. But with regard to night consumption, he could not promise a reduction from 5d. per unit till Alderman Vincent, their Chancellor of the Exchequer, would tell them he did not want any more money.

The report was adopted.

### ELECTRIC LIGHTING NOTES.

At a meeting of the Lighting Committee of the Cardiff Town Council last Tuesday, a letter was read from the Local Government Board sanctioning a loan of £28,125 for electric lighting purposes—to be repayable in 25 years.

The Hampstead Vestry prides itself on the progress of its electric lighting undertaking. It is surprising, therefore, that the following paragraph in the annual report of the Surveyor (Mr. Charles H. Lowe) was not deleted before its publication: "The street-lamps maintained, cleansed, and lighted by the Gas Company number 2326—an increase on the year of 86. In addition, there are eight lamps in Finchley Road which are not used, but which are maintained in readiness in case at any time the electric light should temporarily fail."

The Electric Lighting Committee of the Wimbledon District Council appear to be very pleased with the progress their electric lighting undertaking is making; and they have, with every confidence, asked and obtained the consent of the Council to an expenditure of £3000 on additional cables. Mr. Crimp, the Chairman of the Committee, states that, in response to a circular sent out, demand for current has arisen nearly all over the parish, and from every class of ratepayer. But it is a strange thing that from the centre of the town, where the Committee expected to get a very large demand indeed, they have had no application. In the meantime the applications represent 6678 8-candle power lamps, including street-lamps.

Several references have been made in these "Notes" to the electric lighting undertaking of the Torquay Corporation. It appears that there is at present considerable uneasiness in the town concerning the borough finances—the new rate recently made being the highest on record. A comparison has been made between the expenditure of the old Local Board and that of the Corporation; and it shows that public lighting under the former cost £1850 a year, whereas under the Council the average cost has gone up (by £425 per annum) to £2275, exclusive of the increased cost for the electric light. During the six years the town has been incorporated, the debt has been increased by £100,000. For the electric lighting, drainage, and destructor loans, the ratepayers are taxed to the tune of £2000 a year.

The Electric Lighting and Tramways Committees of the Huddersfield Corporation have been considering the question of applying electric traction to a section of the tramway system. The Borough Electrical Engineer estimates that the cost of the additional buildings and plant which will be required by the Electric Lighting Committee will be £31,500 (including £599 for contingencies). He places the total charge payable by the Tramways Committee at 3-30d. per unit, of which the generation of the electricity will require 1d., interest and sinking fund 1-63d., and repairs 0-67d. Therefore, the Electric Lighting Committee will not profit by the arrangement. To carry out the scheme, the Corporation have given their consent to the Committee applying for the sanction of the Local Government Board to the borrowing of £50,000.

The Penzance Town Council are perturbed by a threatened invasion of the electric light. Edmundson's Electricity Corporation regard the town as a likely place for exploitation, and are threatening to apply for a Provisional Order. They have offered to insert clauses giving the Corporation the option of purchasing the undertaking at the end of 7, 14, or 21 years, upon an independent valuation as a going concern. But the Corporation would rather have nothing to do with it. They had managed, as the Chairman of the Lighting Committee naively confessed, to shelve it for eight years, and they would like to put it off a little longer. The Mayor (Mr. W. H. Julian) expressed the opinion that Penzance was not ready for the adoption of the electric light, and that the light might be much improved. Yet they must either engage in a scheme for which they were not ripe, or hand over another monopoly which they would have to make sacrifices to buy out. This was a position in which Parliament ought not to have placed them. However, he would rather spend the money than be a party to putting power in the hands of another lighting monopoly. It was resolved to dissent from the Edmundson Company's application.

Many complaints have been made of the unsatisfactory result of the electric light in the streets of Exeter. The cause was explained in a report laid before the City Council last Wednesday. In the first place, it seems, the Jandus lamps failed because they were not properly constructed to work on the higher-pressure circuits. In consequence of this, the whole of them had to be removed from the streets, and old lamps in stock temporarily fitted to supply their place. Then the Davy alternating arc lamps gave trouble through the mechanism jamming. However, everything is to be right in future. The contractors for the Jandus lamps have refitted them, and they are refixed; while the Davy Company have undertaken to supply new lamps. Fortunately for the ratepayers, all this is to be done at the expense of the contractors. A report was also presented to the Council respecting the combined action of the electric lighting authorities threatened with proceedings for infringement of the Rucker transformer patents. Down to the middle of August, the combination included electric companies with a gross revenue amounting to upwards of £400,000, and municipal authorities with electric light works of which the revenue is upwards of £68,000. Under these circumstances, the Town Clerk of Exeter was able to report that the Corpora-

tion's liability would be only about 10s. per cent. of the costs incurred; and formal sanction was given to the proposal that the Council should join the combination, and contribute to the defence fund.

A meeting of ratepayers, convened by the Chairman of the Weston-super-Mare Urban District Council (Mr. B. Heap), was recently held in the Town Hall for the purpose of considering the electric light question, which is now before the Council with the view of a scheme being carried out. Mr. H. Butt was the first speaker. He said he was as much opposed as ever to the project, which some time ago was spoken of as a matter of about £20,000; whereas to carry it out would mean an expenditure of something nearer £50,000 or £60,000. He thought it was far better that a scheme of this magnitude should be carried out by a private company than by a body of councillors who had their own businesses to attend to besides the affairs of the town. It appeared to him that the terms offered were fair, inasmuch as the Council were safeguarded in being able to buy the scheme when it paid. It was surely better to buy a paying concern, and pay a little more for it when it was a success, than to start a thing under risky conditions. He thought the number of lamps put down as likely to be taken by the ratepayers was a farce. In a limited area, it was impossible to get a large number of lights; and if they did not have these, how could they get their return? He was not against the electric light; but he was against the Council committing themselves to an expenditure of not less than £50,000 when they had other things that required to be done more urgently. He moved—"That, in the opinion of this meeting, it is not desirable that the Urban District Council should carry out the Provisional Order for lighting the town with electricity, but that the best possible terms should be made with a reliable company for carrying out the work, and for the resumption of the same by the town at the expiration of a reasonable term." Mr. Norman seconded the motion. He argued that the Council would be embarking upon a very risky speculation if they undertook the scheme, which, he said, was doomed to failure if they touched it. Mr. Ball pointed out that the Council were in possession of a Provisional Order which they were asking to be allowed to carry into effect; and while they were in this position they could not, in his opinion, deal with a company. He admitted, however, that if they left the scheme alone they would have freer hands to take up other matters. Mr. Harvey contended that there were other schemes of far greater importance for the welfare of the town than the electric light. Eventually, the motion was carried; and it was also resolved to form a Committee to oppose the application by the Council to the Local Government Board for money to carry out an electric lighting scheme.

**The Price of Gas at Leeds.**—In accordance with the resolution come to at the recent meeting of the Leeds Corporation Gas Committee (*ante*, p. 649), at the next meeting of the Leeds City Council Mr. Joseph Lowden, as Chairman of the Gas Committee, will move that the resolution passed by the Council on the 9th of October, 1895, as to the price of gas be rescinded, and that the Council reduce the price of gas to consumers within the city of Leeds from 2s. 2d. to 2s. per 1000 cubic feet, and to consumers outside the city from 3s. to 2s. 10d. per 1000 cubic feet, such reduction to take effect in respect of gas consumed on and after the 1st of January next.

**Torrington Water Supply.**—An unexpected check has been given to the scheme for the improvement of the water supply of Torrington. Serious complaint has been made for several years of the inadequacy of the supply; and the Great Torrington Water Company at length offered to sell their undertaking to the Corporation, and leave them to provide capital to develop the works. The Corporation and the ratepayers agreed to the proposal; and Mr. Baldwin Latham prepared a scheme for enlarging the reservoir and other works. Application was made to the Local Government Board for a loan of £11,000; and the hope was expressed that, as the town is small and its resources limited, the period of repayment would be extended to the utmost. The Local Government Board have, however, informed the Corporation that, owing to the age of the water-mains and the condition of the reservoir, only ten years will be allowed for repayment of the loan for the purchase of the works. They also require the Corporation to obtain control of the catchment area, both as to the right to the water and as to restriction of manuring operations on any arable land comprised within it; while they ask to be furnished with a report by a qualified chemist as to the quality of the water. The Town Council have sent a copy of the Local Government Board's letter to Mr. Latham for his opinion, and have at the same time instructed him to discontinue preparing plans for the extension of the reservoir.

**The Proposed Purchase of the Skipton Gas-Works by the District Council.**—A largely-attended meeting of ratepayers was held in the Town Hall, Skipton, on Monday last week, for the purpose of taking into consideration the proposed purchase of the gas-works by the Urban District Council. The matter has been under discussion by the Local Authority for several months; and they decided to offer the Gas Company £30,000 for their works. This offer the Company refused. The Council had engaged Mr. Waugh, of Bradford, to advise them upon the condition of the plant; and his report has been open for the ratepayers' inspection during the past few weeks. Mr. J. B. Dewhurst, the Chairman of the Council, presided, and he was supported by all the members who were not directly interested in the Company. The Chairman proposed a resolution to the effect that the ratepayers and owners should give their consent to an application by the Council for compulsory powers of purchase. Mr. Throup seconded the resolution. Mr. J. Roberts said he thought the proposal was forty years behind the time, seeing that the electric light was coming so much to the front. Mr. Chadwick pointed out that Skipton could obtain plant and mains for electric light for £10,100, and they would probably have to pay £60,000 for the gas-works. Mr. Robinson, the Vice-Chairman of the Council, said the Council were not so foolish as to pay £60,000 for the gas-works. Mr. Chadwick replied that if they did not do so they would not get them. Mr. C. Smith said, in answer to a question, that if the Council were called upon to pay £55,000 for the works, they would be able to make a profit on the present price of gas—2s. 11d. per 1000 cubic feet. After some further discussion, the Chairman called for a show of hands, and declared the resolution carried. A poll was demanded.



## EAST LONDON WATER-WORKS COMPANY.

## Half-Yearly Report and Accounts.

In the report which the Directors of the above-named Company will present to the proprietors next Thursday, only brief reference is made to the troubles which have recently come upon them. They explain that the very severe drought, continuing throughout a lengthened period, diminished the flow of the River Lea—the Company's main source of supply—to an extent hitherto unknown, so that "for safety's sake" the Directors were obliged to husband the supply in the reservoirs by reverting, on the 22nd of August, to the intermittent system. They say that, by purchasing all available water from other Companies, and by every means in their power, they did their best to "remedy and mitigate any inconvenience and discomfort caused to the consumers by the shortened hours of supply." A large expenditure has been thereby incurred; so that it has been found necessary to decrease the dividend and increase the reserve fund. The new services laid on in the six months ending June 24 numbered 3074, against 2968 last year; the total number now in supply being 194,600. The reports of Sir Edward Frankland, the Government Analyst, as well as those of Sir William Crookes and Professor Dewar, continue to show that the water supplied is efficiently filtered, and of a high standard of purity. All the works have been maintained (under the supervision of Mr. W. B. Bryan, the Engineer) in an efficient condition.

The accounts accompanying the report show that the revenue from all sources in the six months covered was £168,010, against £158,035 in the corresponding period of last year—an increase of £9975. The expenditure on maintenance was £60,074; on management, £13,502—together, £73,576. For the first half of last year, the figures were £54,464 and £12,784—together, £67,248—showing an increase of £6328 for the past six months. The Directors say the balance in favour of revenue over expenditure may be regarded as fairly satisfactory. The amount available for distribution is £87,220; and a dividend of  $3\frac{1}{2}$  per cent. for the half year (less income-tax) will be recommended. This will absorb £60,220, and leave an unappropriated balance of £27,000.

## SERIOUS POSITION OF THE BIRMINGHAM WATER SUPPLY.

In the course of Mr. Chaplin's reply to the deputation which waited upon him on the 24th ult., to express indignation at the curtailment of the water supply at the East-end, and to call upon the Government to hold an autumn session in order to place the supply under public ownership and control, he pointed out, in regard to this proposal, that the change of ownership would be no guarantee against the evils of which complaint had been made, for in some parts of the country, even where the supplies were in the hands of the Local Authorities, troubles equal to, or even worse than, those at the East-end were being experienced. The President of the Local Government Board instanced Birmingham as a case in point; and the seriousness of the position of affairs in the capital of the Midlands was shown by the few lines given in the "JOURNAL" last week (p. 706). The officials of the Water Department have issued appeals to the public to curtail their consumption as much as possible, and the use of water for public purposes is being kept to the lowest possible level. But it is stated that the appeals "fall on deaf ears." The immediate danger is not so great; but an early winter with severe frost would bring about the most serious consequences. With the view of letting the public know the exact condition of the water resources of the city, a number of representatives of the Press were invited last Wednesday to inspect the Corporation's reservoirs at Shustoke and Whitacre; and the following is a brief account of what they found: The Shustoke reservoir covers an area of 90 acres, and has a storage capacity of 400 million gallons. All around the sloping sides there was a bank of concrete, whitened by the deposit of lime left by the receding water. The water was 8 ft. 6 in. below its proper level; and it sinks about a couple of inches every day. It is stated that this reservoir has never been so low as it is at the present time since it was opened in 1882. Considerably more than half its available capacity has been emptied to meet the excessive demand of the past hot and dry summer. The reservoir is supplied by the River Bourne, which is now little more than a trickling ditch. At Whitacre, the other storage reservoir, capable of holding about 20 million gallons, is absolutely empty. At the present time Birmingham is consuming in its dwelling-houses and factories, and in various other ways, no less than  $19\frac{1}{2}$  million gallons of water per day. The present population in Birmingham is 715,000, and last year the water consumption averaged 23.7 gallons per head. The consumption is now at the rate of 27 gallons per head per day—an excess of  $1\frac{1}{2}$  gallons per day over last year's summer figures, and of nearly 4 gallons over last year's average. It will be four years before the water from Wales is available; and unless the present supply is increased, the consequences during those years may be very serious indeed. If the city has to depend on the quantity of water now stored, it will only have sufficient for ten days. It appears that  $6\frac{1}{2}$  million gallons of water are being drawn daily from the deep wells; but as these have been recently pumped to the full extent of the water they will render, they will shortly have to be left at rest.

In Birmingham, as in the East-end of London, there is great waste of water. In the former city, the Water Department have inspectors all over the town examining fittings and doing all that is humanly possible to prevent waste through mechanical defects. In this they are fairly successful. But, as pointed out by a writer in the "Birmingham Gazette," it is the waste through carelessness and extravagance that it is so difficult to guard against. People will complain that their neighbours waste water; but when it comes to a question of prosecution they back out of giving evidence. He says very pertinently: "It is for the public to learn that, unless they protect themselves, they expose themselves to the most serious consequences. What is wanted is that people should recognize their responsibility, and that they should beget a conscience in this matter. Every gallon of water wasted is a wrong done to the community at large—a direct menace to the health of every man, woman, and child. Yet rich and poor, with reckless prodigality, draw on the supply as though the water were already pouring over the aqueduct from

Wales, and the supply practically unlimited. . . . If the public are wise, if they are good citizens, they will exercise the strictest supervision in the use of water. The danger is present and immediate. Private consumers alone are to blame; with private consumers lies the remedy." This advice is equally applicable in London.

## THE PROPOSED ACQUISITION OF THE DORKING WATER-WORKS BY THE LOCAL AUTHORITY.

## The Transfer Sanctioned by the Company.

An Extraordinary General Meeting of the Dorking Water Company was held last Wednesday, for the purpose of considering a special resolution authorizing the sale of the Company's undertaking to the Dorking Urban District Council, upon the same terms as if the Council had obtained powers for its compulsory purchase. The proceedings were regarded as private; but the Secretary (Mr. T. A. Sommers Scott) furnished to representatives of the Press a *résumé* of what had taken place. The resolution to sanction the purchase had to be passed by a majority of three-fourths of the shareholders present, either personally or by proxy, both as regards the number of votes and the value of shares held. As the total represented was 245, the requisite majority was 184. The votes recorded were: For the resolution, 186; against, 59. As regards the worth of the votes recorded, the total value was £12,880, the requisite majority of which was £9660. The value recorded for the resolution was £9790 (being £130 in excess of the minimum); against it, £3090. The number of shareholders who voted personally was 11, and by proxy 48, making a total of 59; the number of those in favour being 52, against, 7. The following resolution was therefore passed: "That this Company agrees with the Dorking Urban District Council (subject to the Council obtaining the approval of the Local Government Board), to sell and transfer its undertaking to the said Council, such transfer and the price to be paid to be made and determined in all respects as though an Act had been obtained for the compulsory transfer of the undertaking; and the Directors are hereby authorized to enter into such contract as may be necessary to give effect to this resolution."

## THE PROPOSED PURCHASE OF THE DEVONPORT WATER-WORKS BY THE CORPORATION.

## Compulsory Powers to be Applied For.

A Meeting of the ratepayers of Devonport was held on the 22nd ult., to consider the resolution adopted by the Town Council in favour of the compulsory purchase of the water-works. The Mayor (Mr. Waycott) presided over a large attendance. Feeling on the subject apparently ran high, and most of the speeches were accompanied by a running fire of comment.

The Mayor explained that three years ago, in consequence of the dissatisfaction existing in the borough, and more especially of an incident that occurred to one ratepayer, a meeting was called to consider the town's position in respect to the Water Company. The meeting decided that the time had come when the Town Council should take up the question of acquiring the rights of the Company, and appointed a Committee to deal with the matter. The Company had been asked whether they were prepared to sell their property to the Corporation; but they were not prepared to treat. The Council wished for an expression of opinion from the meeting as to the desirability of applying to Parliament for compulsory powers to acquire the property.

Mr. H. WHITFIELD, the Chairman of the Water Committee of the Council, moved a resolution expressing approval of the decision of the Council. The fact that they had taken three years to consider the question was proof that they were not disposed to act in haste. When the Company was formed, it was on the distinct understanding that the charges for water in Devonport should not exceed those in Plymouth. But they had obtained from Parliament power to raise their charges in order to meet their increased liabilities for improvements, though they had shown, by the profits they had made, that there never was any necessity for so doing. In opening negotiations with the Company, they made an offer, in the form of annuities, which guaranteed the very highest rates of interest they could possibly earn under their Act. This offer represented the capitalized equivalent of £350,000 on a paid-up capital of £175,000. It was a generous and munificent offer; but it was refused. Did not common sense suggest that in this refusal the Company supplied them with a reason for going on with the proposal to purchase? In 1871, the population of Devonport was 49,000, the income of the Company was £5756, and the charge for water per head of the population was 2s. 4d.; whereas in 1896, the population was 57,000, the income of the Company was £13,304, and the charge per head was 4s. 8d. In 1876, the dividend of the Company was a fraction over 2 per cent., and there was no reserve; but in 1896, it was upwards of 4 per cent., and the reserve fund was £2962. This practically represented the doubling of the financial advantage of the Company; and they felt that this advantage was growing. If it was good for the Company, was it not good for the ratepayers? Mr. Diggle, the financial and engineering expert engaged by the Corporation, in his report said: "After having most carefully gone into the whole matter from a financial as well as an engineering point of view—for both must be considered in the question in conjunction with each other—I feel quite confident that the increased revenue of the undertaking will be more than sufficient to meet all additional charges for annuities, interest, &c., against revenue." In all large enterprises of this description, it had of late been the custom of Parliament to grant a period of seven or ten years during which the payment to the sinking fund should not be made. Mr. Diggle felt sure he could get seven years for Devonport. Assuming this to be done, there would be no charge whatever upon the rates for the first seven years, as the additional income would meet all additional charge against revenue. But even taking the most unfavourable aspect of the question, and assuming that Parliament did not grant this postponement of the sinking fund payments for seven years, which was



not at all likely, Mr. Diggle estimated that the annual charge could not exceed a rate of 4d.—possibly only of 3d.—in the pound annually. This would, he said, continue for a very limited number of years, and should really not be considered as a loss at all, for by a sinking fund the water-works would ultimately become free of charge in the same way that property did when the owner paid off a mortgage upon it at a certain fixed sum per annum.

Mr. T. CARRINFORD seconded the motion, and said that for twenty years there had been a feeling that the rights of the Water Company ought to be acquired by the town.

Mr. H. BANBURY said they were all water buyers, but they could buy even gold too dearly. Mr. Whitfeld had quoted only a small portion of the report of Mr. Diggle. They were practically told to lay hold of the water rights, and never mind the cost. If the Company accepted the terms of the Corporation for annuities, every halfpenny of the capital would be carried forward for 60 years. At the end of this period, it would be redeemed at 33 $\frac{1}{3}$  years' purchase, which would mean an outlay of £318,000. The Water Committee had not seriously considered the expenditure. The leat would have to be piped, and a storage reservoir built. The piping alone would extend 20 miles; and he estimated that it would cost £5000 a mile. This would mean a total of £100,000, while the construction of a storage reservoir would involve an outlay of £200,000; so that £300,000 must be laid out almost immediately after Parliament sanctioned the purchase. Some of the ablest financiers in the town estimated that the charge upon the rates would be 1s., or possibly 1s. 3d., in the pound. The ratepayers required more information. If they studied their own interests, they would not support the proposal of the Committee.

Mr. W. E. HARVEY characterized the scheme as one of the maddest things he had ever heard of.

Dr. J. ROLSTON challenged Mr. Whitfeld to read the whole of Mr. Diggle's report. That gentleman told them that unless they made a liberal offer they had no chance of getting the Company's property. They had made a liberal offer, and it had been refused; and now if they went to Parliament they would incur a heavy expense which the ratepayers would have to pay. The water supply was good, pure, and well managed; and, under these circumstances, he was not prepared to advocate a cause which would entail a 6d. or 1s. rate for sixty years.

Mr. G. RUNDLE, referring to the financial portion of the question, said that when the Water Company went to Parliament twenty years ago their revenue was less than £1000 a year. During the past fifteen years, they had increased it from £3000 to £4000 a year. The whole liability of the Company on capital account amounted to only £180,000.

At this stage of the proceedings, the meeting was adjourned.

The adjourned meeting was held last Tuesday—the MAYOR again presiding.

Mr. C. B. C. THOMAS, who resumed the discussion, said the Water Company, which was formed in 1793, went to Parliament in 1876 for power to provide filter-beds and give a continual supply. The Town Council opposed the Bill, and endeavoured to get the works into their own hands, but they did not succeed. Since 1876 the Company had furnished a continuous supply and charged an increased rate. The Council had offered the Company far better terms than they would get by their earnings in the next forty or fifty years.

Mr. W. FORD, in supporting the resolution, said he was also in favour of the Corporation purchasing the gas-works, though he was a shareholder in the Gas Company. The profits of these undertakings should go into the pockets of the people who created them, rather than into those of alien and absent shareholders.

Mr. R. S. SMITH contended that the Corporation were not justified in purchasing the water-works even at the price of £350,000 proposed by the Water Committee, though he believed the market value of the undertaking was nearer £500,000. The Company's receipts were £13,700 a year. Of this amount, more than £5000 went for wages, and the maintenance of plant; leaving £8000 to pay interest. How was it possible to pay off £350,000, out of a margin of £8000? If the Corporation purchased the water-works the result would be a loss to the town.

Mr. W. OSBORNE pointed out that three years ago Mr. Smith spoke in favour of the town acquiring the water-works; and all that had occurred in the interval strengthened the case for municipalization.

Mr. J. C. TOZER said they were all in favour of the principle that the Corporation should have control of the water supply, but they should have the details of the scheme before them to enable them to come to a right conclusion. If the works cost £350,000, and the piping of the leat and other improvements involved an outlay of £150,000, they had a total of £500,000. To borrow this at 2 $\frac{1}{2}$  per cent. would mean £13,750. The present net profit of the Company was £6000; but if they allowed for the probable increase, and put it at £7000, this would leave the ratepayers with a liability of £6750 a year, which was equal to a rate of 7d. or 8d. in the pound. In addition, the repayment of the capital would require a further rate of 3d. or 4d.; and they would thus have a total burden of a rate of 1s. in the pound for a period of sixty years.

Mr. T. PROCTOR argued that the experience of other county boroughs justified the Corporation of Devonport in proceeding with the scheme. As to the piping of the leat and other improvements, if the Corporation did not do the work the Company must; and in either case the cost would have to be borne by the people of Devonport.

Alderman E. EMDON said the exact amount of the capital of the Company was £189,866. The income for the past year was £13,871; maintenance expenses were £2778; management came to £2007; and rates and taxes to £902, making a total expenditure of £5687. It remained to be seen whether Parliament would give so long a period as sixty years for the repayment of the capital. In any event, a serious loss would result to the town from the purchase of the works.

The MAYOR remarked that the question they should ask themselves was whether they could afford to pay a few pounds more on their rates, and whether they were justified in doing so. He did not wish to influence them either way, and should be prepared to stand by their decision, and do his best, whichever way the voting went.

Mr. WHITFELD, replying on the discussion, quoted a letter from Mr. Diggle, in which that gentleman said the statements made at the previous meeting were not calculated to further the economical purchase of the

undertaking, and expressed the hope that opposition would cease to put a fictitious augmentation on the value of the Company's property. As to the statement that the piping of the leat and a storage reservoir would cost £300,000, Mr. Diggle said: "There is no reason that I know of why the cost should exceed one-third of that amount, sufficient to meet an increased population of at least 30,000, so far as the reservoir capacity is concerned. Interest and sinking fund upon £100,000 would only amount to £3500, while the additional water obtained for sale at the present prices charged by the Company would produce about £7000 per annum." If it was true that every £100 share in the Company was now worth £140, and that £500,000 would be required to acquire the undertaking, this was all the more reason they should seize the opportunity to stop that aggregation of profits for division among ten gentlemen—profits which the householders were really entitled to share. Parliament was continually granting a period of sixty years for the repayment of capital in such cases. They took £300,000 as the probable cost of the Devonport Water-Works. Interest and sinking fund spread over sixty years on this amount would involve an annual payment of £10,265, to which must be added £6500 working expenses; making a total of £16,765 per annum. Towards this sum they would receive in water-rates £14,063; leaving a deficiency of £2702, which on the basis of the rateable value of the year 1897 would involve a rate of 3 $\frac{1}{2}$ d. in the pound. If the sinking fund were suspended for seven years, as had been done in the case of every town that had similarly applied to Parliament in recent times, the annual charge for interest would be £8250, which, with the £6500 working expenses, would reach a total of £14,750. Subtracting from this the gross income from the water-rates, they had a deficit of only £687 per annum, or less than a rate of 1d. in the pound. During the seven years' suspension of the sinking fund, the increase in the rateable value and the water rates would be more than enough to meet the sinking fund and wipe out the penny rate. In 1880 the rateable value of Devonport was £148,645, and in 1898 it was £221,000; and they were now face to face with a great increase in the rateable value. The first use to which the revenue from such a source should be put ought to be the acquisition of the revenue-earning property.

The resolution was carried by a large majority. A poll was demanded; but the application was not persisted in after it had been pointed out that this was not a statutory meeting, and the gentlemen demanding it were asked to guarantee the cost if the poll should go against them.

#### THE DERWENT WATER SCHEMES.

A Special Meeting of the Sheffield City Council was held on the 28th ult., to consider the recommendation of the Water Committee, referred to last week (p. 707) that the Corporation should lay claim to the Derwent as a source of water supply, and promote a Bill or Bills in Parliament to substantiate their claim against that of the Derby Corporation or any other. The discussion of the question occupied more than two hours; and, in the result, a resolution was passed giving the necessary authority to the Committee to move in the matter, either alone or in conjunction with the Corporations of Nottingham, Rotherham, Doncaster, or Barnsley, or any of them, with the view of acquiring the water of the Rivers Derwent and Ashop, or a competent share thereof. Earlier in the week, the Leicester Corporation visited Ashopton, and drove up the Ashop and Derwent Valleys. The first pause was made about a mile above the village of Bamford, where it is proposed to construct a huge compensation reservoir to supply the mills from there down the valley to the Trent. This reservoir will be something like 3 miles long, and in parts will attain to a depth of 80 feet. There are only five mills for a distance of 20 miles down the valley; and of these only two are of any importance. The gathering-grounds proposed to be tapped possess two great negative advantages—there is no agriculture, and practically no population. The water will be impounded in reservoirs at an altitude of from 600 to 800 feet above sea-level, and consequently will flow by gravitation to Oadby. The site for the first reservoir was pointed out in a part of the valley which might have been formed by Nature for the purpose. It was stated that it would provide storage for more than 2000 million gallons of water, which would be impounded by means of a masonry dam, something like 120 feet in height. This reservoir would be about two miles long; tailing off just above where the River Allport falls into the Ashop. From this reservoir the water would be carried by the conduits to Leicester, or possibly in the first instance to a service reservoir nearer Derby—for the scheme will be so designed that at any time an amalgamation with the Derbyshire authorities can be arranged. Higher up the valley the visitors were shown the suggested site of the second or top reservoir—another natural basin. There will be two reservoirs up the Derwent Valley—in addition to the compensation reservoir at Bamford—and both will be of considerable capacity. A walk of a couple of miles, after the road had become too rough for driving, brought those of the party who undertook the journey to the site of the top reservoir, and within view of the head of the valley. It was stated that the gathering-grounds of the Derwent and the Ashop were of about equal extent, and would produce a similar quantity of water. The total yield has been variously estimated at from 50 to 55 million gallons per day; and of this 30 million gallons will be available for ordinary use, and the rest for compensation purposes. The entire scheme involves the construction of five large reservoirs, and possibly a service reservoir; but in the event of powers being secured by Leicester, a start would be made with the Upper Derwent portion of the scheme, leaving the Ashop Valley to be dealt with afterwards.

**The Extension of the Bristol Water-Works.**—The erection of the pumping station at Blagdon, Somerset, for the Bristol Water Company, is about to be commenced. This work is in connection with the operations, commenced in 1891, of impounding the waters of the Yeo and formation of a reservoir from which the water will be pumped to the present reservoir near Bristol. The new reservoir, when completed, will have a capacity of 2000 million gallons. The water will cover an area about 1 $\frac{1}{2}$  miles in length, and will be in some parts 40 feet deep. The pumping-station will consist of two large engine-houses with two engines in each, boiler-houses with six boilers, a large chimney tower, coal stores, workshops, &c.



## THE CONGRESS OF THE SANITARY INSTITUTE.

The Annual Congress of the Sanitary Institute was opened in Birmingham last Tuesday, under the presidency of Sir J. Fayer. There was a large attendance of members from all parts of the kingdom; and they received a public welcome at the Council House from the Lord Mayor (the Right Hon. C. G. Beale), who subsequently presided at a luncheon.

The opening meeting was held at the Birmingham and Midland Institute. In his Presidential Address, Sir J. Fayer surveyed the progress of preventive medicine or hygiene during recent times. In bringing about this progress, the Sanitary Institute had, he said, taken an important part. He traced the history of that body from its establishment, and referred to the numerous other organizations which had been formed with a similar object in view. He described the conditions under which the people lived fifty years ago, and contrasted them with the present conditions. Public health, he remarked, was now cared for in a sense which was utterly unknown in the past. Houses were better built; sewerage, drainage, and ventilation were provided for; the land was better cultivated and the subsoil better drained; the absolute importance of pure drinking water was recognized; food was more varied and more nutritious in its character; and clothing was better adapted to climate. If all the existing official provisions were enforced, little would remain to be desired on the part of the Executive Government. But as some Acts were permissive, not compulsory, and as others were utterly neglected, much of the benefit they might confer was lost, though education had done much. Upwards of 200 millions sterling had been spent on sanitary work, with great benefit to the public health. Popular teaching and example, and the general diffusion of education, were still necessary in order to convince the proletariat of what so intimately concerned their vital interests. The death-rate was susceptible of further diminution, and expectancy of life might be enhanced; while the general conditions of living and exemption from certain forms of disease were by no means so perfect as they might be. Tainted water was still drunk; chimneys still vomited forth their smoke and chemical fumes; and rivers were still polluted. Cesspools and imperfect drains, badly-constructed, ill-ventilated houses, and so on, still defied alike sanitary law and common sense, and it would perhaps not be until the more complete organization of the public health administration under a Minister of Public Health was effected that the full benefits of sanitary legislation would be realized, and the people attain to that standard of health and duration of life for which they had a right to hope. A vote of thanks was accorded to the President for his address.

The sittings of the various sections were well attended; and a large number of papers were read. Only a few of them, however, had any special interest for our readers. Alderman Cook, Chairman of the Health Committee of the Birmingham City Council, presided over a conference of municipal representatives, and described the sanitary history of Birmingham. Mr. T. de Courcy Meade, City Surveyor of Manchester, was President of a conference of municipal and county

engineers; and Mr. W. W. West, Sanitary Inspector of the Walthamstow District Council, filled a similar position with respect to the representatives of his special department of sanitary work. There was also a conference of ladies on "Domestic Hygiene." Mr. W. Henman, of Birmingham, presided in the section devoted to "Engineering and Architecture," and in his address dealt with the important part taken by architects in questions of sanitation. As President of the Physics, Chemistry, and Biology Section, Dr. G. Sims Woodhead delivered an address in which he reviewed some of the important advances made in sanitary science in recent years. In this section, papers on "Water Analysis" were read by Mr. S. Barwise and Mr. C. E. Seyler. On Thursday evening, Dr. C. Childs delivered an address on "The Prevention of Pollution in our Streams and Rivers." He expressed the opinion that the Rivers Pollution Act of 1876 had generally and persistently failed. The chief difficulties in the way of reforms were the ignorance and indifference of the people; the great cost of sewage purification; the uncertainty with regard to the best means to be employed; and last, but not least, the defects in the law itself, and the impotence of the measures provided for its administration. He described the best practicable and available means for destroying pathogenic bacteria in sewage, and pointed out the defects in the above-named Act. The final sittings were held on Friday. In the Engineering Section, Mr. J. Mansergh described to a large audience, by the aid of lantern views and diagrams, the scheme for supplying Birmingham with water from Wales. Four papers were read before the Physics, Chemistry, and Biology Section. Mr. H. Kerwood and Mr. W. Butler contributed a joint paper entitled "Some Observations on the National Purification of Sewage;" Dr. S. Rideal spoke of the quality of sewage as influencing its disposal; Mr. W. D. Scott Moncrieff dealt with the biolysis of sewage; and Mr. W. E. Adeney, with the "Bacterio-Chemical Analysis of Sewage and Sewage Effluents."

The closing meeting was held on Friday evening. Sir Joseph Fayer occupied the chair, and congratulated the city and the Institute, and those who had attended the congress, upon the result of their deliberations. The Secretary (Mr. E. White Wallis) presented a report showing the attendance. The number of tickets issued to members was 549; to representatives of sanitary authorities and societies, 880; to associates, 400; and complimentary tickets, 150—making a total of 1979, or about 50 per cent. more than at the preceding congress. The attendance at the various sectional meetings ranged from 85 to 260 each; the highest attendance being at the ladies' meetings.

In connection with the congress, there was, as usual, an exhibition of sanitary and other appliances in Bingley Hall; and there were several social functions and excursions.

**Public Lighting by Acetylene Gas.**—At New Milford, Connecticut, an acetylene-gas plant has just been put down for public lighting purposes. The holder has a capacity of 300 cubic feet, and there are four general tanks, each holding 150 lbs. of carbide. The principle is that of continuous supply; water being gradually admitted into one generator until the carbide is consumed, when it is automatically switched to the next generator, and thus the pressure and supply are regularly maintained.

## GAS AND WATER COMPANIES STOCK AND SHARE LIST.

Referred to on p. 741.

| Issue.                | Share. | When ex-<br>Dividend. | Dividend<br>or Dividend<br>& Bonus. | NAME.                      | Closing<br>Prices. | Rise<br>or<br>Fall<br>in<br>Wk. | Yield<br>upon<br>Invest-<br>ment. | Issue.    | Share. | When ex-<br>Dividend. | Dividend<br>or Dividend<br>& Bonus. | NAME.                                    | Closing<br>Prices. | Rise<br>or<br>Fall<br>in<br>Wk. | Yield<br>upon<br>Invest-<br>ment. |
|-----------------------|--------|-----------------------|-------------------------------------|----------------------------|--------------------|---------------------------------|-----------------------------------|-----------|--------|-----------------------|-------------------------------------|------------------------------------------|--------------------|---------------------------------|-----------------------------------|
| £                     | p. c.  |                       |                                     |                            |                    |                                 | £ s. d.                           | £         | p. c.  |                       |                                     |                                          |                    |                                 | £ s. d.                           |
| <b>GAS COMPANIES.</b> |        |                       |                                     |                            |                    |                                 |                                   |           |        |                       |                                     |                                          |                    |                                 |                                   |
| 590,000               | 10     | Apl. 15               | 10½                                 | Alliance & Dublin 10 p.c.  | 22½-23½            | ..                              | 4 9 4                             | 75,000    | 5      | June 29               | 6                                   | Malta & Medn., Ltd.                      | 4½-5½              | ..                              | 5 14 3                            |
| 100,000               | 10     | "                     | 7½                                  | Do. 7 p.c.                 | 16½-17½            | ..                              | 4 5 9                             | 541,920   | 20     | June 10               | 5                                   | Monte Video, Ltd.                        | 13½-14½            | ..                              | 6 18 0                            |
| 300,000               | 100    | July 1                | 5                                   | Australian 5 p.c. Db.      | 105-107            | ..                              | 4 13 6                            | 167,946   | Stk.   | Aug. 31               | 9½                                  | Newcastle & Gateshead Con.               | 230-240            | ..                              | 4 1 8                             |
| 200,000               | 5      | May 26                | 6                                   | Bombay, Ltd.               | 6½-7               | ..                              | 4 5 9                             | 252,855   | Stk.   | Jan. 3                | 3½                                  | Do. 8½ p.c. Db. Stk.                     | 113-117            | ..                              | 2 19 10                           |
| 40,000                | 5      | "                     | 5                                   | Do. New, £4 paid.          | 4½-5               | ..                              | 4 16 0                            | 150,000   | 5      | May 26                | 8                                   | Oriental, Ltd.                           | 7½-8               | ..                              | 5 0 0                             |
| 380,000               | Stk.   | Aug. 12               | 12                                  | Brentford Consolidated     | 275-280            | ..                              | 4 5 9                             | 135,000   | 5      | "                     | 8                                   | Do. New, £410s. pd.                      | 6½-7               | ..                              | 5 2 11                            |
| 240,000               | "      | "                     | 5                                   | Do. New                    | 210-215            | ..                              | 4 3 9                             | 15,000    | 5      | "                     | 8                                   | Do. do. 1879, £1 pd.                     | 1½-1½              | ..                              | 4 11 5                            |
| 50,000                | "      | June 10               | 4                                   | Do. 5 p.c. Prf.            | 140-145            | ..                              | 3 9 0                             | 60,000    | 5      | Sept. 29              | 7                                   | Ottoman, Ltd.                            | 5-5½               | ..                              | 5 11 1                            |
| 159,375               | "      | "                     | 5                                   | Do. 4 p.c. Db. Stk.        | 130-135            | ..                              | 2 19 3                            | 500,000   | 100    | June 1                | 6                                   | People's Gas 2nd M.<br>of Chicago J. Bd. | 103-108            | ..                              | 5 11 1                            |
| 220,000               | Stk.   | Sept. 15              | 11½                                 | Brighton & Hove Orig.      | 262-267            | ..                              | 4 6 2                             | 848,070   | 10     | May 26                | 6                                   | River Plate Ord.                         | 9½-9½              | ..                              | 6 3 1                             |
| 226,320               | "      | "                     | 8½                                  | Do. A. Ord. Stk.           | 190-195            | ..                              | 4 7 2                             | 250,000   | Stk.   | June 29               | 4                                   | Do. 4 p.c. Db. Stk.                      | 99-101             | ..                              | 3 19 3                            |
| 953,500               | Stk.   | Aug. 31               | 10                                  | Bristol, 5 p.c. max.       | 125-130            | ..                              | 3 16 11                           | 250,000   | 10     | Sept. 29              | 10                                  | San Paulo, Ltd.                          | 14½-15½            | ..                              | 6 9 0                             |
| 420,000               | 20     | Sept. 20              | 10                                  | British                    | 50-52½             | ..                              | 4 5 2                             | 135,000   | Stk.   | Sept. 15              | 10                                  | Sheffield A.                             | 242-245            | ..                              | 4 1 8                             |
| 50,000                | 10     | Aug. 12               | 11½                                 | Bromley, Ord. 10 p.c.      | 25-27              | ..                              | 3 17 3                            | 209,053   | "      | "                     | 10                                  | Do. B.                                   | 242-245            | ..                              | 4 1 8                             |
| 75,000                | 10     | "                     | 8                                   | Do. 7 p.c.                 | 20-22              | ..                              | 6 6 4                             | 447,427   | "      | "                     | 10                                  | Do. C.                                   | 242-245            | ..                              | 4 1 8                             |
| 500,000               | 10     | Apl. 29               | 6                                   | Buenos Ayres (New) Ltd     | 9-9½               | ..                              | 4 0 0                             | 5,600,000 | Stk.   | Aug. 12               | 5½                                  | South Metrop., 4 p.c. Ord.               | 140-143            | ..                              | 3 14 7                            |
| 95,122                | Stk.   | June 29               | 4                                   | Do. 4 p.c. Db. Stk.        | 98-100             | ..                              | 5 10 0                            | 1,460,000 | "      | July 14               | 3                                   | Do. 3 p.c. Db. Stk.                      | 101-104            | ..                              | 2 17 8                            |
| 150,000               | 20     | July 14               | 8½                                  | Cagliari, Ltd.             | 29-30              | ..                              | 4 7 6                             | 60,000    | Stk.   | Aug. 31               | 12                                  | Tottenham & J. B.                        | 280-290            | ..                              | 4 2 9                             |
| 100,000               | 20     | Sept. 29              | 7                                   | Cape Town & Dis., Ltd.     | 15-16½             | ..                              | 5 0 0                             | 182,380   | 10     | June 10               | 7                                   | Edmonton J. B.                           | 200-210            | ..                              | 4 5 9                             |
| 50,000                | 50     | May 3                 | 6                                   | Do. 6 p.c. 1st Mort.       | 58-60              | ..                              | 4 3 1                             | 149,900   | 10     | July 1                | 5                                   | Tuscan, Ltd.                             | 10½-11½            | ..                              | 6 1 9                             |
| 550,000               | Stk.   | Apl. 15               | 13½                                 | Commercial Old Stock.      | 315-325            | ..                              | 4 1 8                             |           |        |                       |                                     | Do. 5 p.c. Dbs. Red.                     | 100-108            | ..                              | 4 17 1                            |
| 200,750               | "      | "                     | 10½                                 | Do. New do.                | 252-257            | ..                              | 2 18 10                           |           |        |                       |                                     |                                          |                    |                                 |                                   |
| 200,750               | "      | June 10               | 4½                                  | Do. 4½ p.c. Db. do.        | 148-153            | ..                              | 5 18 2                            |           |        |                       |                                     |                                          |                    |                                 |                                   |
| 800,000               | Stk.   | June 10               | 12                                  | Continental Union, Ltd.    | 207-212            | ..                              | 4 10 11                           |           |        |                       |                                     |                                          |                    |                                 |                                   |
| 200,000               | "      | "                     | 9                                   | Do. 7 p.c. Prf.            | 193-198            | ..                              | 4 10 4                            |           |        |                       |                                     |                                          |                    |                                 |                                   |
| 51,600                | Stk.   | Aug. 31               | 14                                  | Croydon A 10 p.c.          | 305-310            | ..                              | 4 3 0                             | 746,164   | Stk.   | June 29               | 10½                                 | Chelsea, Ord.                            | 313-318            | ..                              | 3 6 0                             |
| 168,400               | "      | "                     | 11                                  | Do. B 7 p.c.               | 255-265            | ..                              | 4 0 9                             | 150,000   | "      | "                     | 5                                   | Do. 5 p.c. Prf.                          | 170-175            | ..                              | 2 17 2                            |
| 555,000               | Stk.   | Aug. 12               | 5½                                  | Crystal Palace Ord. 5 p.c. | 125-130            | ..                              | 3 9 0                             | 160,000   | "      | "                     | 4½                                  | Do. 4½ p.c. Prf. Stk., 1875              | 148-152            | ..                              | 2 19 3                            |
| 60,000                | "      | "                     | 5                                   | Do. 5 p.c. Prf.            | 140-145            | ..                              | 4 11 8                            | 175,785   | "      | Sept. 29              | 7½                                  | Do. 4½ p.c. Db. Stk.                     | 155-160            | ..                              | 2 16 8                            |
| 496,090               | 10     | July 28               | 11                                  | European, Ltd.             | 23-24              | ..                              | 4 11 9                            | 1,720,560 | Stk.   | Apl. 15               | 7½                                  | East London, Ord.                        | 215-220            | ..                              | 3 8 7                             |
| 354,060               | 10     | "                     | 12                                  | Do. £7 10s. paid.          | 17-18              | ..                              | 4 2 6                             | 654,740   | "      | June 29               | 4½                                  | Do. 4½ p.c. Db. Stk.                     | 157-160            | ..                              | 2 16 3                            |
| 5,922,230             | Stk.   | Aug. 12               | 11½                                 | Gaslight & Coke, A. Ord    | 292-297            | ..                              | 3 4 0                             | 890,000   | "      | "                     | 3                                   | Do. 3 p.c. Db. Stk.                      | 103-105            | ..                              | 2 17 2                            |
| 100,000               | "      | "                     | 4                                   | Do. B, 4 p.c. max.         | 120-125            | ..                              | 3 4 1                             | 700,000   | 50     | June 29               | 7½                                  | G'd Junction, 10 p.c. max.               | 115-118            | ..                              | 3 8 7                             |
| 665,000               | "      | "                     | 10                                  | Do. C, D, E, 10 p.c. Prf.  | 307-312            | ..                              | 3 3 8                             | 310,000   | Stk.   | Sept. 29              | 4                                   | Do. 4 p.c. Db. Stk.                      | 140-145            | ..                              | 2 15 2                            |
| 30,000                | "      | "                     | 5                                   | Do. F, 5 p.c. Prf.         | 152-157            | ..                              | 3 2 6                             | 708,000   | Stk.   | Aug. 12               | 14                                  | Kent                                     | 365-370            | ..                              | 3 15 8                            |
| 60,000                | "      | "                     | 7½                                  | Do. G, 7½ p.c. do.         | 230-240            | ..                              | 3 10 0                            | 160,000   | "      | "                     | 7                                   | Do. New, 7 p.c. max.                     | 212-217            | ..                              | 3 4 6                             |
| 1,300,000             | "      | "                     | 7                                   | Do. H, 7½ p.c. max.        | 195-200            | ..                              | 3 4 1                             | 1,043,800 | 100    | June 29               | 10                                  | Lambeth, 10 p.c. max.                    | 300-305            | ..                              | 3 5 7                             |
| 463,000               | "      | "                     | 10                                  | Do. J, 10 p.c. Prf.        | 307-312            | ..                              | 3 0 2                             | 406,200   | "      | "                     | 7½                                  | Do. 7½ p.c. max.                         | 227-232            | ..                              | 3 4 8                             |
| 476,000               | "      | "                     | 6                                   | Do. K, 6 p.c. Prf.         | 182-187            | ..                              | 2 18 10                           | 350,000   | Stk.   | Sept. 29              | 4                                   | Do. 4 p.c. Db. Stk.                      | 140-145            | ..                              | 2 15 2                            |
| 1,061,150             | "      | June 10               | 4                                   | Do. L, 4 p.c. Db. Stk.     | 131-133            | ..                              | 3 0 2                             | 500,000   | 100    | Aug. 12               | 13½                                 | New River, New Shares                    | 432-437            | ..                              | 3 0 7                             |
| 294,850               | "      | "                     | 4½                                  | Do. 4½ p.c. do.            | 148-153            | ..                              | 2 18 10                           | 1,000,000 | Stk.   | July 28               | 4                                   | Do. 4 p.c. Db. Stk.                      | 140-145            | ..                              | 2 15 2                            |
| 958,000               | "      | "                     | 6                                   | Do. 6 p.c. do.             | 198-203            | ..                              | 2 19 1                            | 902,300   | Stk.   | June 29               | 6                                   | Southw'k & V'xhall, Ord.                 | 166-171            | ..                              | 3 10 2                            |
| 70,000                | 10     | May 12                | 8                                   | Hongkong & China, Ltd.     | 14-15              | ..                              | 5 6 8                             | 126,500   | 100    | "                     | 5                                   | Do. do. 7½ p.c. max.                     | 160-165            | ..                              | 3 12 9                            |
| 3,800,000             | Stk.   | "                     | 10                                  | Imperial Continental       | 220-225            | ..                              | 3 9 8                             | 489,200   | Stk.   | "                     | 6                                   | Do. do. 5 p.c. Prf.                      | 168-172            | ..                              | 2 18 2                            |
| 376,400               | 100    | Aug. 2                | 4                                   | Do. 4 p.c. Dbs. Red.       | 98-101             | ..                              | 3 7 4                             | 1,019,585 | "      | Apl. 15               | 4                                   | Do. 4 p.c. A Db. Stk.                    | 141-144            | ..                              | 2 15 7                            |
| 473,600               | Stk.   | Aug. 12               | 3½                                  | Met. of Mel. 7½ p.c. Db.   | 101-104            | ..                              | 4 9 9                             | 1,155,066 | "      | June 10               | 10                                  | West Middlesex                           | 300-305            | ..                              | 3 5 7                             |
| 550,000               | 100    | Oct. 1                | 5                                   | bourne 4½ p.c. Db.         | 110-112            | ..                              | 4 4 1                             | 200,000   | "      | "                     | 4½                                  | Do. 4½ p.c. Db. Stk.                     | 162-165            | ..                              | 2 14 7                            |
| 250,000               | 100    | "                     | 4½                                  |                            | 105-107            | ..                              | 4 4 1                             | 200,000   | "      | Sept. 15              | 3                                   | Do. 3 p.c. Db. Stk.                      | 102-105            | ..                              | 2 17 2                            |

† Next dividend will be at this rate.



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## TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

## EDITORIAL NOTES.

## The Meeting of the Commercial Gas Company.

THE meeting of the Commercial Gas Company on Thursday, under the presidency of Mr. J. Blacket Gill, Chairman of the Company, was replete with interest of a mild, non-controversial kind. The Chairman was able to inform the proprietors that their dividend had been earned, with a balance of £1500 or so to the good; and that the trading prospects of the undertaking are as promising as ever they were at any period of its history. The working during the past half year was satisfactory; some important economies having been effected in the manufacturing department. Nevertheless, the immediate future of the Company is not without cloud. In the first place, it is too true that the current coal contracts were only secured at a considerable advance in price. Mr. Gill did not apologize for this circumstance; merely remarking that the Company do not stand alone in this regard—which is not a particularly strong position to take up. If a gas company were to get into the Bankruptcy Court, it would be but small consolation to find other occupants in the same undesirable situation. Rumour, to which we alluded last week, has it that the Commercial Company were caught in their coal contracts through coming after The Gaslight and Coke Company, whose dealings set the market price, as usual. The pity of it is that the Commercial directorate and proprietary do feel the responsibility for selling gas as cheaply as possible, which is not the case at the Horseferry Road. Repeatedly on Thursday the Chairman of the Company, and after him the Engineer and General Manager (Mr. H. E. Jones), warned the proprietors that the very last thing to be thought of was an increase in the price of their gas. If anything was to suffer from dearer coal and other difficulties, it must be the dividend. The declaration did not evoke the faintest protest.

Besides dear coal, which is purely an accident, the Commercial Company are constrained by law to suffer the stress of most expensive capital—which is a statutory "privilege." It is very remarkable how the capital conditions which were regarded in 1875 as favouring the shareholders have now come to be condemned as prejudicial to the undertaking. As the Chairman reminded the meeting, in 1875 the Commercial Company were rewarded for their promptness in submitting to the sliding-scale, by being allowed to issue their additional capital at par to the existing shareholders. Now the Directors and the management devoutly wish they had not to do anything of the kind. It is a curious illustration of the vanity of human desires. Practically, the privilege means that the management is put to every possible shift to avoid calling up fresh capital, because this costs twice as much as the new issues of the other London Gas Companies. The Directors have borrowed heavily from their bankers; but however they may turn, they are hampered in opening up such a branch of business as prepayment meter supplies, which do not yield much profit under the most favourable conditions. Yet there are proprietors of the Company who would execrate the Directors as traitors if they dared to propose to give up this onerous privilege for the good of the concern! There is not much of the old capital powers left; and those proprietors who have insisted upon having their "pound of flesh" will not have a great deal to congratulate themselves upon when the Company are driven to Parliament. It would have been far better if Parliament had been approached betimes, with the frank admission that the capital powers of the undertaking, although unexhausted, had grown obsolete, and needed bringing up to date. As it is, the aspect of the Company, with the Directors afraid to put into operation the powers which the proprietors are supposed to value so highly, and the management imploring to be spared as long as possible from the burden of necessary fresh capital, is not a gratifying one. Why not confess at once that the exemption from the auction clauses was a "Greek gift," to be relinquished while yet it retains the semblance of something possessing exchangeable value?

## Suggested Reserve Force of Gas Stokers—A Projected Federation of Employers.

A GAS ENGINEER who some time since had the misfortune to have to share the heat and burden of a strike of stokers has made a suggestion to us by which he thinks the brunt



of such a contest might well be lightened. Briefly put, his idea is that a fund should be formed by gas companies, with the object of keeping at command (say) a hundred stokers who would be prepared, under a signed agreement, to take up duty in the event of a strike at any of the subscribers' works. This is the basis of the proposal; but, in the absence of further details, it is difficult to regard it in a very favourable light. In the first place, we cannot see how the fund would be utilized. Would the proceeds of its investment be applied to the payment of a kind of "retaining fee" to the stokers who had the courage to enrol themselves, or in giving them a reward in the event of the defeat of the strikers or compensation on a settlement? This is one of the points on which information should be furnished by the proposer. Then, assuming that such a fund was established, where would a hundred stokers be found who would be willing to sign away their liberty of action in the event of a strike? For such a purpose, non-unionists only, and men of mettle and steady habits, would be of use. But such men are rarely in want of employment; and they would hardly be likely to leave regular and comfortable berths for uncertain and risky positions in gas-works undergoing little short of a siege. Moreover, in most works, the stokers are now bound by agreements; and consequently they would not be able to leave their employment at a minute's notice. Then, again, the scheme could only be applicable to works of limited dimensions. We see a difficulty in getting, under such a project, a hundred reliable men; and to have "on hand" the thousand or two thousand men who would be required in an emergency in some of the large gas-works, seems to be scarcely practicable. However, these are merely a few thoughts that arise in considering the scheme in its crude form; and if the proposer will enter into the matter in more detail, he may perhaps remove the difficulties which present themselves. He has himself passed through the mill; and his idea may be the result of much subsequent meditation.

Since the foregoing was written, particulars have reached us of a scheme which, presuming it eventually takes definite shape, may facilitate the carrying out of the project we have been considering. It appears that a proposition is on foot for establishing a federation of employers on a large scale. The scheme has been "in the air" for about a year; and we learn that it is now practically complete. We hear a great deal in the present day about the Federation of Labour; and the recent engineers' and miners' strikes have shown what can be done by a Federation of Capital. Approval of the present movement has been expressed by a considerable number of employers' associations, representing a great variety of trades throughout the United Kingdom; and it is stated that nowhere is the proposed federation likely to be stronger than in Lancashire and Yorkshire. We believe the idea originated with Mr. George Livesey, and had the support of the late Colonel Dyer; while Sir W. Lewis is among the employers who are engaged in carrying it out. With so powerful an organization as this at work, the project dealt with in the preceding paragraph appears less chimerical than it did at first glance. At all events, it is a subject on which an expression of our readers' views will be helpful.

#### Trade Unionism in the Building Trade.

THE effects of Trade Unionism in the building trades were described in very plain language before the Labour Commission; and matters do not seem to have much improved in this regard, if one may judge from recent events at Leicester, and some correspondence in the "Daily News." The term "master" has apparently ceased to have any proper significance in these trades, and should be dropped in favour of some such word as "money-giver," which is much more expressive of the function reserved for the employer under the rule of Trade Unions. There is no particular reason why Leicester should have furnished the latest illustrations of the actual state of labour in the building trades, which is probably in pretty much the same condition everywhere; but, according to the newspapers, affairs seem to have come to a climax there. The Leicester Master Builders' Federation find themselves face to face with a labour revolt which has been brooding for a long time. The local Building Trades Council last week called out the carpenters and joiners employed on a certain job, for the reason that they had been required to fix ready-made joinery, "which had been prepared either by some

"foreign firm or by some non-unionist house. The result was that the other operatives employed on the same contract came out on strike as well." The Master Builders' Federation thereupon announced that, unless the men returned to work forthwith, they would be locked out as from the beginning of this week. The Society declined to order the strikers back; and accordingly the decision of the Federation stood. The employers complain that the strike is in contravention of an award made in April last, under which neither strike nor lock-out was to take place until the cause of dispute had been discussed by the Presidents of the two Councils of employers and employed. Fears are expressed that the disturbance thus originated will spread over the entire Midlands; but even this would not be an unmitigated misfortune in the circumstances. Another Leicester strike has been precipitated by the rashness of a contractor for building repairs in finding fault with a Society bricklayer's work. The misguided employer ventured to condemn a specimen of bricklaying, and required it to be done over again. The order was spurned; and another bricklayer—also a Society man—was requisitioned to make good the defects. This gave such dire offence to the Society, that they black-listed the second man as "objectionable," and demanded his discharge from another job. The contractor declined to yield; and the whole of the men turned out on strike. It is difficult to see how any work is to be carried on until this sort of thing is radically dealt with. [Just before the "JOURNAL" went to press, the news came to hand that both these threatened strikes are "off." The heads of the Trade Unions implicated have thought better of it; and accordingly, in obedience to their orders, the free and independent carpenters, joiners, and bricklayers of Leicester have gone to work again.]

In London, as an architect has explained in the "Daily News," the bricklayers and the plasterers exhibit the perfection of "organized idleness." It is not a question of wages. The men referred to are paid the full Trade Union scale, and more; but they will neither keep the regular hours nor return a fair day's work for their money. They do not pay the slightest attention to the foreman; but loiter openly over their job. Another writer narrates how on one of his contracts the bricklayers objected to the general foreman spending so much of his time on the scaffold looking after them. "Brickwork, which a few years ago cost £3 to £3 10s. a rod for labour, now costs 'anything from £7 to £10.'" The suggestion is that something must be done to put an end to so disgraceful a state of things. Nothing short of the remedy applied to the engineering trade will effect a permanent cure.

#### Ironmongery Rampant.

It is unfortunately only too true that shopkeeping narrowness of mind and selfishness are still to be found in many places where liberal views of trade might be expected to prevail. The supply of gas stoves and fittings on easy terms by Local Authorities has often been strongly opposed by the ironmongers and the plumbers of the town; and Sheffield was recently put to the expense of a poll of the owners and ratepayers at the instigation of a handful of tradesmen who objected to the Corporation Electricity Supply Department doing its own wiring. It is rather amusing when grasping shopkeepers quarrel among themselves over the division of the spoils of trade, as frequently happens. There is a very well-conducted trade journal called the "Ironmonger," which is a faithful servant of the metal trades. It is entertaining to find in the pages of this periodical unconscious evidences of the habit of the shopkeeping mind that refuses to rivals the liberty of enterprise which it claims and exercises for itself. Thus, while it would be difficult to name, upon the authority of his trade journal, a class of articles in which an "ironmonger" may not deal, it complains loudly and bitterly of other descriptions of shopkeepers, such as drapers, who invade the hardwareman's preserves. What is sauce for the goose is anything but sauce for the gander here. One could understand this trade jealousy better, if there were any craft "mystery" in the case, such as in a measure excuses the skilled artisan's objection to the "handy" labourer's promotion to look after a machine tool. Though this natural objection has been run to death in the Trade Union interest, intrinsically it is a good one, which fair-minded employers will invariably respect. The skilled workman who has attained his grade by means of a long apprenticeship, or



some equivalent probation, has a natural right to the easy things of his trade—the “bits of fat”—just as it is his duty to do his best in the difficult and arduous passages of his calling. But in the case of the so-called “ironmonger,” who keeps a shop for the sale of hardware, the chances are nowadays that he is no “tradesman” at all, in the strict sense of the term. Time was when the public resorted to the ironmonger to get things made—a job of forging, or whitemith’s work, or what not. But our contemporary has often had occasion to complain that modern keepers of hardware shops do not know their trade, and cannot execute the simplest order otherwise than out of the stock of ready-made goods.

Take the number of the “Ironmonger” for Sept. 3. In one column there is a complaint that of half-a-dozen ironmongers in a Welsh town, not one could supply a spike for a walking-stick to be used in hill climbing. Overleaf there is a recommendation of “inexpensive suites and cheap deal furniture, suitable for ironmongers who do a medium class of trade.” The italics are ours. The cream of jokefulness of this kind is to be found in the “Correspondence” column of the same number, where a worthy ironmonger narrates how he “collared” the work of a local Water-Works Committee. This enterprising personage studied the medical officer’s reports, and foresaw that a local board would have to be formed to deal with the question of water supply. As he very naively says: “Now was my time. Although not in a large way of business, I determined to go upon the board, and I was elected. When the water and sewerage works were undertaken, I was placed upon the Committee. I fought down every proposal to the work getting into the hands of plumbers, some of them being members of the board. . . . I advertised in the local paper, dressed one of my windows out with plumbing goods, bought some good stuff, and kept it well to the fore. Since the water has been laid on—some two or three years—I have fitted up over one hundred houses, shops, public buildings, &c.” This is very rich—and so, probably, is the ironmonger who discomfited the plumbers. That in the ironmonger’s but a bit of good business, which in the plumber is rank robbery! All this may be borne in mind by corporation gas committees desirous of delivering their consumers from ironmongering interest. Like another ubiquitous character, the ironmonger, if resisted, will probably flee—to open a window dressed out with carpets, pleasingly relieved with patent medicines in ornamental tin boxes.

#### The Public Works Loan Board.

THE twenty-third annual report of the Public Works Loan Board for the last financial year states that the Commissioners made during the year 583 advances for sums amounting altogether to £1,305,374. The marked decrease which took place in the advances for the previous year continued during the first half of the year 1897-98, until the alterations that were made in the terms of the Board’s loans by the Public Works Loans Act, 1897, came into effect. Then the business revived. It is remarked, by way of explanation, that Parliament has always intended that this Board should be empowered to lend money upon more favourable terms than could be obtained in the open market, with the object of encouraging and assisting in the carrying out of the particular class of public works falling within the purview of the Board. As time went on, however, the special terms which the Board were enabled to offer failed to attract borrowers, who could, and did, resort to the open market with advantage. Accordingly, the Act of 1897 was passed, completely altering the terms for the Board’s loans. All loans on security of local rates, including loans on securities guaranteed by local rates, are now placed on the same footing as regards the rates of interest, without any distinction as to the purposes for which such loans are required; and the minimum rate of interest has been fixed by Parliament at  $2\frac{3}{4}$  per cent. By the Act of Parliament and the Treasury Minute issued thereunder, 30 years’ loans are charged at the rate of  $2\frac{3}{4}$  per cent., 40 years’ loans at 3 per cent., and 50 years’ loans at  $3\frac{1}{4}$  per cent. interest. The Treasury have also power, upon the recommendation of the Board, to extend the period of loans. The general effect of these alterations is that the Board now lend for purposes for which they seldom lent previously. For example, they lent the Cowes Urban District Council £55,562 for the purchase of a gas undertaking and incidental expenses, repayable within 40 years, with interest

at 3 per cent. Several Local Authorities had loans for electric lighting purposes, repayable within 25 years, at  $2\frac{3}{4}$  per cent. interest. Repayments to the Board are made either by way of annuity, in equal instalments of principal and interest combined, or by equal instalments of principal, with interest on the principal from time to time outstanding. The latter is the favourite plan. Borrowers had a way of paying off loans before they became due. But in 1895 the Treasury issued a Minute requiring the payment of a premium on loans paid off in advance; and this placed a check upon the practice. The policy of the Treasury is to induce Local Authorities to curtail the duration of their loans, so as not to unduly burden the rates of posterity, which is certain to have its own requirements to meet. This is the reason for the institution of the sliding-scale of interest, under which long-period loans pay a higher rate than those granted for a short time. There will be no more 100 years’ loans, excepting under Special Acts of Parliament framed with regard to very exceptional circumstances.

#### The Debasement of Waterloo Bridge.

THE protest which we made in these columns months ago in respect of the maltreatment by the London County Council of Waterloo Bridge in the matter of lighting, has received lively but tardy support in the current number of the “Artist.” Our artistic contemporary remarks, with justice, of the bridge lamp-posts: “Any fool can see that, on a bridge like this, they ought to be ornamental and dignified, and in keeping with the bridge—not vulgar, skimpy things like these.” But it must be a superior class of fool to the members and officials of the County Council who did this thing; for they do not seem to be conscious of their folly. Who are they, at any rate? Who is responsible for this hacking about of a priceless monument, this vulgarization of a truly unequalled site? Supposing a common citizen of London, upon discovering the County Council workmen defacing, with the regulation “Union stroke,” the substance of Waterloo Bridge, had echoed the “Woodman! spare that tree!” sentiment, and defied the iconoclastic hammer. He might have been “run in;” but he would have saved the bridge. Unhappily, the opportunity is gone. Now the public have a right to know whom to thank for this addition to the claims of the County Council upon the gratitude of the Metropolis. Strangely enough, nobody comes forward to grasp the honour. Our “Progressive” ædiles are not usually so retiring. The worst of it is that one never knows where this kind of thing will end. If the cheapest and poorest pattern of lamp-post that can be had is deemed good enough for Waterloo Bridge, what standard of elegance and efficiency in this regard is likely to be worked to in other less noteworthy localities? London has suffered far more than can well be expressed from the neglect by the town authorities of the small amenities of the street and its appurtenances and fittings. Unless the County Council are brought to book over this Waterloo Bridge vandalism, the greatest capital the world has ever produced will be branded with a pettiness and poverty, as regards the things in the street, that catch the eye, of which any provincial village authority would be ashamed. Whether London is lit by gas or electricity, let it be done worthily.

#### WATER AND SANITARY AFFAIRS.

THE calm and strictly matter-of-fact statement made by Mr. George Banbury at the half-yearly meeting of the East London Company on Thursday last, must be held, on every ground of equity and common fairness, to vindicate the conduct of the Company in their management of the water supply, including all that relates to the recent recourse to the intermittent system. Any reasonable person may be convinced by the appeal thus made to a sober judgment; but the opponents of the Metropolitan Water Companies seem to have suspended the exercise of every reasonable faculty, in order that they may indulge in vehement and irrational accusations. Doubtless there is method in the madness, and there is an end to be served that inspires the attack, in the pursuit of which every form of warfare is considered fair. There are those who follow blindly in this onslaught; but there are others who lead them who know perfectly well what they are about. The battle-cry—if so we may term it—is “Let us go to Wales.” This is



to be done "at once," as though it were a mere step across a stream; and all the crusade against the Companies is directed to this goal. But there is something else behind. There are the Water Companies already in possession of the existing supply; and they must be dealt with before Wales can be entered upon. "Let us secure the land," is one appeal, and the water-works can be established by-and-bye. The by-and-bye is a long way off—at least a dozen years, according to Sir Alexander Binnie's showing. So the best must be made of present means; and the practical question for London is whether anything better can be done than what the Companies are doing. Could the County Council have had its own way, there would have been no extension of the East London reservoirs, no junction of the Companies' mains, and no Staines reservoirs scheme. Such has been the admirable "foresight" of the Progressive party at Spring Gardens—a mode of proceeding so well adapted to embarrass the Companies and to cripple the supply. Purchase is felt to be a necessary evil, which has to be mitigated by every stratagem which can force down the price. As Mr. Stuart signified in last week's debate, the Council are looking out for "a valuable asset." If in one way millions are to be added to the capital account, in some other way they must be cut off.

Present prospects of rain do not preclude the question—Has there been a drought? The East London Chairman shows that there has been. Nearly the whole country indicates it, Continental rivers show it, and the vintage report from Oporto declares it. Somehow or other, the thunderstorms proper to hot weather have been absent. The East London Company have made fresh reservoirs, once and again; but the rain came not, and the springs had a stinted flow. The existing reservoirs, full in June, have been well-nigh depleted; the inflow being deficient despite all care as to the outflow. Waste has done its wicked work, and has made still worse the havoc caused by what Mr. Banbury properly calls "the forces of Nature." Irresponsible critics can laugh at this; but there is the fact of a rainfall so deficient as to beat all record, reducing the River Lea to a lower point than was ever known before. There are subterranean waters, and it would seem that by direct application to this source is to be found material help in the future; only when wells are proposed there is an outcry that this is merely taking water from the rivers in another form. But the East London Company have sunk wells, and are sinking more; and the wells they have are declared by Mr. Banbury to have been their "salvation" at the present crisis. As for these wells draining the Lea, a thick stratum of London clay intervenes to cut off any connection with the river. If it be asked what kind of "salvation" the East London consumer has enjoyed, an answer is furnished by a statement given in "The Times," and lately reproduced in our columns, showing that out of twenty-five large towns in England and Wales, no fewer than thirteen are putting up with less water than East London has in its restricted supply. In addition it is to be observed that three of the London Companies are at the top of the list; not one of the provincial towns having so large a quantity per head as these are giving. As if to counteract the effect of these statistics, a deputation from an Association which undertakes to defend the East London consumers, waited upon the Water Committee of the County Council on Friday, and stated that in New York the daily supply per head was 84 gallons, and in Marseilles 99 gallons. Of course, this is simply intended to dwarf the East London supply of 24 gallons per head. It is also remarked that the latter quantity includes the requirements of factories and the watering of roads. The same condition applies to the data given in "The Times;" and in the manufacturing towns the proportion which goes to the factories is much larger than in London.

The deputation above referred to, from the Consumers' Defence Association, urged that the County Council should take action in the Law Courts against the East London Company on the subject of a full charge for a restricted supply. This is a matter which is coming before the Railway and Canal Commissioners; but it seems particularly attractive to the East-end agitators, so that they cannot have too much of it. Yet there is a law standing in the way which somehow fails to command the attention or the respect of these gentlemen. The Metropolis Water Act of 1871, in the portion that treats of the constant supply, contains a section which says: "Notwithstanding anything in this

"Act, a company shall not be subject to any liability for not giving a constant supply if the want of such supply arises from frost, unusual drought, or other unavoidable cause or accident." The exemption is carefully guarded by the phrase "unusual drought." That the drought which has affected East London is "unusual," is apparent from the circumstance that such a protracted absence of rain does not appear in any previous meteorological record with respect to England. Mr. Banbury, in his speech, made a quotation from the "Pall Mall Gazette," showing that the deficiency in the rainfall had deprived London of 102,000 million gallons, or a sufficient quantity for fifteen months' supply. This is not a mere question of a few hot months in the summer. There has also been a dry winter; and in the twelve months, as stated by Mr. Banbury, the rainfall has only been some  $12\frac{1}{2}$  inches, as compared with the usual average of  $24\frac{1}{2}$ . In the last nine months, the supply from the clouds has fallen 50 per cent. below the average. If the Progressives, or whoever they may be, desire a greater drought than this, they must be prepared to see every Water Company in London distressed, and Mr. McDougall's vision of an expiring Thames fulfilled.

To-day the County Council resumes the debate which it commenced on Tuesday last in reference to the water supply of the Metropolis. Apart from the rodomontade of Mr. Crooks, there was in last week's debate something explicit, however incorrect, in the statements put forth by Mr. Stuart. The latter repeated the already refuted allegation, that the present distress in the East-end was due to the delay of the Water Company in putting into operation the power which they themselves had sought and obtained for taking an auxiliary supply from other Companies. In reply, it may be sufficient to urge that there was no delay in taking a supply of 6 million gallons per day from the New River Company; and in regard to the Southwark and Vauxhall Company, nothing could be done until the passing of the Company's Bill on July 25. Granting that possibly there was a loss of a fortnight in commencing the requisite works for carrying a main through the Tower Subway, this may be put in contrast with the conduct of the County Council in throwing back the water supply of East London a whole year by its fatal opposition to the Bill of 1893. As we have already pointed out, if the same tactics had succeeded in 1894, East London would have suffered the want in the present year of the 600 million gallons contained in the reservoirs sanctioned by the second Bill. Mr. Stuart, as an expert general, may well try to create a diversion, so as to distract attention from the mischief wrought by himself and his colleagues. But, leaving this part of the subject, and proceeding to consider the vital question of whether it is necessary—or will be in the course of years—to go to some remote region in search of water for the supply of London, we observe that fresh evidence is forthcoming in confirmation of the idea that a large flow of water from the chalk areas into the sea is continually going on along the south-east coast. Sir John Evans may allay his apprehensions that deep wells in the chalk will affect the open streams. There is proof given that a vast subterranean source of supply exists, which at present only feeds the sea, and which engineering skill will be able to turn to account, probably by the employment of means attracting little notice, and requiring only a moderate outlay of money.

**Serious Illness of Mr. Robert Hunter.**—The professional colleagues of Mr. Robert Hunter, of Chester, will be sorry to learn that he is lying in a critical condition as the result of a paralytic seizure while at the works last Friday. Mr. Hunter has been out of health for a year; and about the middle of August, acting upon medical advice, he took a voyage to the Canaries. The trip proved an enjoyable one; and Mr. Hunter returned, after a month's absence, feeling much better than when he started. Unfortunately, however, the journey was not productive of any permanent benefit. We regret to state that yesterday he was rapidly losing strength.

**Sulphate of Ammonia v. Nitrate of Soda for Wheat Growing.**—The last number of the "Journal of the Royal Agricultural Society" contains a communication by Dr. Voelcker, giving the results of experiments carried out at Woburn in growing wheat under various conditions of manuring. The best kinds were the produce of plots dressed with mineral manures and sulphate of ammonia. A comparison between these plots and those dressed with nitrate of soda revealed a marked difference in the produce. There was an increase in the quantity of tail corn, and a much lower weight per bushel of dressed corn, in the plots treated with nitrate.



## ESSAYS, COMMENTARIES, AND REVIEWS.

## GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 829.)

BUSINESS in the Stock Markets in general was of very small proportions last week. The public showed no turn for enterprise whatever; but rather a pronounced disposition to wait a bit and see what was going to happen. For this probably we have chiefly to thank the political outlook, which is disagreeably uncertain; the present state of internal unrest in France being capable of tempting a weak Government into foreign complications, if only as a distraction. So the markets were very quiet and dull; and they grew flatter as the week passed on. Prices for the most part are down, though the fall was nowhere heavy—Consols having about the worst of it. Apprehensions of dearer money had something to do with this; and eyes are looking anxiously towards Berlin, where there is a run on gold. In the Gas Market, there was quite a revival of business; and the quietest week on record was succeeded by one which was really brisk and lively. Every variety of issue was dealt in; and the general tendency was very steady. Changes in quotation were few, and, with one exception, unimportant. In Gaslights, there was considerable dealing in the "A" stock, at close figures touching 295. At one time, it seemed inclined to rise a little, but could not quite manage it. Dealings in the secured issues also were more extensive; and the "K" had a nice rise, while all the rest stood very firm. South Metropolitan was fairly active, and commanded good steady prices, but without any advance. The debenture stock, however, was put up a point. Again there was nothing in Commercial. At the meeting on Thursday, a further issue equal to 10 per cent. on the existing capital—half in new stock and half in debenture stock—was authorized. In the Suburban and Provincial group, there was little doing, except in Crystal Palace, which was unusually busy. Alliance fell back half a point. Among the Continental Companies, attention centred chiefly on Imperial; and prices rose with buoyancy on the intelligence that the Municipality had come to terms with the Association. Union and European were firm and unchanged. None of the remoter undertakings presented any feature calling for remark. Business in the Water Companies was very quiet; and not remarkable for anything beyond the prevalence of good steady prices.

The daily operations were: Gas opened more animated on Monday; and all stocks commanded steady figures. Alliance fell  $\frac{1}{2}$ , without business being marked. Tuesday's operations were mostly in Gaslight "A" at good middle figures. Imperial rose 2; and South Metropolitan debenture, 1. Wednesday's business was largely in Gaslight issues of all sorts; and the "K" moved up 3. Imperial also gained 3 more. Gaslights were left alone on Thursday; but many other issues were briskly dealt in—quotations remaining unchanged. Friday was a good day; and prices all round were strong and buoyant. The only change, however, was another rise of 2 in Imperial. In Water, New River gained 3. Saturday was fairly active; and Imperial advanced 1 more. In Water, Southwark and Vauxhall preference improved  $1\frac{1}{2}$ .

## ELECTRIC LIGHTING MEMORANDA.

Mr. J. Blacket Gill and the "Light of the Future"—The Case of St. Pancras—The Right Place for Street Lamps—An Inquiry from Adelaide.

At the ordinary general meeting of the Commercial Gas Company, last Thursday, the Chairman (Mr. J. Blacket Gill) mentioned an article that had appeared in the "Daily Telegraph" entitled "The Light of the Future," and proceeded to re-assure the assembled proprietors of the ability of the Gas Company that serves the East-end of London to survive the realization of the prognostications of the newspaper writer. It will strike most of our readers that the title in question lacks novelty, having done frequent service in every newspaper published in the English language these many years past. When Mr. Gill referred to its latest re-appearance, and gave it the honour of inclusion among the topics proper for a half-yearly address to the shareholders of a London Gas Company, those who had not read the article must have received the impression that it contained important intelligence respecting the advance of electric lighting. Having looked into it, however, we are able to assure our readers that the article is nothing more than a "popular" account of the St. Pancras Vestry electric lighting undertaking, partly in the form of an "interview" with the Vestry Electrical Engineer (Mr. S. W. Baynes). It is a little difficult for a technical journal to keep in touch with the daily newspapers as regards the matter of special articles appearing from time to time in the latter, in which the province of the technical journal is apparently invaded. Usually the newspapers do not get hold of such matter until long after the technical journal has done with it. But, of course, the general newspaper reader does not see the technical journal; and he is therefore apt to make his first acquaintance with the particular subject in the form of the newspaper "hash," instead of as a fresh bit of technics.

In the instance in point, it is not to be supposed that Mr. Gill's audience of Thursday comprised many habitual readers

of the "JOURNAL;" though, as a matter of fact, we have the satisfaction of knowing that a considerable number of people whose connection with the gas industry is strictly financial do read these columns regularly, with the laudable object of learning what they can as to the course of the industry as a whole. The "Daily Telegraph" article would not tell these initiated ones anything new about the prospects of electric lighting. We not infrequently mention the St. Pancras undertaking, and did so as recently as Aug. 30, in regard to a little upset of the distributing system in the neighbourhood of the Regent's Park. All the same, it is interesting to know what Mr. Baynes had to tell the newspaper reporter concerning the progress and prospects of the undertaking. Last year the Vestry received from private consumers a rental of nearly £30,000, upon a capital investment of £210,691. The gross profit amounted to 7.54 per cent. upon the capital, out of which interest, sinking fund, insurance, and depreciation should have been provided, but was not. The Vestry preferred to credit themselves with a "surplus" of £6518, instead of making proper provision for the future, which would require more than every penny of the so-called profit. With this consideration, of course, the executive staff have nothing to do. It is more to the point to learn from Mr. Baynes that the new arc lights which the Vestry are putting into the streets are of the closed type, which will go for 180 hours without attention, and are being fixed on the kerb. Thus the whirligig of Time brings about its revenges. We have often argued in the "JOURNAL" that the vaunted "improvement" which the electricians claimed to have effected in street lighting by ranging their arc lamps along the centre of the roadway, is no improvement at all. The "young lions" of electricity supply were far too proud, not to say conceited, to learn from those who had had to find out all about street lighting before they came upon the scene. They undertook to do the whole thing upon fresh lines of their own devising, which did not agree with the common practice of gas engineers. Having failed to persuade highway authorities generally that the proper way of lighting a thoroughfare is to sling lamps across it by means of wires, they next undertook to align their arc-lamp standards centrally in thoroughfares delivered over to their tender mercies.

Now they have discovered their mistake—or, at any rate, Mr. Baynes has found it out in St. Pancras. He is not ashamed to confess that "lamp-posts are rather an obstruction in the roadway; and repairs, when necessary, are costly. . . . Lately something was being done to the road beside a centre light, so that all the traffic was sent to one side of the stand. A bus broke down between the kerb and the light; and in consequence the road was blocked. This would not have been the case if the lamp had been on the kerb." It is still averred that kerb lighting is wasteful of light; but is this really so? Does it not give a brighter aspect to the whole street? Central lighting concentrates the light just where it is least wanted, to the loss of the side walks and the edge of the roadway. With central lighting, everybody who seeks to enter or quit a conveyance must do so in shadow; which is a nuisance of no small magnitude. Mr. Baynes does not care much for prepayment electricity meters; and his Committee do not encourage their use. They do, however, believe in the maximum demand indicator, as an economical expedient for charging the consumer fairly for his share of the expense of "making ready." Altogether the newspaper story is reasonable and interesting enough; but there is nothing in it to alarm gas shareholders in the smallest degree.

There has been some discussion in Adelaide, South Australia, upon the thorny question of which system of street lighting is making most progress "at home"—electricity or incandescent gas-lamps. The question is purely of academical interest for Adelaide; seeing that the South Australian Gas Company have a four years' contract still to run with the Corporation. It is obviously impossible to answer such a query conclusively, unless its scope is clearly defined. Naturally, where local authorities have electricity supply undertakings of their own, they commonly like to do the street lighting in their chosen area, in order to start with a "nest egg" of trade. This gives a big spurt to the electric light, for the time being. It is, however, a line of business that does not, in the long run, pay either electric lighting local authorities or companies. The progress that has been made the last three or four years in the application of incandescent gas lighting to street-lamps, is far and away beyond the contemporaneous extension of public electric lighting in the United Kingdom. Town after town is giving in its adherence to the incandescent gas-lamp for public lighting; and when it is remembered that these lamps are applicable wherever gas is to be had, while electric lamps are of necessity restricted to the central compulsory areas of a statutory electricity supply, the failure of the latter to keep pace with the extension of the former is easily understood.

**Thermo-Dynamic Problems.**—We have received from the Technical Publishing Company, Limited, of Manchester, "The Theta-Phi Diagram Practically Applied to Steam, Gas, Oil, and Air Engines." It is the production of Mr. H. A. Golding, Assoc.M.Inst.M.E., the Chief Draughtsman to Messrs. Bryan Donkin and Co., and Assistant Lecturer at the South-Western Polytechnic, London; and the author states in his preface that he has attempted to "present, in as simple and practical a manner as possible, the use of the temperature entropy diagram, and the various methods of drawing it for heat motors."



## THE WORKMEN'S COMPENSATION ACT.

COMMENTS which have appeared in some recent issues of the "JOURNAL" and correspondence in "The Times" have furnished evidence of the difficulties arising under the above-named Act. No sooner has the problem as to the necessity for taking out letters of administration before a legal receipt can be given for the compensation-money started on the road to solution than another presents itself. A manufacturer has in his employ a workman subject to epileptic fits; and he naturally wishes to know whether he can make any special arrangement with the man in regard to compensation for any accident that may occur as the result of this infirmity. The answer seems to be that, as the Act forbids "contracting out," the master, if he retains the man in his service, must bear the extra risk, or possibly get over his difficulty by paying a lower rate of wages in order to compensate him for the greater risk involved. But he may discharge the man; and should such a course be adopted in similar cases, it will lead to the gradual weeding out of those who are not absolutely fit, for few employers would be disposed to retain upon their premises workmen who might prove to be a constant source of trouble. In addition to the difficulties here referred to, others are presenting themselves to the various Insurance Companies. It appears that the Inland Revenue authorities are now claiming that the policies must bear a 6d. stamp if under hand only, and a 10s. stamp if under seal. Some of the offices are reported to be trying to evade this interpretation of the Stamp Act by putting on a penny stamp and writing over it. But it is questionable whether such documents are legal. This is another matter which will have to come up for definite settlement.

It was predicted of the Act that, whatever its shortcomings might be, it would be a good one for the lawyers; and the prediction seems to be in process of realization. At the same time, it must be acknowledged that the lawyers have been of material assistance, by means of the handbooks they have published, in throwing light upon certain obscurities of the Act. Proof of this is afforded by the fact that already some of these manuals have passed through several editions. And here it may not be out of place to notice the recent publication of the third edition of the useful little work by Mr. A. H. Ruegg, Q.C., on the Employers' Liability Act, 1880.\* It was called for by the passing of the Workmen's Compensation Act; and the author has shown his appreciation of the importance of this measure by devoting the whole of the second part of his book to its consideration. The older Act, however, is dealt with as fully as in previous editions. He is careful to point out in his preface that, owing to the novelty of the principles on which the new Act is founded, the vagueness of some of the wording, and the absence of any judicial decisions, it has only been possible for him, while explaining the general provisions, to deal problematically with the difficult questions which so frequently present themselves. But, as might be expected, he has done this in a masterly way. The work possesses the merit of dealing with two important enactments affecting labour in a form which enables their respective provisions to be readily compared. The text is preceded by tables of statutes and cases, after the plan adopted in "Michael and Will;" and there is a good index.

## THE GAS ACTS OF 1898.

(Continued from p. 744.)

The following Acts confer additional powers upon statutory gas companies:—

The Aberystwith Gas Act amends, and is to be construed with, an Act of 1873. It directs that before the expiration of seven years from the passing of the Act the Company shall discontinue the manufacture of gas on the existing site, and remove the works to the new site authorized to be taken for the purpose. At any time within thirty years, the Corporation may purchase the undertaking, after giving six months' notice to the Company, who are not to oppose the Corporation Transfer Bill except on details. The price is to be ascertained by arbitration; and the cost of removing the works is to be taken into account. The initial price for 15-candle gas is to be 4s. 3d. per 1000 feet.

The Enfield Gas Act extends the Company's district of supply, excluding portions of the parishes of Edmonton and Southgate from the district of the Tottenham Company, and transferring them to that of the Enfield Company. Additional lands are to be acquired. As from Jan. 1 next, all the shares in the existing ordinary capital of the Company are to be consolidated into ordinary 5 per cent. stock; and the preference stocks of the Company are to be similarly converted, and bear a uniform preferential 5 per cent. dividend. Unissued stock is also to be unified with the converted stock. Additional capital to the amount of £50,000 is authorized, to carry the usual borrowing powers. The sliding-scale is enacted, with the initial price of 4s. 6d. per 1000 cubic feet for 15-candle gas. Proceedings by

the Company for the recovery of demands not exceeding £50 may be taken in the County Court. Except in the case of a Director retiring by rotation and offering himself for re-election, no proprietor is to be capable of election without 28 days' notice to the Secretary. Gas-pipes may be laid in undedicated roads. It is lawful for the Company to utilize their gas-mains for ancillary purposes. The Company may apply for an Electric Lighting Order; using their own capital for the application and for carrying into effect the Order, if granted. Prepayment for gas supplies may be demanded in certain cases. The period of error in defective consumers' meters is limited to the current quarter.

The Folkestone Gas Act empowers the Company to take additional land, subject to elaborate provisions respecting the displacement of persons of the labouring class. The Company are authorized to raise £130,000 of additional 7 per cent. capital, with the usual proportion of loan capital. The maximum price of 15-candle gas is fixed at 4s. 6d. per 1000 cubic feet. Gas-mains may be laid in undedicated roads.

The Gainsborough Gas Act authorizes the issue of £25,000 of additional 7 per cent. capital, to carry the usual borrowing powers. Borrowed money is not to be converted into capital at more than 4 per cent. The Company may apply for an Electric Lighting Order out of their own capital. Fifteen-candle gas is to be supplied, in place of the 10-candle quality authorized by the Company's Act of 1856. The Urban District Council of Gainsborough may take steps to acquire the undertaking within three years, without opposition by the Company; the price to be ascertained by arbitration under the Lands Clauses Act, including all expenses of winding up.

The Gaslight and Coke Company's (Capital Consolidation) Act has been summarized and described so many times in the "JOURNAL," that it need only be mentioned here for the sake of rendering our catalogue of Gas Acts complete. All the various preference stocks of the Company are converted into one 4 per cent. consolidated preference stock. The maximum stock is converted into 3½ per cent. maximum stock. The "A" ordinary stock is converted into a new ordinary stock bearing 4 per cent. dividend. The debenture stocks are converted into 3 per cent. consolidated debenture stock. The sliding-scale is to operate on the ordinary stock in the ratio of 2s. per cent. per annum; and the maximum price charged to private consumers during any calendar year is to be taken as the price charged in such year. Clause 19 runs as follows: "Whereas the conversion by this Act authorized may affect the market prices of the Company's stocks, therefore be it enacted that, in the event of any purchase of the Company's undertaking by a public or local authority, the market prices of the Company's stocks shall not be taken into consideration in determining the price to be paid for the said undertaking." The costs of the Act are to be paid out of revenue.

The Gloucester Gas Act extends the limits of the Company to include several suburban parishes. Additional lands may be purchased by agreement; and the Company are authorized to construct or contribute towards the construction of railway sidings on the same. Immediately on the commencement of the Act, the Company are to transfer to the credit of their capital account the sum of £10,000, part of the sum of £13,720 4s. 2d. shown by the annual accounts of the Company to be standing to the credit of the profit and loss account after deducting the accrued dividend. This sum is not to be considered as capital entitled to dividend or available for distribution as profits. The share capital of the Company is to be consolidated into a uniform 5 per cent. stock. Additional capital to the amount of £70,000 is authorized, to carry the usual borrowing powers. Prepayment for gas supplies may be demanded in certain cases. The period of error in defective meters is limited to the last preceding quarter, unless it is proved to have occurred during the current quarter. Proceedings for the recovery of amounts under £50 may be taken in the County Court.

The Hartlepool Gas and Water Act only contains one clause relating to gas; and this makes the quality of the Company's gas 15 candles.

The Plymouth and Stonehouse Gas Act extends the district to the existing borough boundary, with a saving provision for the protection of the borough of Devonport: "Provided also that the Company shall not by any exercise of their powers in regard to the expenditure of capital or otherwise within the area added to their limits of supply by this section, either increase the price charged for gas within the existing limits of the Company, or prevent or hinder the reduction of that price under the provisions of the Act of 1894." The issue of £80,000 additional capital is authorized, to bear 5 per cent. dividend, with the usual borrowing powers. Additional lands, comprising the site of a certain tannery, are to be acquired by agreement.

The Southampton Gas Act extends the limits of supply of the Company, and regulates the price of gas at 3s. 6d. per 1000 cubic feet within the borough of Southampton and the Urban District of Eastleigh, and 4s. 6d. beyond. The charge is to be equalized within ten years, subject to the proviso that this process is not to be done at the expense of the inner district. Additional lands are to be acquired. A certain street may be widened, and another thoroughfare stopped. Works of distribution are to be executed under special clauses for the protection of the Southampton County Council. The existing capital of the Company is to be converted into stock bearing a

\* "The Employers' Liability Act, 1880, and the Workmen's Compensation Act, 1897; with the Statutes Affecting these Acts, the Rules of Procedure thereunder, and Forms." By Alfred Henry Ruegg, Q.C. London; Butterworth and Co.; 1898.



uniform 5 per cent. dividend; and the old debenture stock is to be converted into a new 4 per cent. debenture stock. New capital to the amount of £200,000 is authorized, with the usual borrowing powers. Users of gas-engines are to fix anti-fluctuators if required. The gas is not to contain more than 22 grains of sulphur in winter, and 20 grains in summer, per 100 cubic feet. The period of error in defective meters is limited to the last preceding quarter. The Company are not to interfere with the bed and foreshore of the River Itchen.

The Southend-on-Sea Gas Act enables the Company to make and maintain a pier or jetty, with tramway connection with their gas-works. The ordinary capital is consolidated into 5 per cent. stock, with power to raise £100,000 additional stock. The loan capital is to be in the proportion of one-third of paid-up stock. The initial price of 4s. 3d. per 1000 cubic feet is enacted. The Company may apply for, and exercise, electric lighting powers, upon previously obtaining the consent of the Local Authority. The period of error in defective meters is limited to the current quarter. The buildings of the Company (not being dwelling-houses) are exempted from the Corporation Act. The Corporation may have the Company's accounts audited under the Board of Trade.

The Swansea Gas Act enables the Company to purchase additional lands by agreement. The capital is consolidated into 5 per cent. stock, increased by £120,000, with the usual borrowing powers. The price of gas within the extended borough is not to exceed 3s. 6d. per 1000 cubic feet. The reserve fund is not to be increased, nor borrowed money to be converted into share capital. The rate of interest payable on consumers' deposits is reduced to 4 per cent.

The Thanet Gas Act empowers the Company to acquire additional lands by agreement. The capital is to be converted into 3½ per cent. stock, with £80,000 additional, and borrowing powers to the extent of one-third of the paid-up stock. Fifteen-candle gas is to be supplied. The charge for gas furnished to the public lamps is to be 5 per cent. less than that charged for the time being to any private consumer.

The Tottenham and Edmonton Act converts the existing capital of the Company into "A" 5 per cent. and "B" 3½ per cent. stocks, with a new issue of £30,000 of 4 per cent. preference capital. The loan capital is to be in the proportion of one-third of the stock. Fifteen-candle gas is to be supplied, under restrictions as to sulphur impurity. The Company may apply for electric lighting powers, and (if granted) carry out the same with their own capital.

#### THE WINTER INSTRUCTIONS OF THE GAS REFEREES.

THE "Notification" of the Metropolitan Gas Referees for the winter season was issued at the close of last week. It contains the usual intimation that the maximum amount of sulphur allowable in gas will be 22 grains per 100 cubic feet. Beyond this, the Instructions agree, in the main, with those issued in the spring, the chief portions of the text of which, with the appendices, were given in the "JOURNAL" at the time. The directions as to the mode of testing for pressure were those previously in force; but they have since been revised, and certain alterations made therein. They now stand as follows:—

Testings of pressure shall be made at such times and in such places as the controlling authority may from time to time appoint. In order to make this testing, the Gas Examiner shall unscrew the governor and burner of one of the ordinary public lamps, and shall attach in their stead a portable pressure-gauge.

The gauge to be used for this purpose consists of an ordinary pressure-gauge enclosed in a lantern, which also holds a candle for throwing light upon the tubes and scale. The difference of level of the water in the two limbs of the gauge is read by means of a sliding-scale, the zero of which is made to coincide with the top of the lower column of liquid.

The Gas Examiner having fixed the gauge gas-tight, and as nearly as possible vertical on the pipe of the lamp, and having opened the cocks of the lamp and gauge, shall read and at once record the pressure shown. From the observed pressure one-tenth of an inch is to be deducted to correct for the difference between the pressure of gas at the top of the lamp-column and that at which it is supplied to the basement of neighbouring houses.

The pressure prescribed in the Acts of the three Metropolitan Gas Companies is to be such as to balance from midnight to sunset a column of water not less than six-tenths of an inch in height, and to balance from sunset to midnight a column of water not less than one inch in height.

In Appendix L to the Instructions—"The Gas Referees' One-Twelfth of a Cubic Foot Measure"—some few alterations have been made in the directions as to proving the meters used in the various testings.

The regulations are to come into operation at each testing-place as soon as the prescribed apparatus has been provided by the Gas Company, and examined and certified by the Referees. Until then, the Instructions for the winter 1897-8 are to be in force at each testing-place, and the testings are to be continued as heretofore.

**Prevention of Rust on Metal Work.**—A paste composed of 125 parts of lard and 20 parts of camphor, melted together, with the addition of a little acid, is stated to be a good preventive of rust. The objects are dressed with the paste, which is removed after 24 hours.

#### THE SECOND ANNUAL CONVENTION OF THE LEAGUE OF AMERICAN MUNICIPALITIES.

LAST year we paid some attention to the First Convention of the League of American Municipalities, for the sake of the bearing of the proceedings of the convention upon contemporary questions of gas supply in the United States. It appears, from recent numbers of our American contemporary "Progressive Age," that this function has repeated itself during the first days of August this year, at Detroit, when a number of municipal magnates and officials "orated" to each other—apparently to their mutual gratification—upon a variety of subjects more or less connected with municipal government. The President of the congress was Mr. J. MacVicar, Mayor of Des Moines (Iowa); and the bulk of the membership, as at the first meeting, appears to have been composed of representatives of small communities. Still, it must be conceded that the interest of the population of a small town in such questions as the economic administration of gas supply is as great in proportion as that of large communities; while its manifestations are likely to be more practical and close to the facts.

At the first business session of the congress, Mr. James A. Lavery delivered an address on the "Relation of Municipalities to Organized Labour," in the course of which the speaker said some surprising things respecting the development of the municipal idea in other parts of the world. He informed his hearers that "the city of Birmingham, England, now owns and runs its street railways, gas-works, electric lighting plant, and water supply plant. It owns and operates a printing establishment and woolen (*sic*) mill. It runs its own pawnshops. In 1871, the city was the filthiest spot on earth. In that year municipal ownership began. To-day it is the cleanest and best governed city in the world." Truly, one must go from home to hear news. The speaker's object seems to have been to bespeak the favour of municipalities for Trade Unions. He was followed by Governor Pingree, of Michigan, who delivered himself of a somewhat superfluous argument designed to encourage extravagance in the American people, as a necessity for creating "business."

The next debate was upon the question whether municipal undertakings should be managed by boards, single commissioner, or council committees. A flood of talk was let loose upon this and kindred topics; and then Professor Bemis was allowed to descant upon the practical results of municipal administration of electric lighting undertakings. His statement was considerably involved; but he certainly did not make it appear that municipal electric lighting in the United States is cheaper than the same service in this country. Another speaker advocated the making of a charge by municipalities for "franchise rights;" and there was a vague discussion upon the cheapest way of converting private ownership of public undertakings into municipal proprietorship. Altogether, the proceedings were distinctly below the level of the previous year's transactions. The subject of gas supply was left out of the programme; and when the convention adjourned "without date," it must have been felt by those who had attended the meetings that the future of the United States would not be gravely prejudiced if the convention failed to meet again.

#### A COMPARISON OF THE HEFNER AND CARCEL LAMPS AS STANDARDS OF LIGHT.

THE International Electro-Technical Congress which was held at Geneva in 1896, adopted the Hefner lamp as the unit of light. There was perhaps no very serious objection to be urged to this action, especially as the Hefner unit enjoys a very wide recognition on the Continent. But the congress went further, and expressed the opinion that the Hefner unit of light might provisionally, for industrial needs, be regarded as equivalent to the light of one *bougie décimale*, or one-twentieth of Violle's platinum unit of light. A protest against making the Hefner unit thus dependent on so uncertain a standard as Violle's unit, was raised to no purpose by the German delegates to the congress. That the protest was well founded is, however, shown by researches undertaken by M. Laporte, of which the results were presented to the Société Internationale des Electriciens, and were recorded in the "Bulletin" of that body. Most of these results were given, from that source, in tabular form, in the "JOURNAL" for July 26 (p. 200). They have met with criticism from Dr. Hugo Krüss, in a recent number of the "Journal für Gasbeleuchtung;" and it may not, therefore, be inappropriate to refer at greater length to the methods pursued by M. Laporte, and to the more weighty conclusions which may be drawn from his results.

The carcel lamp is used almost solely in France; and it has hitherto been taken for granted in that country that its light is equal to 9·6 *bougies décimales*, while one Hefner unit is regarded as equal to 1·02 *bougies décimales*. The relation between the Hefner unit and the carcel, therefore, becomes: 1 Hefner unit = 0·106 carcel. M. Laporte obtained from the Imperial Physical-Technical Institute at Charlottenburg two incandescent electric lamps, which, under a current of given strength



and electromotive force, were certified to emit light equivalent to 10 and 16 Hefner units respectively. He compared these lamps working under the specified conditions with a carcel lamp, and found them equal to 0.92 and 1.51 carcels respectively. According to the ratio between the carcel and the Hefner unit quoted above, the lamps were, therefore, equivalent to only 8.7 and 14.2, instead of 10 and 16 Hefner units. It thus appeared that the assumption of the Geneva congress was quite unfounded, and of no service industrially. Either the light of the carcel lamp was not equal to 9.6 *bougies décimales*, or the Hefner unit was not equal to 1.02 *bougies décimales*, or both these ratios were wrong. As the *bougie décimale* is difficult of reproduction, M. Laporte next compared the lights of the carcel and Hefner lamps. He used as the standard of comparison an incandescent electric lamp of about 3.3-candle power. Five series of from ten to twenty readings were made with the Hefner lamp, and eleven series with the carcel lamp. The means of these readings were: Electric lamp = 0.341 carcel = 3.72 Hefner units, and consequently 1 carcel = 10.91 Hefner units, or 1 Hefner unit = 0.092 carcel. If we take the ratio between the English standard candle and the Hefner unit at the value found at the Imperial Physical-Technical Institute at Charlottenburg—viz., 1 English candle = 1.14 Hefner units\*—M. Laporte's observations give the carcel lamp an illuminating value of 9.57 English candles, or very close to the value found by several earlier observers. For instance, the Dutch Committee on Photometry in 1894 found that the carcel lamp gave a light of 9.631 English candles;† Mr. W. J. Dibdin in 1885 found its mean value to be 9.4 candles; while Mr. Sugg, as early as 1870, had ascribed to it a value of 9.6 candles.‡ In the year 1896, MM. Durand and Jigouzo made researches which showed that the Hefner unit was equivalent to 0.93 *bougie décimale*, or 0.096 carcel, which ratio gives the carcel a rather lower value than that found by M. Laporte.

Experiments were made by the last-named observer for the purpose of ascertaining if the two carcel lamps in his possession fulfilled the conditions prescribed by MM. Dumas and Regnault in 1842—viz., that the consumption of pure colza oil should be 42 grammes per hour, with a permissible deviation of 3 grammes more or less, for which correction is made on the assumption that the intensity of the light varies with the consumption of oil; that the wick protrudes 10 mm.; that the shoulder of the glass chimney is about 7 mm. above the wick; and that the height of the flame is 40 mm. M. Laporte's lamps consumed more than 45 grammes of oil per hour, until he reduced the length of the protruding portion of the wick to 7 to 8 mm., but maintained the distance between the shoulder of the chimney and the wick at 7 mm. He then found that the consumption kept constantly between 41 and 43 grammes; and he used the lamps under these conditions in his researches. He gave great attention to the ventilation of the testing-room; for he observed that, though it had a cubical content of about 2900 cubic feet, a gradual diminution both of the oil consumption and of the light occurred. The light diminished by 12 per cent., and the oil consumption by 4 per cent., in half an hour; but a thorough renewal of the air restored the original state. Vitiating of the atmosphere was not, however, found to have so marked an effect on the carcel lamps at the central testing-bureau in Paris, and at the gas-works at Baudy.

M. Laporte also made comparisons of the Hefner unit and the German standard paraffin candle. He observed the height of the candle-flame by means of Krüss's optical flame measurer. It varied between 49 mm. and 52 mm.; but within these limits the illuminating value changed in proportion to the height of the flame. It was found that 1 mm. height of flame corresponded to a change in illuminating power of 2 to 2½ per cent. By means of this ratio, M. Laporte referred all the results of his observations to a flame-height of 50 mm. He found that observations made on the same day gave concordant results, but that the results obtained on two separate days frequently differed by as much as 7 per cent. The mean of all his observations gave 1.19 Hefner units as the illuminating value of 1 standard German candle with a 50 mm. flame. In Germany, the paraffin candle has usually been regarded as being equivalent to 1.20 Hefner units.

**An American Gas Power Station.**—A recent issue of the "American Engineer" contained a description of a gas power station using Indiana natural gas, which can be bought for 3½d. per 1000 cubic feet. The installation in question is at Lafayette, and the cost of fuel is only 22 per cent. what it was before gas power was installed. There are three units, each consisting of a 125-horse power engine belted to a 60-kilowatt dynamo. Two are so far at work. The dynamos furnish current for 40 enclosed arc and 1000 incandescent lamps, as well as for a 50-horse power rotary transformer. The gas-engines are of the Westinghouse type, guaranteed to do 125-horse power with not more than 14 cubic feet of gas containing not fewer heat-units than Pittsburgh natural gas. Their cylinders are 13 inches in diameter and 14-inch stroke; their speed being 265 revolutions per minute. About one-twelfth of a penny per horse-power-hour will be found possible with gas at 3½d. per 1000 cubic feet. Indiana natural gas yields 1050 heat-units per cubic foot.

## THE ESTIMATION OF SULPHUR IN COAL AND COKE.

THE proportion of sulphur in coal is a matter of importance to the gas manager, but is of greater importance to the metallurgist. It is not, therefore, surprising to find that more attention is paid to the methods of estimating sulphur in coal and coke by metallurgical than by gas chemists. In place of the brief description of, or simple reference to, one method of estimating sulphur, which, by many writers on gas manufacture is deemed adequate treatment of the subject, we find exhaustive and critical monographs in the metallurgical journals. The manager of a large gas-works nowadays cares very little about the amount of sulphur in the coal which he carbonizes; for purification by bog oxide or Weldon mud is a very economical process. Consequently the methods of estimating sulphur in coal are not now closely studied by gas chemists. Moreover, when it is necessary to make such an estimation, time is seldom an important factor; and the old and reliable, though tedious, methods may be adopted. With the metallurgical chemist, the matter is otherwise. A coal is bought or rejected according to the result of the sulphur determination; and often the latter has to be carried out with considerable rapidity. Therefore we may expect to learn a good deal from metallurgists concerning the estimation of sulphur in coal and coke. If this estimation be not of very much value to the gas manager so far as the selection of coal for gas making is concerned, it should nevertheless help him to put a correct value on his coke. In fact, a few enlightened gas engineers do select coal for carbonization which contains but little sulphur—not in order to save the trouble and cost of the purification of the gas from sulphur compounds, but to produce a nearly non-sulphurous coke, which will realize a better price than ordinary gas coke. Unfortunately the method of carbonizing coal which prevails in gas-works is against the production of truly non-sulphurous coke, however good the coal from which it is obtained; and hence the majority of gas engineers are disposed to ignore the matter entirely. Probably between these extremes lies the path which the wise engineer will prefer to follow; and therefore a few comments, prompted by an article by Mr. G. L. Heath in "Industries and Iron," may be opportunely made on the methods of estimating sulphur in coal and coke.

It is essential that the coal or coke actually taken for the analysis be in a state of very fine powder. An agate mortar serves best for reducing small pieces of the material to this condition. The accuracy of the results depends to a very great extent on the fineness of the sample, especially when the simple fusion methods of determination are used. The old and reliable system of Nakamura is still employed by many eminent chemists; but it is slow, and needs much attention. The coal or coke is put in a platinum dish or crucible with about four times its weight of dry alkaline carbonates, mixed in their molecular proportions (13 parts of potassium carbonate to 10 parts of sodium carbonate). The dish is nearly covered, and gently warmed; and the heat applied is gradually increased until, at the expiration of about three hours, the dish is at bright redness. If the operation be hastened, vapours containing some of the sulphur will escape. On cooling, the mass is extracted with water, and the insoluble matter is filtered off. Usually a little bromine water is added to the filtrate—and the surplus bromine expelled by boiling—in order to oxidize completely the sulphur in it. Hydrochloric acid is then added, and the sulphate present is determined by precipitation with solution of barium chloride in the well-known manner.

A more rapid plan than Nakamura's is the fusion method, of which a good modification has been described by Blair.\* About 1 gramme of the coal or coke is mixed intimately with 10 grammes of dry sodium carbonate and 6 grammes of dry potassium nitrate, and transferred to a platinum dish or crucible. The crucible is then covered and heated. The heat is gradually increased until the mass is in a state of fusion, when it is run over the interior of the crucible, which is afterwards allowed to cool. The melt is extracted with hot water, and the extract filtered. Very frequently the filtrate would then be acidified, and the sulphate in it determined in the usual manner. Blair, however, recommends that the filtrate be acidified with hydrochloric acid, and evaporated to dryness, in order that dissolved silica may be rendered insoluble. The residue remaining after evaporation of the liquid is treated with acidified water, and the extract is filtered; the sulphate in the filtrate being determined in the usual manner. This evaporation of the filtrate of the aqueous solution of the melt makes the method slow; and to shorten the time occupied, Blair recommends that the filtrate be acidified, ammonia added in excess, and the liquid boiled while a stream of carbonic acid is passed through it. The silica, alumina, &c., are thereby precipitated, and are filtered off; and the filtrate is acidified, and the sulphate in it determined in the usual manner.

The fusion method of determination is condemned by Mr. Heath, because of the long time occupied in evaporating the filtrate from the melt to remove silica from the liquid in which the barium sulphate is precipitated. He considers the removal of the silica absolutely necessary in order that the results may

\* See "JOURNAL," Vol. LXII., p. 81. † *Ibid.*, Vol. LXIV., p. 1162.

‡ Vide "Practical Photometry," by W. J. Dibdin, p. 95.

\* "Analysis of Iron," third edition (1896), p. 284.



### Analyses of Coals.

| Description.                                                 | Locality.                                    | PERCENTAGE COMPOSITION,<br>IGNORING THE SULPHUR. |                                           |                  |       | PERCENTAGE OF SULPHUR.                                                 |                                                                                                    |                                                                          |  |
|--------------------------------------------------------------|----------------------------------------------|--------------------------------------------------|-------------------------------------------|------------------|-------|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|--|
|                                                              |                                              | Moisture<br>(at 105° C.).                        | Volatile<br>and<br>Combustible<br>Matter. | Fixed<br>Carbon. | Ash.  | By Hundeshagen's<br>Method, with<br>Bromine as the<br>Oxidizing Agent. | By Eschka's Method,<br>with Bromine (A) and<br>Hydrogen Peroxide<br>(B) as the Oxidizing<br>Agent. | By Fusion<br>with<br>Potassium<br>Nitrate<br>and<br>Sodium<br>Carbonate. |  |
| 1.—Bituminous, clean lump . . . .                            | Ohio, U.S.A. . . . .                         | 0·72                                             | 37·15                                     | 57·01            | 5·12  | 1·364                                                                  | (A) 1·375<br>(B) 1·372                                                                             | ..                                                                       |  |
| 2.—Do., fine slack. . . . .                                  | " " " " " " " "                              | 0·78                                             | 30·72                                     | 54·92            | 13·58 | 2·197                                                                  | 2·203                                                                                              | ..                                                                       |  |
| 3.—Anthracite, clean lump . . . .                            | Penna., U.S.A. . . . .                       | 2·47                                             | 3·00                                      | 88·80            | 5·73  | 0·551                                                                  | 0·529                                                                                              | ..                                                                       |  |
| 4.—Bituminous, clean lump . . . .                            | W. Va., U.S.A. . . . .                       | 0·62                                             | 31·28                                     | 62·67            | 6·03  | 1·068                                                                  | 1·063                                                                                              | ..                                                                       |  |
| 5.—Do., fine slack. . . . .                                  | " " " " " " " "                              | 0·75                                             | 29·64                                     | 62·75            | 6·86  | 1·635                                                                  | 1·637                                                                                              | ..                                                                       |  |
| 6.—Grey, soft friable . . . . .                              | Rhenish Prussia . . . .                      | 2·72                                             | 23·03                                     | 6·41             | 67·84 | 1·540                                                                  | 1·480                                                                                              | ..                                                                       |  |
| 7.—Bituminous, soft and a little shaly                       | Pleasant Hill, Iowa,<br>U.S.A. . . . .       | 1·26                                             | 43·72                                     | 45·65            | 9·37  | 4·99                                                                   | 4·95                                                                                               | 4·97                                                                     |  |
| 8.—Do., soft and weathered. . . . .                          | Pleasant Hill, Iowa,<br>U.S.A. . . . .       | 1·85                                             | 42·90                                     | 45·97            | 9·28  | 4·83                                                                   | 4·76                                                                                               | 4·89                                                                     |  |
| 9.—Black, jet, lustrous, vitreous . .                        | Spain or Bohemia . . .                       | 2·83                                             | 38·70                                     | 49·46            | 9·01  | 0·203                                                                  | 0·201                                                                                              | ..                                                                       |  |
| 10.—Kerosene shale, greyish brown,<br>woody pieces . . . . . | New South Wales. . .                         | 0·07                                             | 82·05                                     | 5·81             | 2·07  | 0·375                                                                  | 0·364                                                                                              | ..                                                                       |  |
| 11.—Carmel, greyish . . . . .                                | Hartley Vale, Blue<br>Mountains, N.S.W.. . . | 0·07                                             | 81·37                                     | 5·32             | 13·24 | 0·41                                                                   | 0·43                                                                                               | ..                                                                       |  |
| 12.—Lignite, brown lump . . . . .                            | Kosten, Bohemia . . .                        | 8·17                                             | 44·14                                     | 39·14            | 8·55  | 0·967                                                                  | 0·966                                                                                              | 0·923                                                                    |  |

be accurate; and he does not refer to Blair's scheme for avoiding the evaporation, and thus shortening the time spent on the determination. Hence his strictures of fusion methods *in toto* are not completely justified. The methods he prefers are the "sintering" or "ignition" processes, of which the best known is Eschka's. One gramme of the coal is mixed with a gramme of pure magnesium oxide and half a gramme of sodium carbonate; and the mixture is heated in a platinum dish (frequently stirred meanwhile). The heat is increased gradually, until at the end of fifteen minutes the bottom of the dish is at low redness. Ammonium nitrate is generally added during the ignition for the purpose of oxidizing the mass; but Mr. Heath prefers to add an oxidizing agent to the aqueous extract of the mass, and to boil the extract for five or ten minutes. The oxidizing agent he employs is saturated bromine water, of which about 15 c.c. are required. The extract after boiling is filtered, and the filter is well washed. The filtrate is then acidified, and the bromine driven off from it by boiling. The determination of the sulphate is then made in the usual manner. Hydrogen peroxide may be used in place of bromine water as an oxidizing agent; but the amount of sulphate in it must be first ascertained, and allowance made accordingly when computing the results. It is almost impossible to obtain hydrogen peroxide of a high degree of purity; and we quite agree with Mr. Heath that, in all such cases as that referred to, bromine water is the purest and safest oxidant.

A modification of Eschka's method, consisting merely in the substitution of potassium carbonate for sodium carbonate, has been proposed by Hundeshagen, who thought that sodium carbonate did not retain the whole of the organic sulphur in certain Bohemian brown coals. Mr. Heath investigated this point, and was unable to confirm Hundeshagen's view. The loss experienced by the latter, Mr. Heath is inclined to attribute to too rapid heating of the sodium carbonate mixture in a deep crucible. Mr. Heath prefers a shallow platinum dish for the operation. Several modifications of the above methods were tried in certain instances by Mr. Heath; but they appeared to have no sufficient advantage over the "fusion" or Eschka's system. He considers the ignition methods, such as Eschka's, far preferable to the fusion methods as rapid operations suitable for technical work. Precaution must be observed, however, when employing the ignition methods on samples of coal containing much iron pyrites or calcium sulphate, to boil the ignited residue with water for a longer time and to wash more thoroughly than is necessary in ordinary cases.

The above table gives the more important of the analytical results that were recorded by Mr. Heath. There are methods of estimating sulphur in coal in fairly extensive use to which Mr. Heath makes no reference. One that is often employed by colliery chemists consists in heating a mixture of the powdered coal with about twice its weight of pure caustic lime, in a porcelain crucible in a muffle furnace. The heating commences with the muffle at barely visible redness, and it is gradually increased to bright redness, at which it is maintained for about three hours. The residue when cold is extracted with water, to which bromine water is added to ensure thorough oxidation. After digestion for about twenty minutes, a slight excess of hydrochloric acid is added, and the whole is raised to the boiling-point to expel the surplus bromine. After filtration, the sulphate is determined in the filtrate in the usual manner. The lime used must be free from sulphur, or the amount of sulphur in it must be ascertained and allowed for. The method is convenient in that less attention is required than with many of the other methods : and the results are fairly reliable.

In all the methods in which the material is heated in an open dish or crucible, sulphur may be acquired by it from the gas-flame if gas is the fuel employed. Many analysts, including Mr. Heath, use a spirit lamp in place of a gas-flame for heating

the crucible or dish in their sulphur determinations. Blair, however, considers this a needless refinement, provided care be taken that none of the fused mass flows over to the exterior of the crucible, and thus comes into direct contact with the gas-flame.\* In laboratories where gas free from sulphuretted hydrogen, and containing only a few grains of sulphur compounds per 100 cubic feet is available, a gas-flame may certainly be used if ordinary care be exercised to avoid the licking of the material by the flame.

Attempts made to distinguish between the sulphur existing in the coal as sulphide, or as organically combined sulphur, and that present as sulphate, cannot be considered of much practical value. If the sulphur in the ash from a given quantity of coal is deducted from the total amount of sulphur in the same quantity of coal, the difference may fairly correctly be taken as the amount of sulphur existing as sulphide in that quantity of coal. The sulphur found in the ash is usually regarded as having existed in the coal as sulphate. If, however, the coal contains carbonates of the alkalies or of alkaline earths, these deductions will be incorrect.

**Institution of Civil Engineers.**—The meetings of the Institution will be resumed on Tuesday, the 1st prox., when the President, Mr. W. H. Preece, C.B., F.R.S., will deliver an address, and will afterwards distribute the medals awarded by the Council.

**The New Physical Laboratory at Manchester.**—The foundation stone of the new physical laboratory which is being built at Owens College, Manchester, was laid last Tuesday by Mr. Henry Simon, who has founded a German professorship in the college, and contributed liberally to the general funds. The laboratory has been designed by Professor Schuster.

**Arithmetical Chemistry.**—We have on previous occasions noticed the useful little book, bearing the above title, written by Mr. C. J. Woodward, B.Sc., Head of the Chemical Department of the Municipal Technical School, Birmingham. We have received from the publishers (Messrs. Simpkin, Marshall, Hamilton, Kent, and Co., Limited) a copy of the new edition, which contains additions in the form of laboratory hints and suggestions for experimental work as a basis for the lessons set. The author is careful to point out that experimental work alone is as useless as are mental exercises alone. His aim has been to induce students to think, and at the same time to find them something to think about. The latter object has been achieved; the former will be, by the use of the book.

**The Regenerative System of Gas Lighting.**—Notwithstanding the changes which have been witnessed of late years in systems of exterior lighting, it is interesting to find that regenerative gas-lamps are still largely employed, more especially for shop-fronts and railway stations. One type of lamp which has had signal success in these directions for some years is Fullford's wind-proof lamp, a new pattern of which is now rapidly making its way, under the auspices of the Lamp Manufacturing Company, Limited. It is of the dual form, and answers the purposes of illuminating and advertising. Two of the lamps are surrounded by one shade, which, having a good reflective surface, not only effectively lights the shop-front, but advantageously displays the written panes. With regard to the use of regenerative lamps for lighting railway stations, their value has, for some reason, been tardily recognized in England, though it has been appreciated in many parts of the Continent, where they have been successfully installed. Now, however, several of the English Companies are giving the Fullford windproof lamp an extended trial, notably the Great Eastern, the South Eastern, and the London and Brighton—the last-named Company having put up a considerable number at their London Bridge, Victoria, and Brighton Stations.

\* *Ibid.*, pp. 284-5.



## NOTES.

**The Benier Gas Producer and Engine.**

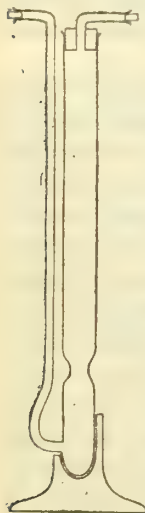
Prominence has been given by "Engineering" to a French type of combined gas generator and motor, called the "Benier" combination, which is being introduced into this country. For economical reasons, combinations of gas producers and engines have been more generally exploited in France than in the United Kingdom. In the Benier plant, the connection between the gas producer and engine is very close. The producer consists of a double cast-iron drum or cupola, lined with fire-brick. The fire-grate is a series of ribs cast on a rotating cylinder, in shape like a large cock-plug, which contains water. As the gas is generated from steam and air, it is drawn from the producer by a pump actuated by the engine. Thus it is supplied to the working cylinder at slightly below atmospheric pressure. Previously mixed with the regulated quantity of air, the fuel-gas charge makes one ignition for every revolution of the crank. This is effected by the following cycle: From the mixing chamber, the charge enters by a suitable valve into the working cylinder, just after the products of combustion of the previous charge have been expelled. The return stroke of the piston compresses the charge; but when the crank is just over the dead-point, it is electrically fired. Just before the piston reaches the end of its outward stroke, the exhaust ports are opened behind it, and the combustion gases are free to escape, which they do by the aid of a puff of fresh air sent after them. This scavenging cushion of fresh air is immediately followed by a fresh charge delivered by the pump. These engines are now being made up to 225-horse power; and one of the type is to be used in the next French Exhibition.

**Gas-Engines for Dock Pumping.**

Particulars have been published by the general engineering press of a new dry dock recently constructed at Limehouse, to the order of an old-established ship-repairing firm, Messrs. Fletcher, Son, and Fearnall. A high degree of interest attaches to civil and mechanical engineering work done for private firms, inasmuch as considerations of economy and efficiency may be supposed to weigh even more with them than with the public bodies and companies who usually require work of the kind. In the present example, an important feature is the employment of gas power to actuate the dock pumps. These are three in number, all centrifugal, two being 26-inch and the third 10-inch suction. The selection of gas-engines for this purpose was due in the first place to considerations of economy; gas showing, according to "Engineering," an economy as compared with steam of over 4 to 1 as a practical result. There will be two large Crossley engines, each of over 40 nominal horse power, but working up to 137 indicated horse power. This plant is designed to pump out the dock, when there is no vessel in it, in 2 hours; or in half an hour less if a big ship is in place. The second reason for the use of gas power for pumping out the dock is its availability at any moment. Ship-repairing has nearly always to be done in a hurry; and it is a most important advantage to be able to start the pumps the instant after a ship is docked, day or night, in order to commence work with the least possible delay. The advantage of gas over steam power in this regard is obvious. In the present plant the gas-engines will not only pump out the dock, but will also drive a dynamo for lighting the establishment and actuating machine tools.

**A Convenient Form of Drying-Tube for Gases.**

At the recent meeting of the British Association, Mr. A. G. Vernon Harcourt, F.R.S., described a convenient form of tube for drying gases. A common method of performing this operation is to pass them through a wash-bottle containing sulphuric acid, and then through a U-tube filled with fragments of pumice moistened with the same liquid. The number of corks and connections in this arrangement increases the chance of leakage. The U-tube must be supported in an upright position, both when in use and afterwards, so that the acid may not come in contact with the corks. If too much acid is poured in, the bend becomes blocked by a plug of liquid. There are no means of telling when the acid has become less efficient by dilution; nor is it easy to re-charge the tube with fresh acid. The form of drying-tube shown in the accompanying diagram avoids these defects. It is at once a wash-bottle and a drying-tube. It has one cork, and stands upright. The pumice can be well drenched with sulphuric acid; the excess draining down and filling the lower part (through which the gas bubbles) to a convenient height. Dilution announces itself; and the acid is easily renewed. The shape is that of a Gay-Lussac burette with a constriction about 2 inches from the bottom. A piece of pumice, large enough to block the constriction, is first dropped in, and the tube is filled to near the top with small fragments of pumice. In charging with acid, care is taken not to wet the upper part of the tube. Next day the level of the acid in the lower part of the tube is marked with a strip of gummed paper. The small side tube entering the large tube near the bottom, is the inlet for the gas.



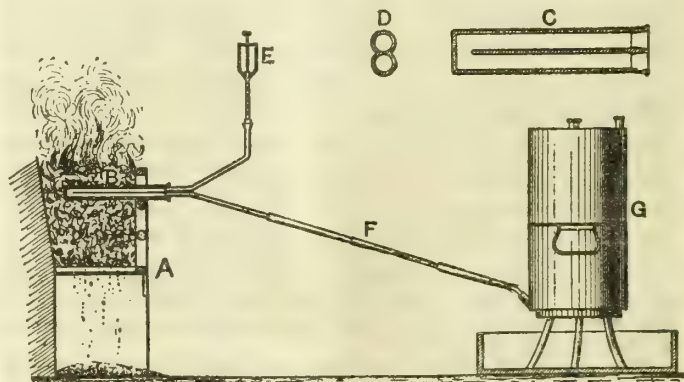
When the moisture absorbed has raised the level of the acid about 2mm. above the mark, the acid in the lower part is poured off through the small tube, and fresh acid is poured in through the pumice. The inlet and outlet tubes are made of the same height, so that a series of similar drying-tubes may readily be joined together.

**Chemical Notes on the Drying of Linseed Oil.**

Lippert, experimenting with oils and varnishes in order to observe the effect of the absorption of oxygen during the process of drying, finds that for boiled linseed oil the less drier used the better, whether the drier be a manganese resinate or lead oxide. After its application upon a surface, a coating of this kind increases in weight while drying. The higher the proportion of drier, the sooner is the maximum of absorption reached, and the sooner, also, the coating begins to lose weight again. Conversely, the smaller the proportion of the drier, the larger is the total weight of oxygen taken up. After four weeks, the varnish containing 2 per cent. of manganese had commenced to soften again, and stuck to the palm of the hand. The preparation containing only 0.15 per cent. of manganese was distinctly the best. With litharge also, the larger the proportion of drier the sooner the varnish attained its maximum weight, and the less total oxygen was absorbed. All the films were equally hard to the touch when they had reached their maximum weight; but after four weeks they softened again—this being more especially noticeable with the specimens containing much of the drier. Additions of litharge above  $2\frac{1}{2}$  per cent. made no appreciable difference to the absorbing power; while for practical work the proportion of the lead ought evidently to be kept lower than that permissible with the manganese salts. The reason why such coatings soften again after becoming dry is not yet known. It may be found to depend on the presence of an excess of drier, or of an unsuitable one. It does not prove adulteration with rosin or rosin oil. It may be due to oxidation of lead linoleate into a liquid turpentine-like body by prolonged exposure to the air. Science indicates no better way of testing a drying varnish than by the finger.

**The Earliest Water-Gas Plant.**

The earliest water-gas plant upon record was described in a paper bearing the somewhat enigmatical title "Factitious Airs," read by Sir Frederick Bramwell before the British Association in Bristol. This paper was a description of an enterprise started in Bristol in 1798 by Dr. Thomas Beddoes, styled the Pneumatic Institution, and having for its object the treatment of consumption and other diseases by the inhalation of various gases, then called "factitious airs." Some years previously, the firm of Boulton and Watt had made and sold apparatus for use in "pneumatic medicine." An illustrated pamphlet and price list of the apparatus, signed by James Watt, was published in 1796. From this pamphlet, the accompanying diagram is reproduced, slightly modified so as to show the arrangements for the production of the "hydro-carbonate" air. A is the furnace; B the fire-tube, shown enlarged at C, and in cross section at D; E is the arrangement for regulating the admission of water to the tube; and F is the connecting pipe, leading to the gasholder G.



The directions for preparing the hydro-carbonate air are: "Fill both cylinders of the fire-tube with small bits of charcoal, none of them exceeding a quarter of an inch cube; insert the water-pipe into the mouth of one of the cylinders, and the end-piece of the conducting pipe into the mouth of the other . . . . When the fire-tube has become perfectly red hot, admit water by the water-tube, pretty freely, in order to expel any noxious matter contained in the charcoal, and suffer any air which is thus produced to escape. When this part of the operation has been continued for five or ten minutes, restrain the water and bring the airholder into its place. With a proper degree of heat, and due exhibition of water, a 3-gallon airholder may be filled in half an hour without any steam passing into the conducting pipe." It is not recorded that anybody really died from this heroic treatment; but though the process was soon abandoned, and the Beddoes Institute closed, it had a most valuable bye-product in the person of Humphry Davy, who was the assistant in charge of the gas-generating apparatus, and went from it in 1801 to become assistant lecturer at the Royal Institution. The interest of Boulton and Watt in this earlier gas-making apparatus may have predisposed them to look favourably upon the pioneer work of Murdoch in coal gas manufacture.



TECHNICAL RECORD.

A COMPARISON OF DIFFERENT SYSTEMS OF LIGHTING.

The last volume of Transactions of the Société Technique du Gaz en France contains an important communication by M. Bouvier, of Lyons, giving the results of investigations carried out by him to ascertain the comparative value of different systems of lighting. The results are presented in two tables, which are preceded by explanatory matter justifying the data taken by the author as the basis of his calculations. We reproduce the tables, and give a few of the author's examples of the application of the proportional numbers. We will suppose that it is desired to compare incandescent gas with incandescent electric lighting. In order to obtain the light of 1 carcel (9·6 candles), it is necessary to consume 0·018 cubic metre (0·63 cubic foot) of gas or employ 0·0375 kilowatt-hours of electricity; or, in proportional figures, for a given number of carrels there would be

required 1 cubic metre (35·3 cubic feet) of gas as compared with 2·08 kilowatt-hours of electricity. Then what will be the price of one kilowatt-hour, with equal lighting, where gas is sold at 25 c. per cubic metre (5s. 8d. per 1000 cubic feet)? To equal 1 cubic metre of gas, 2·08 kilowatt-hours of electricity will be required; consequently, 1 kilowatt-hour will cost 12·02 c. If it is desired to compare a body of gas consumers of whom 25 per cent. use Auer burners and the rest flat-flame and argand burners, with another body using electricity in the proportions of 20 per cent. supplied to arc and the remainder to incandescent lamps, the latter will consume an average of 0·032 kilowatt-hour, and the former an average of 0·075 cubic metre for the production of 1 carcel. Assuming that the price of electric current is 1 fr. per kilowatt-hour, M. Bouvier shows that the gas consumers would not be paying more for the same quantity of light produced at 42 c. per cubic metre (9s. 6d. per 1000 cubic feet) than the electric current would cost at the above-named rate. In the case of a group of gas consumers of whom half use Auer burners, they would burn only about 50 litres (1·75 cubic feet) per carcel, and would get their light, with gas at

| System of Lighting.                                                                                                      | NORMAL DUTY. |                 |                  | Product of Each Unit in Carrels. | Consumption Required to Produce 1 Carcel. | Numbers Proportional to those in Column A. |       |       |       |       |      |       |       |          |       |  |
|--------------------------------------------------------------------------------------------------------------------------|--------------|-----------------|------------------|----------------------------------|-------------------------------------------|--------------------------------------------|-------|-------|-------|-------|------|-------|-------|----------|-------|--|
|                                                                                                                          | Consumption. | Lighting Value. |                  |                                  |                                           |                                            |       |       |       |       |      |       |       |          |       |  |
|                                                                                                                          |              | Carrels.        | Decimal Candles. |                                  |                                           |                                            |       |       |       |       |      |       |       |          |       |  |
| GAS—                                                                                                                     |              |                 |                  | 1 Cb. Mt. =                      | Cub. Met.                                 | (1)                                        | (2)   | (3)   | (4)   | (5)   | (6)  | (7)   | (8)   | (9 & 10) | (11)  |  |
| (1) Flat-flame burner . . .                                                                                              | 125 litres.  | 1'00            | ..               | 8'00                             | 0'125                                     | 1                                          | 1'400 | 1'330 | 6'94  | 1'660 | 2'50 | 3'787 | 3'330 | 12'50    | 16'66 |  |
| (2) Do., hollow-top (average)                                                                                            | ..           | ..              | ..               | 11'10                            | 0'090                                     | 0'720                                      | 1     | 0'960 | 5'00  | 1'200 | 1'80 | 2'730 | 2'400 | 9'00     | 12'00 |  |
| (3) Fishtail, hollow-top, and Wenham burners, used by consumers in the following proportions: 50, 30, and 20 per cent. . | 150 litres.  | 1'60            | 16               | 10'64                            | 0'094                                     | 0'752                                      | 1'040 | 1     | 5'22  | 1'250 | 1'84 | 2'850 | 2'500 | 9'40     | 12'50 |  |
| (4) Auer incandescent burners (average*) . . . . .                                                                       | ..           | ..              | ..               | 55'55                            | 0'018                                     | 0'144                                      | 0'200 | 0'192 | 1     | 0'240 | 0'36 | 0'545 | 0'480 | 1'80     | 2'40  |  |
| (5) Fishtail, hollow-top, Wenham burners, 75 per cent.; Auer burners, 25 per cent. . . . .                               | 75 litres.   | 1'00            | ..               | 13'33                            | 0'075                                     | 0'600                                      | 0'830 | 0'800 | 1'16  | 1     | 1'50 | 2'270 | 2'000 | 7'50     | 10'00 |  |
| Fishtail, hollow-top, and Wenham burners, 50 per cent.; Auer burners, 50 per cent. . . . .                               | ..           | ..              | ..               | 18'52                            | 0'054                                     |                                            |       |       |       |       |      |       |       |          |       |  |
| (6) Fishtail, hollow-top, and Wenham burners, 40 per cent.; Auer burners, 60 per cent. . . . .                           | 50 litres.   | 1'00            | ..               | 20'00                            | 0'050                                     | 0'400                                      | 0'555 | 0'532 | 2'76  | 0'660 | 1    | 1'510 | 1'330 | 5'00     | 6'60  |  |
| PETROLEUM—                                                                                                               |              |                 |                  | 1 Kilo =                         | Kilo.                                     |                                            |       |       |       |       |      |       |       |          |       |  |
| (7) M. Bouvier's trials in 1888 . . . . .                                                                                | 99 grms.     | 3'00            | ..               | 30'00                            | 0'033                                     | 0'264                                      | 0'366 | 0'350 | 1'83  | 0'440 | 0'66 | 1     | 0'880 | 3'30     | 4'40  |  |
| ELECTRICITY—                                                                                                             |              |                 |                  | 1 Kw.-hour =                     | Kw.-hours.                                |                                            |       |       |       |       |      |       |       |          |       |  |
| (8) Incandescent system— 3'75 watts per candle (average lamps and duration) . . . . .                                    | 60 wt.-hrs.  | 1'60            | 16               | 26'66                            | 0'0375                                    | 0'300                                      | 0'416 | 0'400 | 2'08  | 0'500 | 0'75 | 1'136 | 1     | 3'75     | 5'00  |  |
| 3'50 watts per candle (good lamps, first 250 hours) . . . . .                                                            | 56 "         | 1'60            | 16               | 28'57                            | 0'035                                     |                                            |       |       |       |       |      |       |       |          |       |  |
| (9) Arc system, lamps of 6 to 20 ampères . . . . .                                                                       | ..           | ..              | ..               | 100'00                           | 0'010                                     | 0'080                                      | 0'111 | 0'106 | 0'55  | 0'133 | 0'20 | 0'300 | 0'266 | 1        | 1'33  |  |
| GAS—                                                                                                                     |              |                 |                  | 1 Cb. Mt. =                      | Cub. Met.                                 |                                            |       |       |       |       |      |       |       |          |       |  |
| (10) Compressed . . . . .                                                                                                | 10 litres.   | 1'00            | ..               | 100'00                           | 0'010                                     | 0'080                                      | 0'111 | 0'106 | 0'55  | 0'133 | 0'20 | 0'300 | 0'266 | 1        | 1'33  |  |
| (11) Acetylene . . . . .                                                                                                 | 7 to 8 „     | 1'00            | ..               | 125'00                           | 0'0075                                    | 0'060                                      | 0'083 | 0'081 | 0'416 | 0'100 | 0'15 | 0'227 | 0'200 | 0'75     | 1     |  |

\* The burner No. 3, introduced at the end of last year, gives a result 27 per cent. higher than the average here shown.

| System of Lighting.                                                                                                                                                  | Unit Price.             | Consumption (A) and Cost (B) per Carcel-Hour. |          | Numbers Proportional to those in Column B. |       |       |         |      |       |       |       |        |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------------------------------------------|----------|--------------------------------------------|-------|-------|---------|------|-------|-------|-------|--------|--|
|                                                                                                                                                                      |                         | (A)                                           | (B)      | (1)                                        | (2)   | (3)   | (4 & 5) | (6)  | (7)   | (8)   | (9)   | (10)   |  |
| ELECTRICITY—                                                                                                                                                         |                         |                                               |          |                                            |       |       |         |      |       |       |       |        |  |
| (1) Incandescent lamps using 3'75 watts per decimal candle, excluding renewals . . .                                                                                 | 90 c. per kilowatt-hour | 37'5 wt.-hrs.                                 | 3'375 c. | 1                                          | 1'35  | 1'875 | 2'250   | 2'53 | 3'375 | 3'746 | 9'375 | 16'875 |  |
| GAS—                                                                                                                                                                 |                         |                                               |          |                                            |       |       |         |      |       |       |       |        |  |
| (2) Flat-flame burners. . .                                                                                                                                          | 20 c. per cubic metre   | 125'0 litres                                  | 2'500    | 0'747                                      | 1     | 1'388 | 1'666   | 1'88 | 2'50  | 2'770 | 6'944 | 12'50  |  |
| (3) Argand burners. . .                                                                                                                                              | " "                     | 90'0 "                                        | 1'800    | 0'533                                      | 0'72  | 1     | 1'200   | 1'35 | 1'80  | 2'000 | 5'000 | 9'00   |  |
| (4) Various burners used by consumers in the following proportions: Flat-flame, 37'5 per cent.; argand, 22'5 per cent.; Wenham, 15 per cent.; Auer, 25 per cent. . . | " "                     | 75'0 "                                        | 1'500    | 0'444                                      | 0'60  | 0'833 | 1       | 1'13 | 1'50  | 1'666 | 4'166 | 7'50   |  |
| ACETYLENE—                                                                                                                                                           |                         |                                               |          |                                            |       |       |         |      |       |       |       |        |  |
| (5) Gas produced with carbide at 60 c. per kilo. . .                                                                                                                 | 2 frs. per cubic metre  | 7'5 "                                         | 1'500    | 0'444                                      | 0'60  | 0'833 | 1       | 1'13 | 1'50  | 1'666 | 4'166 | 7'50   |  |
| PETROLEUM—                                                                                                                                                           |                         |                                               |          |                                            |       |       |         |      |       |       |       |        |  |
| (6) Oil of average quality . . .                                                                                                                                     | 40 c. per kilogramme    | 33 grammes                                    | 1'330    | 0'390                                      | 0'53  | 0'730 | 0'880   | 1    | 1'33  | 1'460 | 3'660 | 6'60   |  |
| GAS—                                                                                                                                                                 |                         |                                               |          |                                            |       |       |         |      |       |       |       |        |  |
| (7) Present (1898) consumers, using 60 per cent. of Auer burners of recent types . . .                                                                               | 20 c. per cubic metre   | 50 litres                                     | 1'000    | 0'296                                      | 0'40  | 0'555 | 0'666   | 0'75 | 1     | 1'110 | 2'777 | 5'00   |  |
| ELECTRICITY—                                                                                                                                                         |                         |                                               |          |                                            |       |       |         |      |       |       |       |        |  |
| (8) Arcs of 6 to 10 ampères . . .                                                                                                                                    | 90 c. per kilowatt-hour | 10 wt.-hrs.                                   | 0'900    | 0'266                                      | 0'36  | 0'500 | 0'600   | 0'67 | 0'90  | 1     | 2'500 | 4'50   |  |
| GAS—                                                                                                                                                                 |                         |                                               |          |                                            |       |       |         |      |       |       |       |        |  |
| (9) Auer burners, consuming, on an average, 18 litres of gas per carcel, excluding renewal of mantles . . .                                                          | 20 c. per cubic metre   | 18 litres                                     | 0'360    | 0'1066                                     | 0'144 | 0'200 | 0'240   | 0'27 | 0'36  | 0'400 | 1     | 1'80   |  |
| (10) Auer burners with compressed gas, excluding cost of compression . . .                                                                                           | " "                     | 10 "                                          | 0'200    | 0'059                                      | 0'08  | 0'111 | 0'133   | 0'15 | 0'20  | 0'220 | 0'555 | 1      |  |



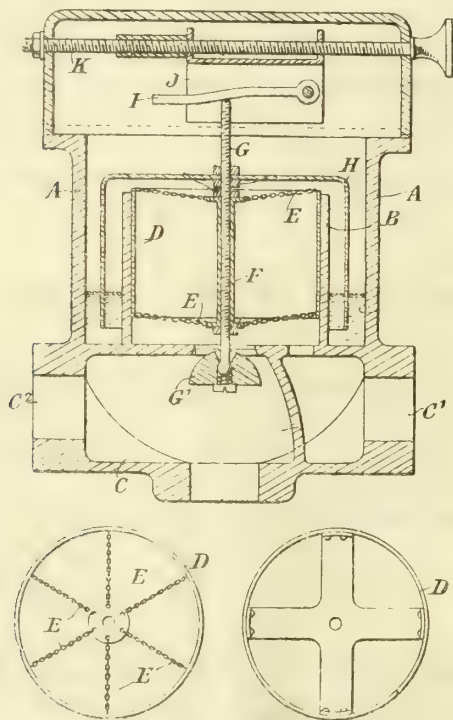
60 c. or even 64 c. per cubic metre (13s. 6d. or 14s. 6d. per 1000 cubic feet), at about the same cost as electricity at 1 fr. per kilowatt-hour—deducting renewal of mantles and maintenance of lamps. In his second table, M. Bouvier makes a comparison of the systems of lighting in use in Lyons, employing the rates of consumption contained in the first table. The price of electric current in the city is 1 fr. per kilowatt-hour; but in view of a reduction in the near future, the author took 90 c. The price of carbide of calcium is 60 c. per kilogramme retail, or 55 c. by taking 100 kilos. But here again a diminution in price is expected. According to Herr Bunte, acetylene cost, in the spring of 1897, 1 fr. 55 c. per cubic metre in Berlin; making the price of carbide 47 c. per kilo. Assuming that a system of lighting with Auer burners, as in example No. 9 in the table, costs 100 frs., what will be the cost of the same quantity of light obtained by the use of incandescent electric lamps? As the proportional figures for these two illuminants are 1 and 9'375, M. Bouvier shows that it would be necessary to spend 937 frs. 50 c.

## REGISTER OF PATENTS.

**Service or Meter Governors.**—Farmer, D. J. & S., of Elizabeth, N.J., U.S.A. No. 23,062; Oct. 7, 1897.

This invention relates to a gas-governor having inside a valve supported by radially extended chains connected to the stem; and it works without weights on the float to curtail the pressure.

The casing of the governor contains a tank A, with a cylindrical compartment B extended up from the bottom, where there is a valve-seat and an outlet opening. Below the casing is a compartment C for receiving the gas. This compartment is made with a wall separating the outlet C<sup>1</sup> from the inlets C<sup>2</sup> and C<sup>3</sup>. Mounted within B is a cylinder D, which has



a series of radial flexible arms E projecting from it. These arms are connected to flanges of a collar F, surrounding the valve-stem G, which is screw-threaded throughout its entire length for engaging with nuts adapted to secure the collar F to the stem. Attached also to the stem G is a float H; and connected to the lower end of the stem is a semispherical valve G<sup>1</sup>, with a socket for engagement with a ball forming part of the lower end of the valve-stem, and kept in contact with it, so that the valve is seated securely even though the governor may be slightly out of plumb. Resting upon the upper end of the valve-stem is a loosely pivoted swinging weight I, mounted on the spindle of an adjustable carriage J, susceptible of lateral adjustment by means of a screw K.

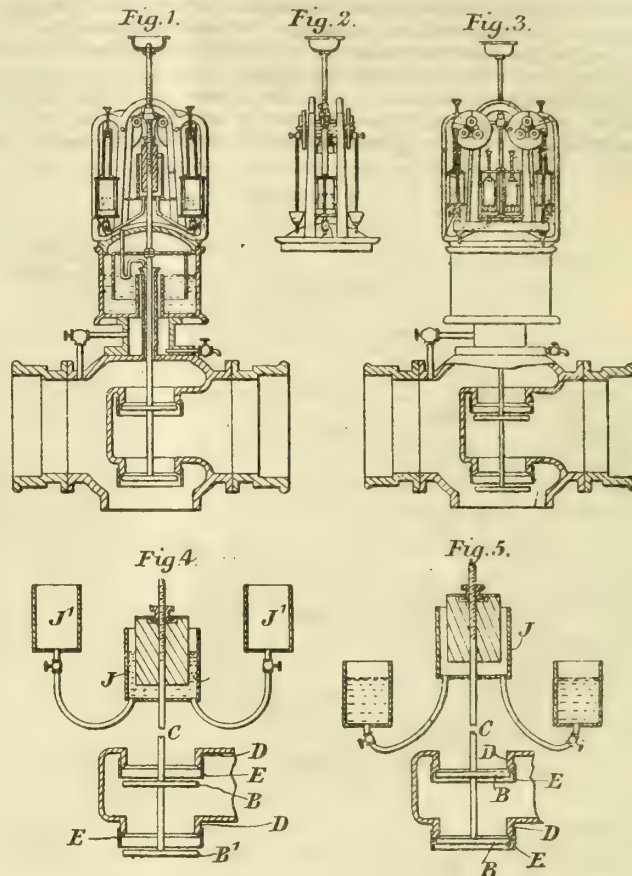
The gas enters at either C<sup>2</sup> or C<sup>3</sup>, and thence passes up through the opening above the cone G<sup>1</sup>, and through the outlet C<sup>1</sup>. When the pressure is too great, the float is forced up to partially close the valve, whereby the pressure is reduced—the reservoir A being, of course, supplied with a filling of any suitable liquid for preventing the gas from escaping around the float. The object of the swinging weight I is to gauge the amount of pressure required to lift the float; and the weight can be adjusted for increasing or decreasing the leverage by turning the screw K in either a right or left hand direction.

**Differential Automatic Gas-Governors.**—Farmer, D. J. & S., of Elizabeth, N.J., U.S.A. No. 23,063; Oct. 7, 1897.

In this governor "prompt automatic change of pressure" is said to be brought about, partly by means of an adjustable plunger located within the fluid receptacle, and partly by means of a compound valve-seat.

Fig. 1 is a vertical sectional elevation of the governor. Fig. 2 is an end elevation of the upper portion of it. Fig. 3 is a side elevation of the governor, illustrating a slightly modified form. Fig. 4 is a diagram (in section) of the valve and the fluid receptacles, illustrating the relative position of the parts when the valve is open; and fig. 5 is a similar view with the valve closed.

The body or base of the governor comprises a preferably globe-shaped casing, in which is the "compound valve-seat" forming part of the invention. The valve consists of two discs B and B<sup>1</sup>, mounted upon a vertical rod C, and operated within downwardly projecting seats D, which form an integral part of the casing. Surrounding these seats are sliding collars E, adapted for adjustment vertically upon the seats for the purpose of controlling the gas supply by the valves being caused to travel downwardly to variable distances before the maximum supply is allowed to pass into the mains from the source of supply. Projecting up centrally from the upper wall of the casing is a tube through which the valve-rod C passes; and upon it is mounted a water-tank. Securely fitted to the upper edge of the tank is a dome or cover; and the operative mechanism of the governor is mounted thereon.



This mechanism comprises, primarily, fluid receptacles J and J<sup>1</sup> (designated "weight vessels"), adapted to receive the mercury for operating the device. Of the weight vessels, the centre one J is mounted upon the valve-stem C; and the vessels J<sup>1</sup> are suspended from cross-rods forming part of an arrangement of oscillating wheels—all located between uprights securely mounted on the dome of the tank. The vessels J<sup>1</sup> are preferably closed at each end; and they are suspended from the cross-rods by means of slotted hangers and adjusting screws threaded through the head portions of the hangers and bearing against the cross-rods, for the purpose of vertically adjusting them. The vessel J is open at its upper end, and has an adjustable plunger in it. The vessels J and J<sup>1</sup> are connected to each other by flexible tubes, with stopcocks for controlling the flow of fluid when desirable. The upper end of the valve-stem C is provided with a cup-shaped receptacle, adapted to receive weights for adjusting the apparatus. Weight receptacles or troughs are also suspended from the wheels, for a similar purpose.

In fig. 1 the governor is shown in position for day service, or when the minimum of gas is being passed through the valves to the street. It will be observed that the side fluid vessels are below the centre one. They contain all the fluid, and sustain the valves B and B<sup>1</sup> in their upward position, whereby a minimum quantity of gas is supplied to the mains. When the consumption increases, the pressure is reduced in the mains, which causes the float to descend by gravity. The weight fluid in the vessels J<sup>1</sup> then begins to flow to the vessel J, and the gradual change of weight causes the valves to descend, whereby an increased volume of gas is allowed to pass into the mains and the pressure is increased. The collars E, surrounding the valve-seats D, may be set so as to cause the valves to drop slowly for either a short or long distance before giving out the full volume or maximum supply of gas, whereby full weight pressure is not supplied to the mains until the valves are below the lower edges of the collars, as shown in fig. 4, and all the weight fluid is transferred from the vessels J<sup>1</sup> to the vessel J. The valve is then supplied with its maximum weight; and the full maximum pressure is delivered to the mains. When the consumption is diminished, the float begins to rise by the back-pressure in the mains, and the upward movement of the valves will be continued until the maximum pressure in them causes the valves to assume the position illustrated in fig. 5, whereby the minimum supply of gas is permitted to enter the mains, and the weight fluid is gradually transferred back to the vessels J<sup>1</sup>.

**Manufacturing Acetylene Gas.**—Sigurdsson, O. V., of Hammersmith. No. 23,351; Oct. 11, 1897.

In this acetylene gas-producing apparatus, the patentee proposes: "The combination with the gas-generating chamber of a calcium carbide supply chamber or hopper fixed to the head thereof; a feeding chamber at the base of the hopper communicating with the latter and with the gas-generating chamber; and a valve within such feeding chamber so



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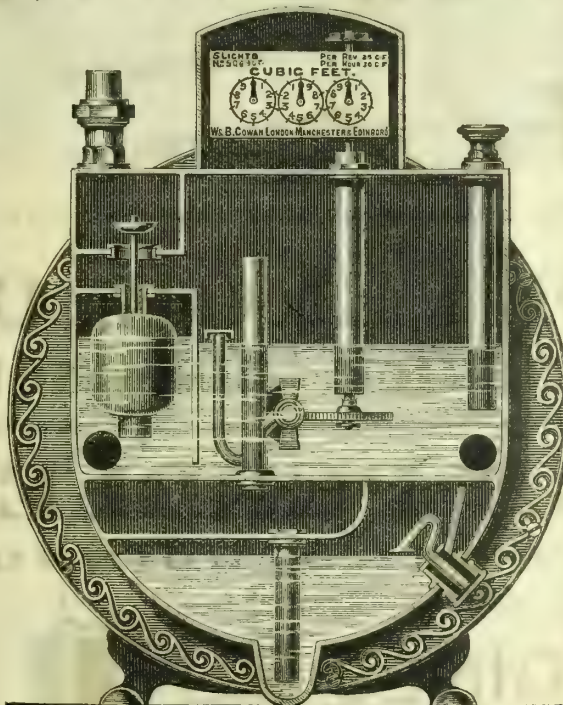
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undertaking in England, who informs Mr. Little: "I have been all over the United States, and have seen no elevators equal in design or durability to your own; and I have come to the conclusion the Americans surpass us only in electric light work." This Engineer-in-Chief supports his belief in the Smethwick manufactures by recommending his Directors to send the order for one of the largest installations of conveyors and elevators ever placed in this country to the New Conveyor Company, Limited.

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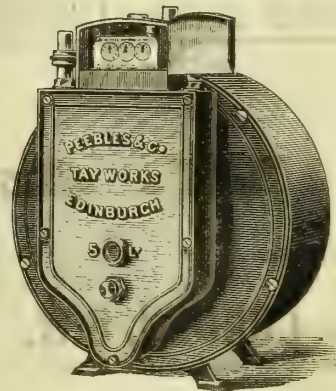
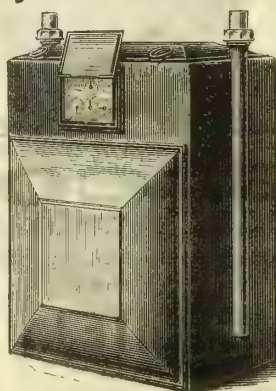
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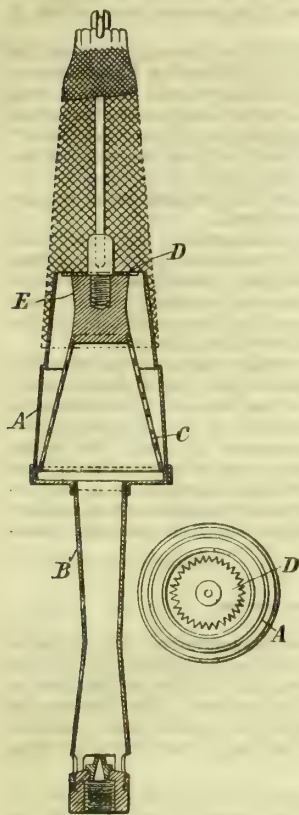




formed as, when slightly open to the gas-generating chamber, it shall also be open to the calcium carbide supply hopper—such valve being operated by a forked lever on its spindle and a stud carried by the gasometer."

**Incandescence Gas-Burners.**—Imray, J.; a communication from O. Kern, of Paris. No. 26,064; Nov. 9, 1897.

In patent No. 294 of 1897 [see "JOURNAL" for May 10 last, p. 1062]



was described a form of incandescence gas-burner, the tube of which, instead of being of uniform diameter throughout its height, gently tapers to a smaller diameter at a constricted part about the middle of its height, and then gently tapers from the constricted part to a larger diameter at the top. According to the present invention, a tube of this kind is surmounted by a burner comprising an outer casing, an inner perforated shell, a boss thereon, and a disc having a serrated edge.

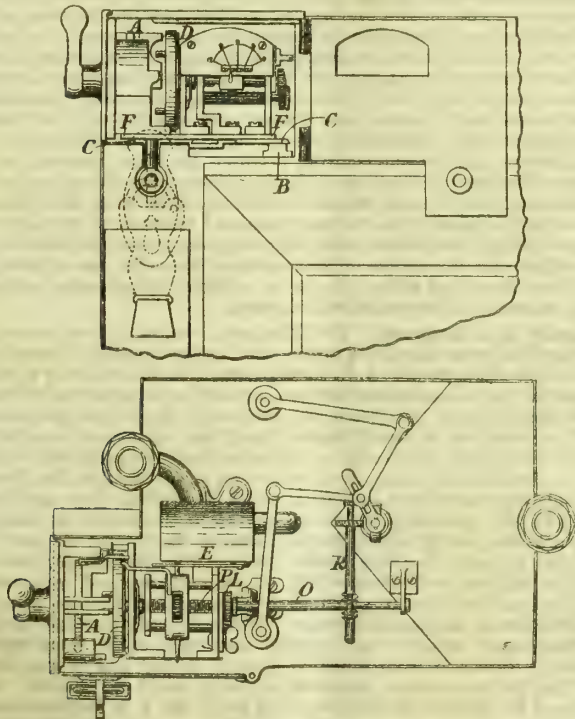
As shown, the taper casing A has a mean diameter about twice that of the upper mouth of the tube B; the height of the casing being about three-fourths of the total height of the tube. Within the casing is a taper shell C of thin metal (preferably copper), perforated with narrow and approximately vertical slits. The shell at its top has a diameter about equal to that of the upper mouth of the tube B. On the top of the shell is a boss E, on which is fixed a disc D, notched all round its circumference so that it presents the appearance of a toothed wheel—the teeth nearly covering the annular interval between the top of the boss E and the mouth of the casing A.

The air and gas admitted at the bottom of the tube B are thoroughly mixed as they ascend the tube and casing; and the mixture issuing through the perforated shell C, and then through the intervals between the teeth of the disc, and the annular

space around them, when ignited "gives a flame having great intensity of heat, which, playing on a refractory mantle, will heat it to brilliant incandescence."

**Coin-Freed Gas-Meters.**—Nasmith, J., and Mercer, A., of Manchester. No. 2662; Feb. 2, 1898.

The object of this invention is to permit of the prepayment attachment being removed without any disturbance of the meter or of its case; so that it can be adjusted or corrected on the consumer's premises. The arrangement is described as applying to a meter such as that referred to in patents No. 2626 of 1891 and No. 387 of 1894; and the illustrations show a plan of the upper part of a dry meter with the prepayment mechanism in position, and a front view of part of the meter.



On top of the meter-case is fixed a plate B, having three projections formed on it, and bored and tapped for the reception of screws. To the plate is screwed a base-plate C; and to the latter is attached the valve-box E by a screw. The box is divided into two compartments by a transverse diaphragm, as described in the 1891 patent; the valve-seating surrounding an orifice in the diaphragm being attached to it. Inlet and outlet pipes are connected to the upper and lower compartments of the

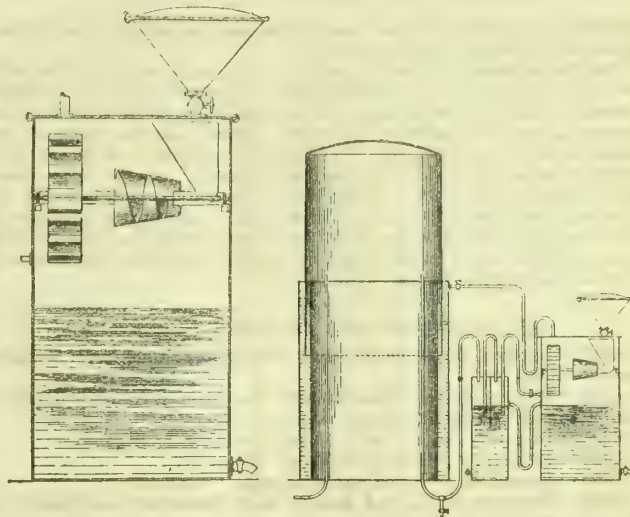
valve-box, and to the measuring portion of the meter. The valve-box is closed by a cover soldered in position. The valve is suspended (as described in the patent of 1891) on the end of a lever fixed on a spindle passing through the stuffing-box in the side of the valve-box, and connected with the link by which the position of the valve is controlled.

The prepayment mechanism is substantially similar to that described in the earlier patents; but some modifications have been made in its construction. For instance, the disc D, which is operated by the penny when held in the coin-receiver A, is now fixed on the screw spindle P, instead of on a separate spindle connected to the screw by gearing. To the underside of the frame F is fixed a projecting piece or bracket, in which is a threaded eye; and the front of the meter-casing is cut away to permit the easy passage of the eye when the prepayment mechanism is being withdrawn or placed in position. When the mechanism is in its working position, the door is closed; and the shank of the staple is screwed into the eye and tightened up.

For altering the change-wheel mechanism, there is a wheel mounted on the end of the long pinion, and driven from the pinion L; the carrier being borne in a quadrant, which can be set as desired. The spindle O has fixed on its inner end the pinion L, and is actuated from the spindle R, by means of which the index is driven. When the mechanism is withdrawn, the spindle O is held in position by brackets fixed respectively to the plate C and the meter-case. The change-wheel can be altered as desired, and the carrier again put into gear with it, while the prepayment mechanism is withdrawn; but when it is restored to its working position, the wheels easily fall into gear. The wheel L is fixed on O, and, gearing with the carrier wheel, thus rotates the pinion at a speed proportionate to the speed of O and the ratio of the two wheels.

**Producing Acetylene Gas.**—Strode, W. W., and White, G. H., of Osnaburgh Street, N.W. No. 11,161; May 16, 1898.

In carrying out this invention, a wheel is provided so formed (as shown) that it may be turned by water. It is operatively connected to a carbide-feeding device so constructed that it conveys the carbide in lumps or powder, without any tendency to become clogged or stopped. The device consists of a hollow rotatable vessel or chamber, preferably cone-shaped, part of which is divided internally into a spiral passage. The carbide is introduced into the vessel from a hopper or other receptacle, the end of which projects some little distance into the smaller end of the cone, in order that the carbide may, as far as possible, be kept away from the junction of the cone and hopper (at which point it would cause considerable friction). The conical shape of the vessel, the patentees remark, also contributes to this end. The vessel is revolved by the water-wheel; and the carbide slowly passes along the spiral passage, until it drops out into water below it.



The apparatus is preferably mounted on the upper portion of a vessel, the lower part of which serves for holding the water into which the carbide drops. The water operating the wheel falls into this vessel, and thus tends to replace the water absorbed by the carbide.

The gas is led away, by preference, to a holder similar to that described in patent No. 6658 of 1897 (see "JOURNAL" for March 22 last, p. 649); the water displaced by the holder being used to operate the wheel. Thus "the quantity of water, and the quantity of carbide delivered by its means, will be proportional to the displacement of the holder, which in its turn depends upon the amount of gas consumed."

The receptacle for the carbide is preferably made in two portions, one inside and the other outside the vessel already described. The two sections communicate with each other; but they are so arranged that, upon opening the outer one for recharging or other purposes, communication between the two parts is cut off. This is so as to prevent access of air to the vessel containing the gas, and thus obviate danger of gas escaping from the vessel.

**Using Calcium Carbide for Generating Acetylene.**—Dillberg, G., of Sydney, New South Wales. No. 15,214; July 11, 1898.

This invention, says the patentee, is designed to obviate the necessity of employing any mechanical devices in the generation of acetylene from calcium carbide, and, says the patentee, "to minimize to almost prohibition" the choking of any passage or burner through which the acetylene has to pass before being combusted.

To accomplish this object, he proposes to employ an envelope of some porous material—such as canvas, calico, wire gauze, or the like—shaped as a bag, cylinder, or otherwise, as may be desired, in which carbide may be placed. Thus enclosed the envelope is immersed in water, which penetrates into the interior of the envelope, acts upon the carbide, and evolves acetylene. "The bubbles thus formed naturally endeavour to rise to the surface of the water; but by this method they encounter the

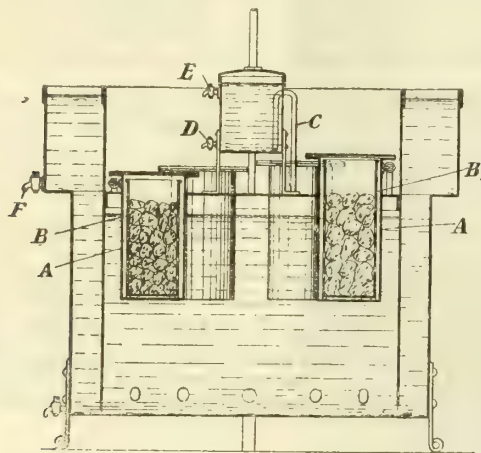


resistance of the porous material confining the carbide. Thus obstructed their filmy coating bursts, and liberates the gas, which is then permitted to pass through the pores into water where it rises to, and above, the surface in a highly purified condition, while the film with which the bubble was coated is retained in the envelope, and the surplus carbon is retained in the water." By this means it is claimed that the gas reaches the burners in a pure state; thereby prolonging their lives very considerably, while the offensive odour of the gas is greatly minimized.

**Acetylene Gas-Generator.**—Dant, H., of Nuremberg, Germany. No. 16,090; July 23, 1898.

The patentee employs a reservoir arranged in, and fastened to, the bottom of a cistern, and closed at the top by a cap; the lower part being provided with holes allowing water to pass to the interior from the cistern. In the cap are a series of air-tight cylinders A, which contain calcium carbide vessels B. The cylinders are furnished with cocks serving for the inlet of water and the outlet of gas; and each one differs from the others in that they are at various heights or points above the water-level. By this arrangement, one cylinder comes in operation at the time when the lower-lying one has been flooded and has finished its operation—i.e., when all its carbide is converted into gas and is submerged.

In the middle of the cap is a cleaner or cooler C, communicating with the main reservoir by a syphon-tube, and having two cocks, D E, of



which the former serves for the water-outlet and the latter for controlling the level of the water in the cleaner.

When the apparatus is not in operation, the main vessel is filled with water up to the cock F; the carbide cells are charged; and the cylinders A closed. Water is allowed to pass in until all the carbide cylinders are submerged, and the pressure drives the water into the lowest-lying cylinder, and gas is generated. When the development of gas is proceeding, it forces the water into the main reservoir, whence it is forced into the cleaner or cooler C. When the contents of the first cylinder are completely converted into gas, it is filled with water by the pressure in the cistern; and after this the water ascends to the cock of the cylinder lying next higher than the first one, in order to cause the generation of gas in it, and so on to the last cylinder.

#### APPLICATIONS FOR LETTERS PATENT.

- 20,317.—LOUDEN, W., "Boiling and grilling attachments for cooking ranges." Sept. 26.
- 20,342.—RICARIS, C. DE, "Manufacture of a carburet compound and of an inflammable gas therefrom and apparatus therefor." Sept. 26.
- 20,430.—DILLBERG, G., "Acetylene gas generator." Sept. 27.
- 20,451.—DYMOND, J., "Gas-producers." Sept. 27.
- 20,453.—BOWER, G., "Regenerative lamps." Sept. 27.
- 20,468.—THWAITE, B. H., and ALLEN, H., "Generating acetylene gas from calcic carbide." Sept. 28.
- 20,488.—WHITE, J., "Simplicity atmospheric gas-making machine." Sept. 28.
- 20,524.—MILLS, B. J. B., "Improvements in means for lighting incandescent and other gas-burners provided or not with chimneys." A communication from P. Bardot. Sept. 28.
- 20,541.—POERSCHMANN, F. B., and SCHNEIDER, H., "Acetylene generators." Sept. 28.
- 20,580.—WEST, J., "Conveying coke and other materials." Sept. 29.
- 20,605.—CHANDLER, S., jr., & J., "Acetylene gas-lamps." Sept. 29.
- 20,626.—CREES, G. W. B., "Generator of acetylene." Sept. 30.
- 20,646.—ABELES, R., "Carbide and acetylene gas apparatus." Sept. 30.
- 20,700.—POTTER, W. G., "Valves applicable to gas, steam, and water service." Oct. 1.
- 20,722.—COLOHAN, J. F., "Acetylene or other gas-lamps." Oct. 1.
- 20,740.—THOMPSON, W. P., "Incandescent mantles." A communication from O. Lenz. Oct. 1.
- 20,750.—POST, W., "Controlling distant gas-burners." Oct. 1.
- 20,756.—SCHULTZ, K., "Incandescent burners or lamps." Oct. 1.

**Gas "Boycotted" at Barcelona.**—According to a telegram received through Reuter's agency, the shops of Barcelona are lighted by other illuminants than gas, owing to a dispute between the consumers and the Gas Company, which has reached an acute stage.

**Reductions in Price.**—The Southwold Gas Company reduced the price of gas, as from the 1st inst., from 5s. 10d. to 5s. per 1000 cubic feet. The Sleaford Gas Company, Limited, announce that, as from the quarter commencing Jan. 1, 1899, the price of gas will be reduced from 3s. 9d. to 3s. 4d. net per 1000 cubic feet, and that all discounts will be abolished. The Lighting Committee reported at the last meeting of the Higham Ferrers Town Council that the Gas Company had reduced the price of gas to 2s. 8d. per 1000 cubic feet, which was 5d. less than last year.

## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### The Origin of Gas Associations.

SIR,—Your "Notes from Scotland," in this week's "JOURNAL," have drawn my attention to Mr. Myers's letter in your previous issue, which I had not before observed.

I was taken quite unawares when asked by the Secretary during the progress of the dinner at Duns to propose "The Waverley Association of Gas Managers." During the short time which elapsed before I was called upon by the Chairman, it occurred to me as being most appropriate to the toast to make reference to the unique position of the "Waverley" as being the pioneer Association. The story told on the spur of the moment was frank and open—just as it stood out in bold relief as imprinted on my memory "in life's young day," all too familiar to require any preparation on my part for its correct rehearsal.

Dates are at all times difficult things to remember; but, though the exact date is obliterated from my memory, I remember quite clearly that it was in the season of the long days. After the meeting and dinner in the Queen's Head Hotel, Kelso, Mr. Clazy, the newly-elected President, took the company (along with their wives) around the town and through the grounds of Floors Castle on a beautiful summerlike afternoon.

The late Mr. Robson, of Selkirk, who formally convened the meeting, may have been right or wrong as to the precise date; but of the fact of my promptly communicating the formation of the Waverley Association to my friend Mr. Mackenzie, prior to the formation of the Association Mr. Myers refers to, there is in my mind no manner of doubt. Nor is this version of the origin in any way inconsistent with the story of Mr. Myers, which quite fits in alike with the subject of their conversation at the preliminary meeting in Cupar, and with the course pursued in the formation of this second Association on the lines which had been previously communicated to Mr. Mackenzie.

JAMES C. ADAMSON.

Airdrie, Oct. 8, 1898.

**Coke Manufacture by Coke-Ovens in Lancashire.**—The Duke of Bridgewater's Trustees are now expending between £30,000 and £40,000 in establishing at Greenhey, near Bolton, plant for the manufacture of coke and residual products by means of coke-ovens. The Trustees are having put down a battery of 70 ovens; and it is expected that, when the new industry is fully established, it will find employment for close upon 200 workpeople.

**Unaccounted-for Gas at Darlington.**—The Gas Engineer of the Darlington Corporation (Mr. T. Smith) was recently requested by his Committee to report upon the question of unaccounted-for gas. As a result he finds that the figures relating to Darlington are below the average of nine neighbouring towns. At the same time, he points out that the principal causes contributing to the loss of gas are defective mains and services, public lamps consuming more than the regulated quantity of gas, faulty registration of consumers' meters, and the somewhat leaky condition of the two oldest gasholders. With regard to the measures to be taken to reduce the percentage of waste, he recommends that the following course be adopted: (1) The testing of a number of the public lamps to ascertain the consumption of gas; (2) the testing of consumers' meters in all cases where they have been in use for a period exceeding five years; and (3) the recrowning of No. 2 gasholder. These proposals have been adopted.

**Acetylene Gas and Plant Life.**—An inspection of the installation of acetylene gas which had been introduced into the plant-houses of the Botanical Gardens, Edgbaston (primarily for the purposes of a garden party given to the United Kingdom Band of Hope Conference, and also at the close of the garden party given to the Sanitary Institute Congress) took place on the 30th ult. There was a large attendance of members of the Botanical and Horticultural Society and others, and the various demonstrations and explanations which were given were listened to with much interest. In the course of the evening, the Hon. Secretary of the Gardens—Professor Hillhouse—took the opportunity of saying that, in the interests of the Society, he had studied the light from two points of view—injury to plants from evolved gases, and relations with colour. He had gone through the houses with the utmost care, and had failed to see the smallest sign of injurious effect resulting from the use of the gas; while the most critical colours, so far as artificial illuminants were concerned, came out of the ordeal with success.

**Llanelly Gas Company.**—This Company, writes a local correspondent, have had some hard luck during the last few months. It was hoped that the new Manager (Mr. A. R. Cawley) would be able not only to reduce the price of gas to consumers, but also succeed in getting a better dividend for the shareholders. In March last, however, a strike with the men resulted in some loss to the Company; and the second and more serious struggle which took place early in September has no doubt cost the Company a considerable sum. It is not yet known whether the District Council will try to enforce a claim to which they think they are legally entitled for the gas-lamps not being lighted in the streets for nearly a week; and the penalty, which they estimate at the rate of £2 per lamp per night, amounts to above £5000. Meanwhile, Mr. Cawley has succeeded in making a dividend of 2½ per cent. for the half year ending June 30; and it will be acceptable to the shareholders, for they have had very little during the past four years. The half-yearly meeting was held last Wednesday, when it was reported that some of the retort-settings were being converted from direct to gaseous firing; and it was anticipated that by this means a considerable saving would be effected. At a meeting of the District Council yesterday week, Mr. J. A. Williams moved that the Council make inquiry of the Gas Company as to their being prepared to negotiate for the sale of the works, and as to the possible cost of acquiring them. In support of the motion, Mr. Williams contended that, under good management, the gas supply should prove a profitable business. The tendency throughout the country was for the municipalization of such works; and there was no reason why municipalization should not be adopted in Llanelly. After some discussion, the motion was defeated by six votes to four.



## MISCELLANEOUS NEWS.

## COMMERCIAL GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. J. BLACKET GILL in the chair.

The SECRETARY (Mr. H. D. Ellis) having read the notice calling the meeting, the Directors' report and the accounts—the chief portions of which were published in last week's issue—were submitted.

The CHAIRMAN, in moving the adoption of the report and accounts, said the Directors were always pleased to meet the proprietors, because they received them with much kindness; but on this occasion perhaps the pleasure was enhanced by the fact that they had a particularly good report and statement of accounts to present. For the first time for a long while past, they had been able to earn the very satisfactory dividend of 13½ per cent. on the old stock, and 10½ per cent. on the new stock, and to carry forward something like £1500 for the benefit of next half year; and, he was bound to say, they might want it. Proceeding to call attention to some of the principal items in the accounts, he said that coal had cost £1400 less than in the corresponding period of last year; and wages had decreased by £2826. The total cost of the manufacture of gas showed a diminution of £3484, which was particularly satisfactory. The sale of gas had brought in £3230 more; and the meter-rental an additional £833. But, he was sorry to say, the residuals came out about £630 less. It had cost them £137,789 to earn £191,748—the balance, £53,958, being £6731 more than this time last year, which, as he had said, enabled them to declare the handsome dividends of 13½ and 10½ per cent. The increase in the consumption of gas for the second quarter of the half year was at the rate of nearly 5 per cent.—to be exact 4·82 per cent.; but, over the whole half year, the increase had been 2·19 per cent. When he reflected that The Gaslight and Coke Company simply showed an increase of 1·6 per cent., and the South Metropolitan Gas Company (who, of course, had a better district than they had) an increase of 4·8 per cent., he thought their own figures were very satisfactory. He should state that of the increase 14,162,000 cubic feet were contributed by the coin meters. This, too, was a figure upon which they could dwell with pleasure. He was sure that during the late tropical weather this poor man's friend—the coin meter system—must have been an inestimable advantage. Altogether they had nearly 9000 of these meters out in their district, and about 9000 stoves, which, he should think, ought to have some effect upon the atmosphere of this rather gloomy London by not having so many coal fires throwing off smoke. Having mentioned that the new sulphuric acid plant was now at work very successfully, and had produced some profit this year, the Chairman said he had no doubt that some of the proprietors had read a long article in "The Daily Telegraph" on "The Light of the Future," in which it was stated, with some show of certainty, that all the streets of London would be lighted by electricity. He thought that perhaps the Company were singularly fortunate in their district, because he did not think they had very much money there to spend upon a luxury like the electric light; and he believed it would be some time before it would encroach upon them. Even if the electricians did come—and they did make efforts every now and then to light their streets—with the constant increase in the coin meter system, he did not think they could do the Company any harm. The Board had spent a considerable sum this last year or two upon water-gas plant. The proprietors were aware that they had to produce gas of 16-candle power; and he had ventured several times to speak of the extreme waste and folly of having to do so. But they had to do this according to their Act of Parliament; and, therefore, it was absolutely necessary they should use some enrichment process. They found that water gas was a decidedly convenient adjunct; and they had plant in operation at Poplar, and were just about getting another to work at Wapping. There was no doubt water gas was a great advantage and convenience to gas companies, because anything that tended to cheapen the supply or manufacture of gas must be a good thing to the consumers at large. A Departmental Committee were sitting to inquire into the question of the supply of water gas; and he would now therefore merely allude to the matter in this way: That water gas, as they used it, mingled with coal gas, was not a bit more dangerous than coal gas alone. Coal gas was particularly dangerous if one chose to leave a gas tap turned on in a bedroom at night time. Anyone sleeping there would be dead by the morning; and exactly the same would happen with water gas. Then, again, what more dangerous method of lighting could there be than the petroleum lamps, about which they were constantly reading in the newspapers? The electric light, too, might be regarded as by no means a safe one; and so he claimed for gas that it was the safest light in existence. He regretted to say that they would have to pay a good deal more for coal this half year than last. The unfortunate strike in South Wales had no doubt caused the price of coal in the North to increase considerably. It had always been the practice of the Board to make their contracts about May or June; but this year, knowing that the strike was coming on in the early part of the year, they did not take any steps, as they hoped that it would soon be over. But such was not the case. The consequence was that, when they went into the markets to make their contracts in June, they found they would have to pay more than last year. This was an unfortunate circumstance. But it was a matter over which they had no control; and they must therefore put the best possible face on it. On the other hand, it was probable they would get some compensation by obtaining much better prices for coke and sulphate of ammonia; and tar also seemed likely to rise. They were not alone in this respect, because other gas companies had also had to pay higher prices. At the same time, it was a little unfortunate. There was another question with reference to the capital; but he would defer speaking about it until the resolution he had proposed was passed.

The DEPUTY-CHAIRMAN (Mr. W. G. Bradshaw) seconded the motion, which was at once unanimously adopted.

On the proposition of the CHAIRMAN, seconded by the DEPUTY-CHAIRMAN, dividends were declared of 13½ per cent. per annum upon the old stock, and of 10½ per cent. on the new stock, both less income-tax.

The SECRETARY then read the resolution referring to the raising of

further capital. The first section was as follows: "That the Board of Directors be and are hereby authorized, in exercise of the powers conferred by the Commercial Gas Act, 1875, to raise the sum of £75,074, by the issue of new ordinary stock to the amount of £37,537, such stock to be denominated new stock, and by the issue of debenture stock to the amount of £37,537, such debenture stock to bear interest at the rate of 4½ per cent. per annum; and that such new stock and debenture stock shall be offered at par among the respective proprietors of ordinary, new, and preference stocks, in rateable proportion to the amount of stock appearing by the register of the Company to be held by such proprietors respectively at the dates of such offers, but so that no offer or apportionment of such new stock or debenture stock shall be of any fraction of £1 sterling." The second part of the resolution provided for the disposal of stock not taken up and paid for within the time limited by the Board.

The CHAIRMAN said the Directors were simply asking the proprietors to give them the power to issue this stock. No date had been fixed for its issue; and they would certainly have quite a month's notice when the Directors thought it advisable to raise some of the money. The proprietors were all no doubt aware of the circumstances of this issue. Under their Act of 1875, they had the power to issue to them this stock at par; and the power had been exercised on several occasions previously. From a shareholder's point of view, stock which stood at a large premium in the market allotted to them at par was particularly agreeable, but probably from the Engineer's point of view it was not so, because he was now working on capital upon which they were paying 7½ per cent.—that was on the stock issued last time; and he had to compete with companies who were getting their money at between 3 and 4 per cent. Therefore the Commercial Company were somewhat handicapped in the race. He did think an immense amount of credit was due to their Engineer for having submitted to this so long, and for having given them such good dividends, while he had been working with capital at a higher rate of interest than his neighbours. The water-gas plant, another purifying-house, and other appliances connected with their works rendered it absolutely essential that they should raise further money in the near future; and therefore it was that the Directors now asked for this authority. Take, for instance, the coin meters. These were making a large demand upon their capital. As he (the Chairman) had already stated, they had 9000 fixed, which meant a considerable amount of money; and, under present circumstances, they did not get anything like an adequate return for the interest they had to pay on the capital spent on them. But they put by a certain sum every year for depreciation of these meters; and, as years rolled on, and they got their money back, the business would be even more prosperous than it was now. He wanted to say a word or two in the way of a hint as to the new stock. This stock was really a fine bonus for the shareholders to put into their pockets. He believed theirs was the only Company that had such a chance. As he had already told them, they were going to work with rather dearer coal; and things might not be quite so prosperous with them. He said they *might* not be; not that they *would* be. However, there might be a difficulty in declaring the full dividend they had had for a good many years past. But there would not be much difference one way or the other, because they had a modest reserve to fall back upon. Issuing the new capital at par to the proprietors was equivalent to receiving a good dividend for some years to come; and he wanted them to bear this in mind, in case in future it should be inexpedient to declare quite the full dividend. He asked them not to depart with the idea that he was giving way to any gloomy prognostics. He had no idea of doing so. His opinion was that the Company were in an admirable position. Some words which Mr. Livesey used at the meeting of the South Metropolitan Gas Company had struck him as being very true. Mr. Livesey said: "The shareholders of a gas company required to look at things in rather a broader spirit than a simple question of dividend." He quite agreed with that; and he wished the proprietors to do so too. It was the last thing in his mind to say anything in depreciation of the Commercial Gas Company. They had had an excellent past; and he saw no reason why they should not have a fine future before them. He concluded by moving the adoption of the resolution.

The DEPUTY-CHAIRMAN, in seconding, said he should like to emphasize what the Chairman had said at the beginning of his speech—that the Directors had not come to any determination when this stock should be issued. He hoped this was fully understood. It was to the interest of the Company to put off what was a good day for the shareholders, but an evil one for the Company—to defer issuing the stock as long as it was reasonably possible to do so.

The motion was unanimously carried.

Mr. GEORGE LIVESY said the last six months had been an anxious time; and there were anxious times still before the Directors. It was therefore more than ever necessary that the Board should have the hearty support of the proprietors. They were extremely pleased and satisfied with all the Board had done, and had the fullest confidence in what they would do in the future to meet the difficulties that might arise. Especially had they confidence in their Engineer. He had great pleasure in moving a vote of thanks to the Chairman and Directors.

Mr. CREIL seconded the motion, which was cordially agreed to.

The CHAIRMAN, in responding, expressed the gratification of the Board at receiving the approval of such a past-master in the art of gas making as Mr. Livesey. He then proposed a vote of thanks to the officers and their staffs; speaking in glowing terms of the work of the Engineer (Mr. H. E. Jones) and the Secretary (Mr. H. D. Ellis).

The DEPUTY-CHAIRMAN seconded the proposition, which was unanimously passed.

Mr. JONES, in reply, said he was much obliged to the proprietors for their kind vote of thanks to himself and his staff. Probably they had not earned the vote better in any year within his memory than they had done in the past year and the preceding one. These had certainly been years of hard work. The one thing the staff would like would be to have a little more margin without raising the price of gas. Increasing the price was, of course, out of the question. He was as firm a believer now in "Cheap Gas" as he was thirty years ago when he wrote anonymously over that signature; and the writer who adopted the *nom de plume* of "Keep the Lead," he believed he might say, also retained his early conviction that the policy of the day must be the utmost cheapening of gas. The Commercial Company had for thirty years been in a very exceptional



position. They were the first to take the sliding-scale; and, because they showed that spirit of adventure, they were the last Company to receive the power of allotting capital to their shareholders instead of putting it up to auction. In those palmy days when the margin of price was more liberal, and the prices of labour, coal, and other things were more reasonable, they thought it a very inviting prospect, and a very good plum. But the incidence of having to raise money for 24 years at these rates, coupled with the increasing expenses in every direction, the increasing uncertainty that surrounded them, and the increasing pressure that the public even were putting upon gas companies, led him to wish that they might have a little more margin, and not be fixed in such a tight place. But wherever the slackness came from, it must never come from raising the price of gas. Years of observation had convinced him of the enormous possibilities that were open to gas supply if only it were cheap enough. There was a tremendous field for gas for motive power and fuel. But the price of the gas for these and other purposes must be kept low, whether the shareholders got 10, 7, or only 5 per cent. He would, however, take care, as long as the proprietors gave him their confidence, to do his best to make the price cheap and the dividend as good as possible. But the dividend must give way to the necessity of the case—that was, the necessity of supplying cheap gas in every possible direction. He had no fear; but he would ask them to be a little merciful, and let them have cheap money. Then the enormous elasticity which he had observed in the gas business would turn them round the corner, and would still permit the proprietors to meet and accord to him and his colleagues a hearty vote of thanks.

Mr. ELLIS also responded; and the proceedings then terminated.

### EAST LONDON WATER-WORKS COMPANY.

The Half-Yearly Meeting of this Company was held at the Offices, St. Helen's Place, Bishopsgate, E.C., last Thursday, under the presidency of Mr. GEORGE BANBURY.

The SECRETARY (Mr. I. A. Crookenden) read the notice convening the meeting; and the report of the Directors was taken as read.

The CHAIRMAN reminded the proprietors that when he last addressed them he was able to place before them a very satisfactory state of affairs; and for some time afterwards this prosperous condition of things continued. The revenue was on the increase; better houses were being built; the supply and pressure all over the district were never better; and complaints were never fewer in number. But of late the forces of Nature had been mercilessly against them; and the severe drought, following on several dry seasons, lowered the flow of the River Lea—their main source of supply—to such an unknown extent that, in order to render the reservoirs capable of bearing the unwanted demands upon them, they had to revert to the intermittent supply. Of course, there was immediately a great outcry against them. Some said it was for their own selfish ends; and others that there was really no drought, and that it was all owing to their apathy and neglect. He would just briefly touch upon each of these several assertions. As to the first, nothing could be further from the Company's wishes than to meddle with the constant service, as any interference therewith caused them endless worry, anxiety, and enormous expense. It was therefore only upon pure compulsion that they took this retrogressive step. As to there being no drought, the rainfall for the past twelve months was only some 12½ inches, against the usual average of 24½ inches. Still, all would have gone on well with far less than the average rainfall; but when it came this year to well-nigh a cessation of rain, or only 9 inches in nine months—which was 50 per cent. below the average—the necessity arose for their measures of safety until the long-delayed downpours should set matters right again. As they were well aware, the drought was not confined to the East London district. Many towns, country places, and canals had suffered, and were suffering, to a great extent. In fact, there had been letters and articles in the papers to the effect that many country residents only wished that they were half as well off for water as the inhabitants of East London. In several large towns—such as Edinburgh, Croydon, Leicester, Leeds, Bradford, Birmingham, Paris, and other places—the supply had had to be curtailed owing to the persistent absence of rain. As regards the serious want of water in many places, and as to Leeds especially, he might read a short extract from an article in the previous Tuesday's "Times"—

If there is any consolation in contemplating the misfortunes of others, East London consumers already have it in abundance. Many country places are absolutely waterless, and have to fetch every drop from a distance of several miles; while the shortage in the large towns in the Midlands has assumed a very serious aspect. Even Leeds, which lies outside the area of severe drought, and normally has the largest supply of all the very big provincial towns in England—even Leeds has been placarded with notices peremptorily forbidding the use of water for washing windows and doorsteps, and for similar purposes, under a penalty of £5. This is an instructive illustration of the advantage of having a public water authority which can enforce economy with a heavy hand when the public interest requires it. One shudders to think of the indignation meetings and the denunciations that would ensue if a London Water Company dared to take such a step. And yet the Leeds people pay their water-rates all the same, whether they get the full supply or not. Perhaps the aggrieved Londoner may find some balm in the reflection that even municipal engineers have "miscalculated" their resources in this year of grace, and that the consumer has to suffer without redress.

There was a great Musical Festival going on at Leeds at the present time; and one of the evening papers on the previous night said:

The large fountain which occupies the centre of the space in front of the Town Hall, flanked by statues of Wellington and Peel, is handsomely decorated with evergreens in pots and tubs; but, sad to relate, in consequence of the long drought, the water will not be turned on. Another reminder for East London that it is not the only sufferer this autumn!

There was rather an interesting letter in the "Pall Mall Gazette" of Aug. 24, showing that this remarkable deficiency in the normal rainfall had deprived London of 102,000 million gallons, or a sufficient quantity for fifteen months' supply. Lastly, as to want of foresight, they doubtless remembered how, after much opposition, the Company obtained parliamentary sanction for augmenting their storage by 600 million gallons,

Aided by this additional reserve, they were enabled, notwithstanding the prolonged and pitiless absence of the usual rains, to maintain the constant supply until Aug. 22 last; their reservoirs being full on June 20. No sooner were these works completed than, again looking ahead, they last year obtained further powers to construct other reservoirs to hold an additional 1000 million gallons. They had increased, and were still increasing, their supply from wells. They had laid down new arterial mains to meet satisfactorily increasing needs; and they had had schemes for further supplies under consideration and discussion. It seemed somewhat paradoxical, that those who killed the Company's Bill in 1893 for more storage reservoirs, and who nearly repeated the process in 1894, on the grounds that the Company had plenty of water, that their application to Parliament was premature, and that they merely wanted to enhance their purchase value, should now turn round and upbraid them for want of prudence and foresight. He was speaking the other day to an engineer who was quite independent—holding no water stock—and who made what he (the Chairman) thought was rather a pertinent remark. He said: "If your opponents had really known more about the matter, they would not have protested to Parliament against what you were asking for, but they would have 'pitched into you' for not asking for more." They had been condemned, vilified, and abused plentifully; but, singular to say, the point upon which they might be open to criticism and stricture had not been urged against them—probably because their detractors were more open to blame than themselves. He referred to the fact of their not having in days gone by insisted upon cisterns being fixed in every house. They had the vestries, sanitary authorities, builders, and landlords all against them. It was, however, certainly a temptation to confer upon the dwellers in the poorer tenements the seeming boon of a supply of water direct from the Company's mains, without the intervention of cisterns which might become foul. But subsequent knowledge had shown that there must be cisterns co-existent with the constant supply—in fact, during temporary intermittent service, those with cisterns hardly perceived any difference. As a high official water authority said to him: "If you could have an ideal supply that never failed, ideal engines, pumps, and mains that never go wrong, and ideal consumers who always go right, you might do away with cisterns; but as long as human affairs remain as at present, you must have these necessary household receptacles." The correspondent of one of the morning papers who paid frequent visits to the poorer parts of the East-end, had written as follows upon this important matter:—

And here let me observe that all the discomfort due to the intermittent water supply would vanish if these houses had cisterns. There was not one I visited which might not have had a 50 or 100 gallon cistern conveniently and properly placed. Those who object to their provision on sanitary grounds, are evidently unaware that the question has been carefully inquired into by the highest sanitary authority in the country, which pronounced unequivocally in their favour.

Throughout this remarkable period of heat and drought, there had been nothing approaching a water famine, as the Company had been supplying 32 million gallons a day, or 24 gallons per head, during two periods of the 24 hours. Formerly the intermittent supply was universally in force; and in some instances it remained so to the present day. But now its temporary adoption was termed a "water famine." Millions of people must therefore until recent years have undergone this infliction without being in the least aware of it. As to the quantity of water supplied, he might mention that in "The Times" of the 12th ult. there was a table giving the amount of water supplied at the end of August in twenty-five towns in England and Wales. This showed that only three towns gave more than the average of all London, and no fewer than thirteen towns were now putting up with less water than the East London restricted supply. As already stated, the occupants of the poorer tenements without cisterns suffered annoyance and inconvenience from the cessation of their wonted abundant flow. To remedy these discomforts as far as possible, 26,000 earthenware vessels for holding water had been provided by the Company, and freely distributed. Stand-pipes had been erected upon the fully-charged mains; and they had cordially co-operated with the various local authorities in their efforts to aid the poorer classes by undertaking to pay for water-carts for the daily distribution of water in those localities where such a course was deemed necessary. They had purchased, and were still purchasing, all the supplies available from the Kent, New River, and Southwark and Vauxhall Water Companies, as well as smaller additions from other sources. The New River Company at once acceded to their request for aid, and, for some time before they had to shorten their supply, sent to them daily down the Lea what they could spare at their Hertford intake. Had not the usual rains failed entirely, this help would have saved all difficulties. But with a view of providing for the worst, Mr. Bryan, who had previously been in communication with Mr. Restler, the Engineer of the Southwark and Vauxhall Company, carried out a connection with their mains and those of that Company through the Tower Subway. For this valuable addition to their supply, grateful thanks were due to the Southwark and Vauxhall Company, to their Chairman (Sir Henry Knight), and especially to Mr. Restler, for his hearty and able co-operation. The plans and plant were speedily got ready, and the work commenced without a moment's delay. "The Times" correspondent who was present when the water first passed through the pipes laid in the Subway said:—

The work was begun on Sept. 1, and has therefore taken less than 18 days. Credit for its completion in several days less than the most sanguine estimate, must be given, not only to the Engineers and Contractors (Messrs. John Aird and Son), but also to the firms who supplied the special materials required at the shortest notice, and to various Companies affected, whose hearty co-operation has greatly facilitated the proceedings. Lastly, but most honourably, to the men who have toiled day and night in the tunnel throughout the hot weather. On Saturday, one of them fainted from the excessive heat.

They gratefully recognized the valuable assistance of many of the local authorities; and they moreover tendered their thanks to the great body of their poorer and cisternless customers, for bearing the temporary trouble with great good temper and equanimity. As already mentioned, the Company did their best to lessen the discomforts resulting from the interruption of the constant service; but he could not help thinking that in some quarters political feeling, a desire for notoriety, and *cacoethes scribendi* exaggerated matters. Certainly, their difficulties were increased



by the remarkable weather which prevailed during August and September, and by the waste that took place during the restricted hours of supply. There was some good rain on Aug. 7; but after that waves of intense heat set in, with absolute drought, and with tropical weather altogether exceptional in September. Clouds gathered, the barometer went down, and the forecasts led to the belief that rain was coming. Nothing but a few drops, hardly to be dignified by the name of a shower, however, resulted from these portents. The weather report for September gave the rainfall at only 0.31 inch, or exactly one-seventh of the average; and it went on to say that, as regarded London, "the present year is so far the driest on record." Then there was another curious thing. Though during July, August, and September the weather was often intensely hot, the thunderstorms that might naturally have been looked for were altogether absent. This driest of summers, following one of the driest of winters, of course, reduced the flow of the Lea, as registered at Field's Weir, far below any previous record. There was ample proof that a good deal of the quantity supplied to the consumers during the shortened hours was wasted—partly by carelessness and neglect, and partly from a desire to "serve out the Company." In fact, this latter motive was both openly and covertly avowed in certain letters to the Press. The proprietors knew well enough that the old theory of mains shattered by frost was itself completely shattered at the inquiry before the Local Government Board Commissioners; therefore he would only remark that the less quantity pumped per head under constant supply since the frost, and the readings of the Deacon meters, conclusively proved that the decision of the Commissioners was correct. He might state that after the great frost the Company spent nearly £40,000 from income in lowering and improving the mains, so as to mitigate the effects of any future frost, and to permanently benefit their system. He must not close his remarks as to the temporary alteration in their usual mode of supply without expressing their hearty thanks to most of the leading newspapers, for the fair and admirable way in which they put the case before the public. From personal inspection, and from information obtained from trustworthy sources, the whole state of affairs was accurately, clearly, and justly represented to their readers. The proprietors were aware that the Hackney Vestry had instituted proceedings against the Company before the Railway Commission. One would have thought that the universally acknowledged drought would have been sufficient answer; but the Company were prepared to meet any case that might be urged against them. He ought perhaps to tell them that the Royal Commission had sat some thirty days, and had heard the evidence of the London County Council, the Outside Authorities, and certain independent witnesses. The meetings would be resumed early in November, when the evidence of the Companies would be proceeded with. Turning to the working of the past six months, there had been a substantial increase in their revenue when compared with the same period of 1897, amounting to £9421, which brought up the increase for the whole year to £20,000. Much of this additional income during the past half year had, however, disappeared by certain necessary unavoidable demands upon revenue which had to be met. Coals, engine charges, and parish rates had all involved a larger outlay; but the heaviest additional expenditure was for new sand for their filter-beds, which came to over £2500. This, of course, was a very necessary outlay, as, without keeping up the most essential element in their filtration to the very highest point of efficiency, they would not maintain their present character for purity of supply. It was satisfactory to observe that the amount written off for empties, bad debts, &c., was still further reduced by £500, when compared with the same items in last year's return. They laid on water to 2981 new houses during the past six months; and, as usual, these new tenements were mostly east of the Lea and outside the Metropolitan area. The rate per house paid by these new comers averaged £1 3s. 8d., which was nearly 9d. per house more than that of the corresponding time last year. In addition to the new dwellings, they put on 222 new meter supplies; so that trade prospects might be deemed fairly hopeful. He mentioned that in the newly-built houses they supplied, including those rented at 10s. a week and under, there were, as a rule, fitted baths with hot and cold water laid on, for which the Company's charge was 4s. a year. This sum was fixed for fitted baths by the Company's Act of 1853, when comfort and cleanliness were far less to the front than at present. Those who lived in some country places, and knew the amount of pumping required when baths were frequently used, must think an annual charge of 4s. for this item remarkably reasonable. There was an increase of nearly £900 in their law charges, mainly attributable to costs with regard to the Royal Commission from March, 1897, to June of the present year, and including all Counsel's fees connected therewith. Their wells had been their salvation; and as there was between these wells and the River Lea a thick, impermeable stratum of London clay, they did no harm to the flow of the stream. He mentioned on the last occasion that the well at East Ham would prove valuable to them, and this had certainly been the case. They fortunately struck some good, additional fissures there; and during the period of scarcity—though the work was still incomplete—this outlying district had reaped much benefit from this source of supply. Sir Edward Frankland, the Government Analyst, when sending them the analyses that he had made of the water from this well, congratulated them upon its purity. They were improving their yield from the chalk at several stations; and as they pumped but little from their wells when river water was plentiful, the shafts and adits filled up, forming satisfactory underground reservoirs. They had already acquired a considerable amount of the land for the new reservoirs lately sanctioned, and hoped before long to get the work in hand. The official reports of Sir E. Frankland, Sir W. Crookes, and Professor Dewar upon the results of their analyses of the London water, showed that during the past six months the East London Company stood as a rule next to the New River Company in point of purity (that was usually the case), and that the removal of the bacteria from the raw water by their storage and filtration was very marked—reaching as high as 99.85 per cent. He might mention that in his last report upon the East London water, Sir E. Frankland said that "after storage and efficient filtration, it was delivered in excellent chemical and bacterial condition." Figures then followed, showing that the above processes eliminated over 99 per cent. of the bacteria—thus practically removing them all. Sir E. Frankland further stated that the "deep-well waters of the Kent and East London" were "of excellent chemical quality." The Companies' Analysts closed their report for last month with the following remark: "The excellent

quality of the water supplied to London during the past month has been fully maintained." He was glad to say that the health of the district, as ascertained from skilled and independent testimony, continued to be satisfactory. When the President of the Local Government Board received a deputation from the East-end on the 24th ult., Mr. Chaplin told them that Dr. Bruce Low, who had been in constant attendance in the district, reported that "in the four weeks before the intermittent supply, the death-rate from all causes had begun to increase in London generally, but more particularly in the East London district. The increase has continued since the intermittent supply, but has relatively been less in the East London district than in London as a whole." The result was the same as regarded diarrhoea, as the report went on to say: "The fact that the increase has been relatively less in East London than in London as a whole, since the constant supply in East London failed, is satisfactory, as suggesting that the scarcity of water has not had any appreciable effect on encouraging diarrhoea." At a meeting of the Metropolitan Asylums Board, held about the middle of last month, the Chairman's conclusions were similar to those of Dr. Bruce Low, as he stated "that at present, at any rate, there was no evidence to show that any undue amount of disease was arising from scarcity of water in the East-end;" also that "the proportion of the cases of disease notified in the eight East-end parishes to the number occurring in the whole of London was last year 28 per cent., as compared with 20 per cent. this year. Dr. Sedgwick Saunders, Medical Officer of Health for the City of London, reported that "the health of East London compared favourably with that of the Metropolis generally;" that "from a chemical point of view the condition of the East London Company's supply in its present state was purer than in April, 1897, and as wholesome as the New River Company's water;" and that "the difficulties that had arisen depended rather on the absence of means of proper storage of water for domestic and sanitary purposes" than in diminished supply. He (the Chairman) would not trouble them with statistics confirming the above statements, but would merely say that in the Registrar-General's report for the week ended Saturday, the 24th ult., West Ham, the extensive district entirely supplied by the Company, stood second among the 33 large towns of England as regarded lowness of death-rate. Portsmouth stood first, with 15.9 deaths per 1000; and West Ham second, with 16.4. London as a whole stood at 21.6; and Brighton, at 24.3. Their Engineer and Secretary had rendered them most valuable and efficient aid; and their thanks were due to these gentlemen and to their staff for their valuable work during these trying and anxious times. Finally, as regarded the dividend, he had already said that the past half year had been a very favourable one for them; and had it not been for the late almost absolute absence of the usual rainfall, they would have paid the same dividend as last time, at the rate of 8 per cent., and carried forward a good round sum to the reserve. After due consideration, and having in view the heavy outlay which this catastrophe—for he could call it nothing less—would entail upon them, it had been determined to decrease the dividend and to increase the reserve fund to £27,000; and this was evidently the wisest course to adopt. He concluded by moving the adoption of the report and accounts and the declaration of a dividend of 3½ per cent., less income-tax, on the ordinary stock of the Company for the half year ended Midsummer last, payable on the 13th inst.

Mr. HERBERT DALTON seconded the motion.

Mr. H. ROKEBY PRICE said he thought that both the proprietors and the general public must feel very much indebted to the Directors and the officers for the outcome of the past half-year's working. He thought that the Chairman's speech was a vindication of the Company's endeavours to meet the demands which had been made on them.

The resolution having been carried unanimously,

The CHAIRMAN said the Directors were all very much obliged to Mr. Rokeby Price for his kind mention of their services. It was a great strength to them to know that they had the proprietors' confidence and sympathy. Rain did not appear to be coming; but he thought it must do so before long. A few days' good rainfall would make a wonderful difference in their position.

Mr. PRICE proposed a vote of thanks to the Chairman, Directors, and officers, and said he thought that great judgment had been displayed in decreasing the dividend declared on the present occasion, and increasing the reserve fund.

Mr. BADDELEY, in seconding the motion, remarked that there was no doubt all the proprietors fully realized that the Directors and officers had passed through a most anxious time; and they felt that the Directors and the officers were entitled to their warmest thanks and sympathy for the way in which they had conducted the affairs of the Company. Some people found fault with the Directors for not having power over the elements; attributing to them the continued absence of rain. In his opinion, the dividend had been most properly reduced for the half year; but they might look forward to their affairs being so conducted in the future that they would soon revert to the dividend which they had been receiving in previous half years.

The resolution was carried unanimously.

The CHAIRMAN, in reply, said he could only repeat what he had already stated, that the proprietors' encouragement and sympathy were regarded by them as of the utmost value. Of course, they had had a most trying time; but it had fallen, as they must be aware, principally on Mr. Bryan, whose health, he was happy to say, continued to be fairly good, but whose anxieties at the present time never ceased, either by day or night.

The proceedings then terminated.

**Gomersal Water-Works Arbitration.**—Mr. S. H. Crowther, of Huddersfield, the Umpire in this matter, has awarded the sum of £8410 as the price to be paid by the District Council for the undertaking and interest of the Water Company. The costs of the arbitration are, by agreement, to be also paid by the Council. The undertaking was valued by Mr. Fenwick, one of the expert witnesses for the Company, at thirty years' purchase of the net annual profit (£600), and by Mr. Charles Gottat twenty-five years' purchase. For the Council it was contended that not more than five years' purchase should be allowed as compensation for disturbance; the Company having no statutory powers. The Company had, however, an agreement with the Bradford Corporation which has yet 15½ years to run, and it would appear that the award has been made on the basis of this agreement.



## THE GAS QUESTION IN VIENNA.

## Defeat of Dr. Lueger.

In the "JOURNAL" last week, it was stated, on the authority of the Vienna Correspondent of the "Daily Chronicle," that the Imperial Continental Gas Association had obtained from the Municipality of Vienna a contract for lighting up to 1911 the suburbs now supplied by the Association. The agreement came to between the parties was considered by the Stadtrath (which is equivalent to a Court of Aldermen in London) last Tuesday, and passed without alteration; but it had to be sanctioned by a full sitting of the Municipal Council. It is just two years since this trouble began in Vienna with the bold declaration of Dr. Lueger that by the end of October, 1899, the English—by which he meant the Association—must be turned out of the city. In view of the present position of affairs in the Austrian capital, it will not be out of place to briefly narrate the story, as told by the correspondent of the "Financial News." Writing on the 2nd inst., he said:

"They were haughty and wanton words which our burgomaster uttered when he formally made known to 'his people of Vienna,' that he would not rest until he had 'driven the English from Vienna.' Vainly even the Liberal members of the Communal Council, who favoured the project according to which Vienna should take under her own management the lighting of the city, endeavoured to convince their colleague of the uselessness of constructing new gas-works, and to advise him to enter into fresh negotiations with the Imperial Continental Gas Association. Self-conceit, however, triumphed over reason and reflection. The English Company, it will be remembered, were prepared to cede their works to the city for 16,500,000 fls.; and possession could have been had this year. These conditions were much more favourable than those previously offered; and if Dr. Lueger had accepted them, it could have been said even then that he had carried out a large operation successfully. He, however, refused. He had sworn to drive the English out of Vienna. At once the construction of new gas-works and the laying down of new pipes was commenced. The result is that Vienna looks like a heap of ruins, and traffic is interrupted, while the cost of the new works is estimated at 40,000,000 fls.

"But now comes the worst of it. Vienna is losing her actions against the English Company. For the better understanding of this affair, let me explain that Vienna comprises ten old and nine new districts. The latter nine up till recently formed autonomous parishes, which, as such, had independent contracts with the Imperial Continental Gas Association for a period expiring in some cases in 1908, in others in 1920. Two judgments have now recognized the validity of these contracts, even after the districts had been incorporated into the city. These decisions have had the effect of upsetting the estimates of the municipal gas schemers, who had reckoned on supplying light for the entire Municipality.

"Dr. Lueger was at last obliged to relax, and enter into negotiations with the Association. The day before yesterday, rumours to this effect were circulated; to-day they are confirmed by the 'Neue Freie Presse.' The English Company intended for the ensuing year to lower the price of gas; and would undoubtedly have compelled the Municipality to follow suit. As an inevitable consequence, the new venture, which, according to the predictions of the anti-Semites, was bound to become a gold mine for the municipal finances, would have scarcely paid at all. This imminent danger caused Dr. Lueger to change his tactics. Moreover, there is another eventuality—viz., that the new works may not be ready in time, and that therefore Dr. Lueger would have to ask the English to continue the supply of their gas for a certain time to the whole town. According to the 'Neue Freie Presse,' therefore, the following agreement has now been arrived at: Without considering the above-mentioned judgments, the Imperial Continental Gas Association keeps the exclusive right up to 1911 to light eight districts, and it is provided that no lowering of the price of gas shall take place. Besides this, the Municipality will take over the meters in the old districts for 1,330,000 fls. This agreement, although still awaiting the sanction of the Communal Council, signifies the complete defeat of Dr. Lueger. For 16,500,000 fls. the existing works could have been purchased; and now 40,000,000 fls. will have to be spent, and yet up to 1911 only the old districts will be lighted by municipal gas. On the other hand, the population were promised cheaper gas; and now the competing Company must be asked not to lower their prices.

"Six or seven months ago the 'Financial News' had already foreseen as probable an understanding with the Association, and pointed out how they would make a much better deal by supplying the suburbs until the expiration of the contract than by selling the works for 16,500,000 fls. There is not the slightest doubt that the English Company will be able by 1911 to do very well by their shareholders. Will this defeat of Dr. Lueger at last open the eyes of the Viennese population? It remains to be seen. In any case, the understanding with the English Company means the utter failure of the anti-Semitic municipal campaign. Dr. Lueger's prestige has suffered considerable damage; and the movement for ruining a group of investors who relied upon the good faith of the Municipality of Vienna has distinctly failed, assisted though it was by a leading German bank."

The agreement came to between the Municipality and the Association was laid before the Communal Council last Friday; and it gave rise to a very turbulent discussion—noisy scenes being witnessed both on the floor of the Chamber and in the galleries. The vote was taken amid the most deafening uproar, and resulted in the adoption of the contract. The Vienna Correspondent of the "Standard" characterizes the proceedings during the sitting as "scandalous," while his colleague of the "Daily Mail" says it was the "rowdiest sitting of the Council which has ever been known." This was his description of it: "From six o'clock, when the sitting began, until ten, when the anti-Semitic majority ejected their opponents from the Town Hall by main force, a deafening tumult prevailed. City Fathers fought like men bereft of reason, belaboured each other with sticks and fists, tore each other's hair, and scratched each other's faces. Ink-pots were hurled at the Chairman, whose voice and bell alike were drowned by the shouts of the contending councillors, who, in addition to shouting, beat their desks with flat boards. At the conclusion of the sitting, black eyes, bleeding noses, disfigured faces, and torn

clothes were to be seen on all sides. The anti-Semitic majority claim to have affirmed the contract with the English Company, though amid tumult." At the conclusion of the sitting, the disturbance was continued in the street—a small group of councillors on emerging from the Town Hall being received with jeers by a mob of young roughs, who followed them for some distance. The Progressist party in the Council subsequently held a meeting, and unanimously decided to lodge a protest against the validity of the vote. The protest was promptly forwarded to the President of the Council. It is believed that the protest will have no effect, nor will it impair the validity of the agreement.

## SWANSEA GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Friday—Mr. T. T. Woods in the chair.

The report of the Directors showed that in the six months ending June 30 a net profit of £5290 had been earned—sufficient to pay the full statutory dividends. Adding the balances brought forward, there was a sum of £2958 to carry to the credit of the profit and loss account. Notwithstanding the depression in trade and the extraordinarily mild temperature during the half year, the increase in the consumption of gas amounted to 6·8 per cent. as compared with the six months ending June, 1897. This resulted from additional consumers and the large number of gas cooking-stoves fixed during the half year.

The CHAIRMAN, in moving the adoption of the report, referred to the passing of the Swansea Gas Act of last session, which received the Royal Assent on the 23rd of May, and congratulated the shareholders that all the rights, powers, and privileges of the Company remained intact. He then detailed the objects of the Act, which are the raising of the capital to £120,000 of 5 per cent. ordinary stock, the consolidation of the various shares into one uniform 5 per cent. stock, the increase of the borrowing powers to £30,000, and authority to sell gas by prepayment meters, and other purposes. He announced that from the 10th of June to the 29th of September no less than 1290 applications for coin-meter supplies had been received, and stated that there was every indication of the increase continuing. He gave particulars as to the sale by auction of the new ordinary stock on the 22nd of July, which realized £24,723 15s., or equal to £123 12s. 4d. per £100 of stock. He congratulated the shareholders upon the continued prosperity of the Company and the increase of gas consumers throughout the district. In conclusion, he indicated the various diminishing expenditures which by economical management had been carried out as compared with the half year ending June, 1897. He pointed out that the chief increases in the revenue were £1168 in the gas-rentals, £200 in the residual products, and £100 in the sundry receipts. With respect to the coin-meter system, he mentioned that the Company were put to a large expense in fitting up houses for it, and that the work was being performed in the best style consistent with economy. He trusted that all small private dwellings would ere long be supplied with gas, which would tend a great deal to improve the aspect of houses at night time, and render workmen's homes comfortable and economical.

The report was adopted.

The usual resolutions authorizing the payment of the full statutory dividends, and the passing of votes of thanks to the Chairman, Directors, and Engineer (Mr. Thornton Andrews) for their services during the past half year, closed the proceedings.

Interest in the acquisition of the Swansea Gas-Works by the Corporation has been revived by the publication of an article, with subsequent correspondence, in the "Cambrian." The following figures have been put forward by one writer to show how the works may be purchased: Maximum dividends, £10,100 per annum, at 28½ years' purchase, £287,850; 10 per cent. on ditto, £28,785 (together, £316,635); debenture stock, £37,408—total, £354,043. Repayment: Interest at (say) 2½ per cent., and sinking fund at 1½ per cent. (together, 4 per cent.), for repayment in (say) 45 years. Four per cent. on £354,000 gives £14,160 for paying interest and sinking fund. Against this there is the profit for the year ending June 30, 1897, £11,817; saving in Directors' fees, £600; ditto in salaries, £1000; economies in other directions, £500—total, £13,917. This would leave a deficiency of £243 per annum. The calculations have been based upon the capital, dividends, &c., of the Company before the fresh capital was raised; and the writer admits that they are liable to modification and alteration. He sees no reason, however, why the Company and the Corporation should not come to terms on a basis something like the above.

## COLONIAL GAS UNDERTAKINGS.

The reports of two Colonial undertakings have come to hand since the arrival of the particulars published in the "JOURNAL" for the 27th ult.

In the six months ending the 30th of June, the Brisbane Gas Company received £19,260 for gas, &c., supplied; while manufacturing expenses, depreciation, &c., came to £11,265. The balance at the credit of the profit and loss account at the above-named date was £8878, including the amount brought forward. The Directors recommended a dividend of 4½ per cent., amounting to £6295, the tax on which came to £315; making together £6610, and leaving £2268 to be carried forward.

The North Shore (North Sydney) Gas Company, Limited, made a net profit of £2949 in the six months ending June 30; and the addition of the balance brought forward made up £3022. Out of this the Directors recommended the payment of a dividend of 3 per cent. for the half year, £2700; setting aside £210 to provide for interest; addition to officers' fidelity guarantee fund, £50; interest suspense account, £20—making a total of £2980, and leaving a balance of £42 to be carried forward. During the half year, enlargements and extensions of the mains have been made in various parts of the Company's district. After careful consideration, the Directors decided to make the following reductions in the prices charged for gas, to take effect from the 1st inst.: 3d. per 1000 cubic feet to private consumers, making the price 4s. 9d. net; and 2s. 6d. per lamp to the boroughs of North Sydney and Mosman, making the charge £4 15s. per lamp per annum.



## MORLEY GAS-WORKS ARBITRATION.

Tuesday, Sept. 27.

(Before Mr. J. MANSERGH, M.Inst.C.E., Umpire.)

Last week we commenced a report of the proceedings at this arbitration, which was held to fix the price to be paid by the Corporation of Morley for the undertaking of the Morley Gas Company, under an Act obtained in the last session of Parliament. Our report ended with the evidence submitted on behalf of the Company.

Mr. CORBET WOODALL was Arbitrator for the Corporation; Mr. THOMAS NEWBING, for the Company. Mr. BALFOUR BROWNE, Q.C., and Mr. FRANK BALFOUR BROWNE appeared for the Corporation; Mr. PEMBER, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., represented the Company.

Mr. BALFOUR BROWNE, in opening the case for the Corporation, said they had to consider what was the legal income of the Company, then whether the income could be maintained, and if so what was the security for it in the future. The Company had taken the income for the year 1897, which the Corporation said was wrong, inasmuch as the figures to June, 1898, were available. The Corporation also thought a larger sum should be deducted for wear and tear than the Company had allowed and set against the surplus. But the Company had made no adjustment of the revenue account, except in respect of what they called conversion of borrowed money into share capital. He should ask the Court to disallow every one of the ridiculous items of £166, £126, and £406, because the Company had not these sums—they did not exist in fact, and they never could have existed in a prudent and well managed company. Before the Company could have made the conversion, the consent of a general meeting of shareholders must have been obtained. This consent had not been secured; and no prudent body of shareholders would have consented to it. Moreover, it would have been a fraud upon Parliament to raise this large sum at 10 or 7 per cent. when in 1889 they had obtained parliamentary powers to raise capital at a very much lower figure. The claim under this head worked out to £21,477, which was simply a ridiculous figure. Then they took 10 per cent. on this £21,000, on the ground that the Corporation were purchasing compulsorily a thing which the Company never had. Further than this, to crown the absurdity of such a magnificent investigation, they claimed 2½ per cent. for re-investing money they never had. He therefore asked the Court to strike off this claim, together with the 10 per cent. and 2½ per cent. allowances on them. Passing on, Counsel pointed out that, though Mr. Stevenson had steadily said £400 ought to be spent in duplicating the boiler and providing another engine, he made no deduction in this respect. In the Corporation valuations, they started with the gross revenue for the year ended June, 1898—the latest year available, but which the Company had avoided because it showed a further decrease in trade. The Corporation, while not expecting Morley to pass away, did assert that its progress had not lately been very rapid; two of the principal trades on which it depended being very depressed. This depression was acting seriously to the detriment of the Company. It had been very serious in the last four years; and the half year to June last was the worst of the lot. The total income of the Company for the half years ending June, 1896, 1897, and 1898 was £6442, £6188 and £6048 respectively; and in the December half years of 1896 and 1897, the figures were £7020 and £6663 respectively. This diminution of income was considerable; but it was likely to be increased by public works in the town being finished. Under these circumstances, he held that the revenue was not well secured. The surplus of which they had heard so much was swept away by proper adjustments. It was contended that, if it was so swept away, further income could be produced by adding 1d. or 2d. per 1000 cubic feet to the price of gas; but surely this would be a ruinous thing to do in the face of competition. Having obtained the gross profits, the Corporation deducted the interest on the debentures and a further sum for interest on accumulated profits, which, with the reserve fund, had improperly gone into the works. He did not say they should not have any balance in hand; but it certainly should not be nearly as much as they had had. There were large undivided balances in the Company which really belonged to the consumers; and, further, they were indebted to the consumers some £4000 or £5000 in respect of income-tax paid for the shareholders. With the adjustments which the Corporation made, the income of the Company was hardly sufficient to pay the maximum dividends. The multiplier which the Corporation used was 25 years; and as to this the Court would have to be guided by the evidence on each side. The works were in several respects deficient; and regarding the unstamped meters, the evidence would show that the Corporation might have to stamp every one, at a cost of £931. Counsel, in conclusion, dwelt at some length on the point of the allowance of 10 per cent.; asserting that there was nothing in the Purchase Act entitling the Company to claim it. This 10 per cent., which was mentioned in the Lands Clauses Act, was only to give indemnification for damage done; but some way by which the Company were damaged must be found before anything of the kind was allowed. It was because the Committee did not intend to allow the 10 per cent. that they granted the Company the cost of re-investment. If the Company had proved further damage, the Court could have allowed it. But no claim for damage had been advanced; and therefore nothing could be allowed.

Wednesday, Sept. 28.

Mr. Charles Hunt, examined by Mr. BALFOUR BROWNE, said he had visited the works of the Company; and when in Morley he made himself familiar with the depression in trade there—the fact that collieries were being worked out, and that the electric light was being substituted for gas. As to the retorts, he allowed 10 per cent. for those under repair and contingencies, which would leave a productive capacity of 652,000 cubic feet per 24 hours. This figure was based on the actual production for mouthpieces as given him last winter by the Company's officials. It was fully 100,000 cubic feet in excess of the maximum daily make hitherto. There were two exhausters, one of 15,000 and the other of 30,000 cubic feet capacity per hour. These were to some extent in duplicate, but not fully so, as regarded the heaviest winter make. They were driven by one engine, the duplication of which, as with the

exhausters, was necessary. The steam-boiler should also be duplicated. It was not sufficient for the boiler and exhausting machinery to be equal to the maximum requirements, because if at the time of the heaviest manufacture a breakdown occurred, serious loss might result. The scrubbers and condensers also were insufficient for the present make, and required supplementing. The purifiers, six in number, were each 16 feet square by 4 ft. 6 in. deep; four being for oxide of iron, and the other two for lime. They were insufficient for the present maximum production, and therefore clearly incapable of purifying anything like the 652,000 cubic feet of gas daily which the retorts could produce. There ought to be 0.6 foot of superficial area for each 1000 cubic feet passed through per 24 hours, for each purifier; and on this basis they would be about 25 per cent. deficient. There were three gasholders. The largest had a capacity of 500,000 cubic feet, and was prepared for the addition of a third lift, which would increase its capacity by about 50 per cent. One—of 32,000 cubic feet capacity—was so small as to be practically useless. The third—of 360,000 cubic feet capacity—was 30 years old, and therefore near the end of its life. The aggregate capacity was 890,000 cubic feet, or nearly 1½ days' maximum production. The usual quantity was 1½ days' production. Some portions of the works were in excess, while others were too small. The parts should all be of about the same capacity, in order that all might be made available. Some of the retorts were useless, because other apparatus did not correspond; so that the capital represented by the excess retorts was dead. To bring the works all into line would involve considerable sacrifice of existing plant. There was not nearly sufficient storage for coke. Under certain circumstances, where the demand was steadily increasing, and where one could bring the whole into line without sacrifice, excess plant might be looked upon as insurance. In the present case, to utilize the excess the purifiers would have to be very much larger than now, and more room provided for scrubbing power; and, the area being limited, this could only be done by sacrificing the small gasholder. Therefore in this instance the excess capacity could not be regarded as insurance, or giving security; it was waste. The demand for gas seemed to be decreasing, so that if the present excess works were a burden on the undertaking the burden was likely to be increased. The reconstruction of the works he referred to would involve a sacrifice of this other plant, the capital cost of the reconstruction would be a burden on the present revenue, and the plant sacrificed would have to be paid for out of revenue. The return of unaccounted-for gas—which included that used at the works, estimated at 1½ per cent.—had in the last few years much increased; it having been a little over 11 per cent. from 1890 to 1896, while in the past three half years it averaged 13.54 per cent. This loss represented about 400 cubic feet of gas per ton of coal carbonized, which was a serious item, and largely neutralized the good results the Company had obtained in carbonizing. Either the mains and services had been allowed to fall into a leaky condition, or mining had caused an increasing amount of disturbance. If the collieries were less worked than formerly, the mains and services were evidently becoming leaky, and sufficient money had not been spent on them. The total length of mains was 36,313 yards; 11,120 yards being 3-inch or under, and 4483 yards only 2-inch. The latter was not suitable for distributing, save in exceptional cases. A prudent manager would replace all the 2-inch mains by others of not less than 3 inches diameter, which would tend to reduce the unaccounted-for gas by lowering the pressure. The other mains should be examined; and, having regard to the leakage, he believed many would be found defective. The Company had been in the habit of repairing their meters themselves, but not re-stamping them afterwards, as was required by the Act. There must therefore be a large number unstamped. The cost of stamping, including removal, refixing, &c., was about 5s. per meter. He calculated the deduction necessary to make good deficiencies of plant as follows: Additions to purifiers, £1700; boiler power and exhausting machinery, £505; condensers, £350; scrubbers, £500; and £657 the cost of laying 4383 yards of 3-inch main, at 3s. a yard, in lieu of the same length of 2-inch main, which would be of no value to take up—making a total of £3757. This, in his opinion, was the sum necessary to bring the works up to a condition to make the dividends safe. The cost of stamping 3684 meters, at 5s. each, would be £921, which, with the £3757, made £4678 to be deducted from the capital sum representing the value of the works. In dealing with the revenue account, he took the year to June 30, 1898. The last half year was a bad one for the Company; but he thought it best to use the most recent figures available. The balance of revenue account in that year was £4521 8s. 5d., or less debenture interest, £134 6s. 11d., £4387 1s. 6d. The total sum the Company could divide was £3380; so that there was an apparent surplus of £1007. The next matter was one that ought to have been in the working expenses, but was not. If it had been, it would have decreased the balance and consequently the apparent surplus. He thought a fair amount to allow for repair and maintenance of mains, pipes, fittings, and apparatus was 5d. per 1000 cubic feet sold, which included inspectors but not meters. The amount actually spent was 2.21d.; and the difference—2.79d. per 1000 cubic feet on 87,344,000 cubic feet sold—worked out to £1015, which, with £105, being 3 per cent. on £3500 undivided balance, made £1120 to be set against the apparent surplus of £1007. There was thus a deficiency of £113. The undivided balance last June was £5668, or, less the half-year's dividend, £4178. Allowing £678 to be carried forward, gave the £3500. Having regard to the falling off in the consumption of gas and in receipts, he should say this was certainly not a well-secured undertaking. Moreover, the future expenses would probably be increased, because the price of coal had advanced and miners in Yorkshire were asking for a further increase of wages. To increase the price of gas was at best a most unsatisfactory way of recruiting revenue, and should be resorted to only in exceptional circumstances—not in face of a decreasing revenue and competition from the electric light. Witness referred to the increase which had occurred over a period of years; but he pointed out that the increase took place in the early years, and had now ceased. He should say it would be difficult to maintain the present consumption. He did not think there was a large field for prepayment meters in the Company's district; but even if a considerable number were used, it would not add much to the business. Prepayment meters did not always pay. At Manchester, they did not under these circumstances. He thought a full and fair price would be 25 years purchase of the maximum dividends payable, less the amount to be taken off for making good the deficiencies. Applying this figure to the maximum dividends (£3380) gave £84,500, which, less the cost of



making good deficiencies in works and of stamping meters (£4678), left £79,822 as his estimate of the full value of the works. The Corporation under the Act would take over the debenture and loan capital. The allowance for re-investment he ignored altogether.

Cross-examined by Mr. PEMBER: He did not think the retorts could make 7000 cubic feet of gas per mouthpiece. They were generator retorts; but if converted into the regenerative system, they could produce that quantity or more. When at the works, he inquired what the highest make last winter was; and it was on this information that he arrived at their productive capacity. He was not aware that during last winter the Company had 14 mouthpieces on, which were only temporarily and partially used. The exhausters were not in duplicate for the heaviest make; but he did not know that there had been a shortness of gas. There was always a danger of one breaking down. It would be an extraordinary thing, but if it did happen to the largest one, the remaining exhauster capacity would be inadequate. Except in their size, he saw no sign of inefficiency in the purifiers. He did not test the gas. There ought not to be more than two changes a week in a purifier, if the oxide was in fair condition.

Mr. PEMBER: As to storage, are you aware that all the coke sold is sold forward by contract, and away from the town?

Witness: No. It depends on the conditions of sale as to what storage is necessary.

You said that to bring the works into line would involve the sacrifice of the small gasholder?—Yes.

I thought you suggested that it was of little use?—Of little use for gas storage; but it would involve a sacrifice of money to get rid of it. It cost money to build, and that you would throw away.

Are you under the impression that Morley is going to decay?—I am of opinion that the gas consumption is not going to increase. In the recent parliamentary proceedings, I said there would probably have to be immediate extensions of the gas-works; but then the Corporation had not the information they now possess. The unaccounted-for gas has grown 4 per cent. in the last three or four years. The figures in this respect for the past twenty years appear to show a fairly steady improvement, down to 1891 or 1892. If the unaccounted-for gas is dependent on mining operations, that seriously affects the prospects of the Company.

But our income has been earned in spite of all these things?—Yes; but I am dwelling upon the increase in the unaccounted-for gas.

But I put it that the increase is not what you suggest—that for the four years up to last year it is only 10 or 11 per cent., having five years before been as much as 11·87 per cent.?—What I suggest is that if it was possible during a period of four years to keep the unaccounted-for gas down to 10 per cent., it ought to be possible to maintain it at that figure.

Anything we did to stop the leakage would be to our advantage?—Yes.

We should have less gas to make to supply the demand; and it would be pecuniarily to our advantage?—Yes.

Mr. BALFOUR BROWNE: The only question is that it would cost money to do it.

Witness, in further examination, could not say whether the expenditure to secure the stoppage of the leaking would be greater than the saving.

Mr. PEMBER: With regard to the meters, have you heard that anybody has expressed discontent with the condition of them as they stand?

Witness: No.

I suppose the Corporation at any time could have insisted on meters being tested?—Yes; or any consumer.

What led you to suppose all the meters were unstamped?—We have no other information.

Mr. PEMBER (to the Umpire): What I am told is that half the meters were bought as new ones, and bought stamped.

Further cross-examined: Prepayment meters were being adopted in most large towns, including Birmingham; but in Birmingham they were proceeding very cautiously with them. He thought the Morley Corporation, when applying for their Purchase Bill, were under the impression the Company were more prosperous than was the case. He agreed that the Company had paid income-tax in error; if they had not done so, £151 would have been added to the profit. Money spent on new mains should come out of revenue, not capital; and the same with retorts. If there were 210 additional consumers last year it would not look like a decaying concern. In the Stourbridge case, he asked for 31 years' purchase; but there the income was progressive. He held that the two cases were not similar.

Re-examined by Mr. BALFOUR BROWNE: Whatever was the Company's method of disposing of the coke, their storage was absolutely incapable of dealing with it. If the £151 income-tax was improperly paid, it ought to go to the balances divisible among the consumers, not to the Company.

By Mr. CORBET WOODALL: If the leakage was excessive, the consumers were paying too much for their gas. He should look at the small mains and small services first to discover leaks.

By Mr. NEWBIGGING: The purifiers could be enlarged within the present house.

Mr. Hemingway was re-called; and, in reply to Mr. PEMBER, he said the new services in the year to June, 1898, numbered over 200.

Mr. W. A. Valon, examined by Mr. FRANK BALFOUR BROWNE, said that the works were in very fair order, but were not sufficient in general particulars for what was required of them. He estimated that to put the works in an efficient state would require £3480; and he adopted the figures of £657 for distributing plant and £921 for stamping meters, as combined in Mr. Chester's valuation, which made £5058. He handed in a table showing the reduction in gas-rental in the year 1898 over 1896 and 1897. In the year ended June, 1896, the gas sold was 92,869,800 cubic feet, and the gas-rental £9947 17s. 2d. In the year to June, 1897, the gas sold was 90,251,500 cubic feet, and the total rental £9685 2s.—showing a decrease on 1896 of £263 15s. 2d. In the year to June, 1898, the gas sold fell still further to 87,344,000 cubic feet, and the rental to £9381 11s. 1d.—or a further decrease on the preceding year of £303 10s. 11d. Thus the loss in 1898 over 1896 was £566 6s. 1d. The business of the Company at present was therefore going backwards. This was mainly due to bad trade, and to a great many mills using their surplus plant to produce the electric light. In his valuation he had taken the figures for the year to June, 1898. The gross profit was £4521 8s. 5d., from which he deducted £134 6s. 11d. interest on debentures, £105 interest on accumulated profit, and £1015 7s. 5d. in respect of additional expenditure required to bring the cost of repairs, maintenance, and renewal of works and mains to 5d. per 1000 cubic feet. This gave the maintainable profit as £3266 14s. 1d. The maximum dividends payable being £3380, a deficit was left of £113. Applying to the maximum dividends the multiplier of 25, which he held to be fair and liberal, produced £84,500; and this, less £5058 for deficiencies in works and plant, gave his final figure of £79,442.

Cross-examined by Mr. BAGGALLAY: Generally the works were insufficient for the make though they were meeting present demands, which he did not think likely to increase. The works also had produced maximum dividends for a great number of years, and provided a surplus.

Mr. BAGGALLAY: Do you know of any case whatever of a gas company, serving a district with a population of 24,000, and having a sale of between 80 and 90 million cubic feet of gas, who, having paid maximum dividends for a great number of years, has fallen behind?

Witness: I cannot quote any particular case at present; but I do not know that this applies to the present Company.

Mr. Charles Gott, in reply to Mr. BALFOUR BROWNE, said the staple trades of the district were woollen-cloth, coal, and stone. The first was very much depressed; and coal was not being produced so actively as formerly. The number of empty houses was increasing; being 92 in 1881, 169 in 1891, and 302 in 1898. He handed in a list of twelve mills which had installed the electric light for themselves; and there were also a number of important premises which had now adopted electricity. The present site of the gas-works was small, and owing to its surroundings could not be enlarged. The works, plant, and apparatus were all old; and if there should be a material increase in the demand, the Company must abandon their present site and go to a new one. Under these circumstances, the Company could only carry on business at a disadvantage, as compared with one having more modern works. In his valuation, he took 25 years' purchase of the maximum dividends, which produced £84,500; and he then deducted the amount required to be expended to supply deficiencies, which he estimated at £5000—making his final figure £79,500.

Cross-examined by Mr. PEMBER: Despite the depression, Morley was a prosperous borough, and had been rapidly growing in population.

In re-examination, witness said that, though the town was prosperous and the Company was a sound one, he still thought 25 years' purchase good value.

Mr. Charles Beevers, of Messrs. Beevers and Adgie, chartered accountants, of Leeds, detailed a list of eight mills which, in various half years, as compared with the half year to June, 1898, had decreased their payments for gas from £302 18s. 6d. to £151 11s. 9d.

Cross-examined by Mr. PEMBER: He had not the amounts for the intermediate half years. The inference he drew from the figures was that the falling off was due to the electric light.

Mr. BALFOUR BROWNE then put in a resolution, under seal, of the local Co-operative Society, who had paid the Company as much as £104 in a half year for gas, saying they were going to give up using it in favour of electricity.

#### Thursday, Sept. 29.

At the commencement of the proceedings to-day,

Mr. PEMBER informed the Umpire that the Secretary of the Company had ascertained that 2082 meters had been purchased within the last ten years, duly stamped according to the Act; leaving 1604 which might or might not be stamped.

Mr. BALFOUR BROWNE said he would accept the figures without the Secretary being re-called. The learned Counsel then proceeded to address the Umpire on behalf of the Corporation. He said the two questions to be considered were: What was the maintainable revenue? And how was the revenue secured? The better the security for an income, the smaller the interest people would lend at, and therefore the higher the number of years at which the income must be capitalized. In this case, the income could not exceed £3380; and though this amount had been earned to date, the works in any particular year might be in such a condition as to make immediate expenditure necessary. In such an event the £3380 would not be maintainable. It might be also that the revenue in a particular year was due to a peculiarly favourable contract for coal, or to very high prices for residuals. In this case the accounts would have to be adjusted. Here it was clear the works were in a defective condition, because in 1889 they obtained power to raise £40,000 with which to improve and extend them. The capital had not been raised; but that was because it was subject to the auction clauses, and would not benefit the shareholders more than other members of the public. It was admitted by the other side that there should be a deduction of £400, and that the revenue needed adjustment in connection with the expenditure on renewals and repairs; yet neither of these things had been done. Instead of making an adjustment, they fell back on the big balance they said they had. But this balance was not theirs, for they ought to have absorbed it by reducing the price of gas long ago. The £3380 was not maintainable. In order to maintain it, large sums would have to be expended on the works, and a considerable further amount on repairs. How was the income, if it could only be earned by the expenditure of this money, secured? It had been said that this was an opportune time to sell. If it was opportune for the Company to sell, it might well be said that it was inopportune for the Corporation to buy. It was opportune to sell because the shareholders had obtained all they could obtain; the maximum dividends being now paid, and all arrears cleared. If the Company had earned anything more, they could not have divided it; and so they had nothing to expect from the future. The only benefit of a surplus would be to secure their £3380. Strictly speaking, he thought the Company could be made to divide every penny of revenue. But the Corporation had not insisted on that; and out of the £4000 odd of balances, they had only taken £3500 as money to be devoted to reducing the price of gas. Regarding the prospects of the Company, on which the security of the income depended, he held that they were distinctly not good. The income was going down; there being diminutions in each of the last four half years. It was urged that this was only a temporary fluctuation, such as had occurred before; but it was more permanent than that, because they heard that mills were being closed or working half time, and that the coal trade was not prosperous. Supposing the income were secured in the best possible way, no one would think of giving even 28½ years' purchase; and certainly not in the present case, when, coupled with the preceding

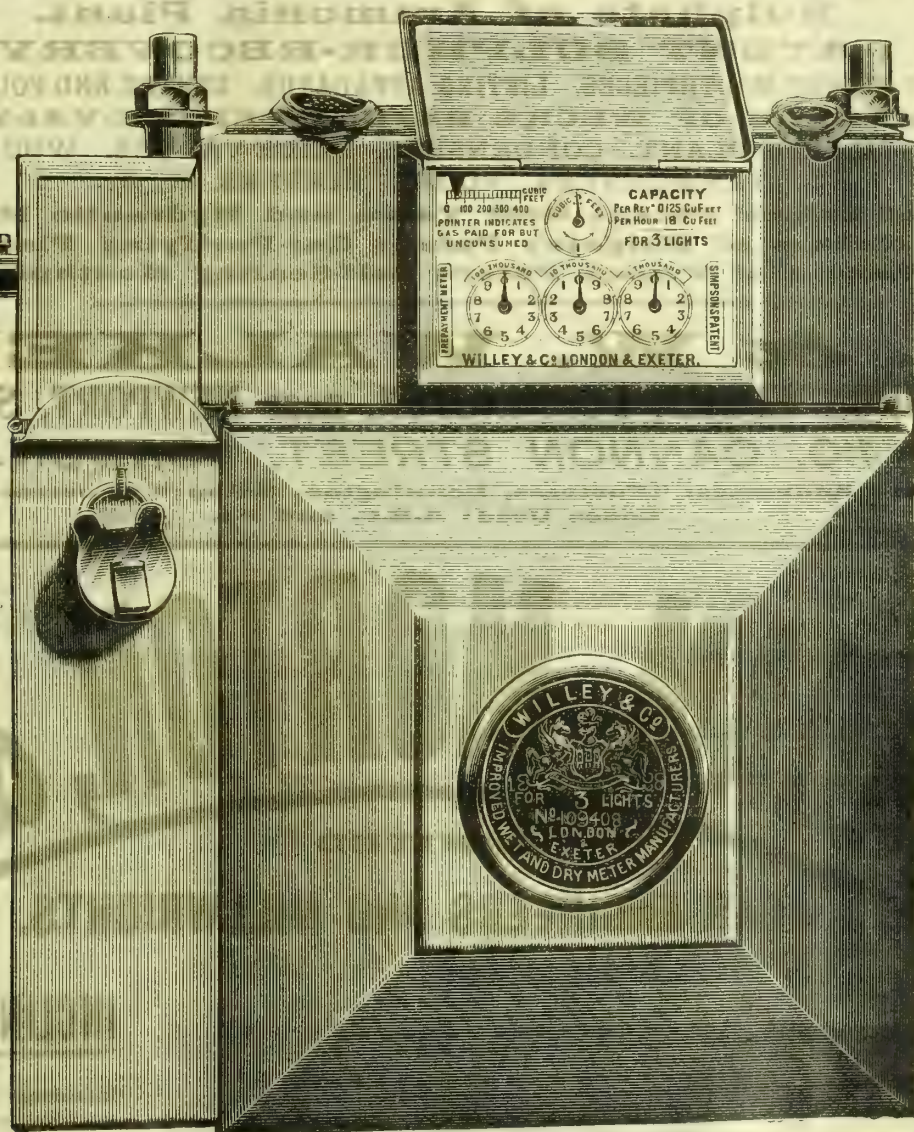


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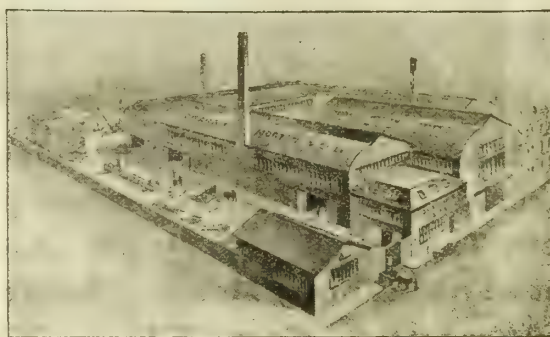
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facts, they found the electric light being adopted in the mills—not apparently by using the gas of the Company, but by utilizing surplus plant. Then the income-tax, if it had been illegally paid, belonged to the consumers. It would amount in the aggregate now to between £4000 and £5000, which sum was really due from the Company. This matter was difficult to deal with; but if the Company had been continuing in existence, and the fact had reached the Corporation, they would have had to make the Company refund this sum. That it was illegally distributed, was certain. They were also told that there were now more uninhabited houses in Morley than ever before. It was said that if the surplus were wiped out by further expenditure on maintenance and renewal, the Company could raise the price of gas. Mr. Chester, however, declared that it would be suicidal to take this step in face of competition. Regarding the allowance for re-investment, the Act said it was to be the reasonable expense incurred in re-investing the considerations paid for the concern. The actual expense was 1 per cent.; and this was all they were entitled to, because the section said nothing about compensation for loss or delay in finding an investment. As to the claim for compulsory purchase, he contended that if the Committee of the House of Lords intended to allow the Company the full 10 per cent., it was their bounden duty to have had it expressed on the face of the Act, just as they had stated that the Company were to be allowed the expense of re-investment. It was true that Lord Rookwood expressly asked whether the Lands Clauses Act carried the 10 per cent., and that Mr. Squarey for the Corporation said it did, and that following this the Lands Clauses Act was inserted. But if 10 per cent. was to be allowed, it would have been specified, as was the fact that the Company were to be reimbursed their parliamentary expenses, though these expenses were not even mentioned in Committee. The 10 per cent., or any portion of it, could only be allowed when loss or damage was established, not for compulsion; and there was no loss or damage in this case. Therefore, after allowing the cost of re-investment, he asked the Court to give the Company nothing in respect of the 10 per cent. claim. In conclusion, the learned Counsel briefly alluded to the conversion, which he said was absolutely illegal.

Mr. PEMBER, on behalf of the Company, referred at length to the conversion of the mortgages of £2800 and £1800, the temporary loan of £1800, and the reserve fund and floating balances. He said that the possibility of treating them as the Company's valuers had treated them, was an element of value. The Company could effect this conversion under section 56 of the Companies Clauses Act of 1845, which was incorporated in the Morley Gas Company's Acts of 1848 and 1868. A conversion had been effected once; and no one ever suggested that it was illegal. It could therefore be done again, with regard to any capital raised under these two Acts. With capital raised under the 1889 Act, it was different, because the auction clauses were in that Act; but these conversions were of capital under the earlier Acts. The learned Counsel proceeded to refer at length to the sections relating to the conversion of capital; asserting that they amply justified the Company's valuers in the course they had adopted. Therefore the legal possibility of conversion was an element of value which the Court could not disregard. It was no answer to say that the Company had not done it hitherto—possibly because they considered they had certain moral duties to their consumers. He acknowledged no moral duty to the consumers, nor any duty not to convert, if he had the power, and it was to his advantage. He claimed not only that he had the right to make these conversions, but that the advantage would rest with him; and this being so, the Court was bound to give effect to these potentialities. As to the reserve fund, he would grant that he ought to have borrowed money for the purpose for which he had used the fund; but this had nothing to do with his condition in the future. It would be merely a dereliction in the past, with which the Umpire had not to deal. He could still borrow the £4600, and turn it into 7 per cent. capital; and what was true of this was true of the balances also, because they were invested in the business, the business had had the benefit of the money; and the utmost that could be said was that the Company ought to have raised the amount and put it into the concern. Well, he would raise the money, and then he would convert it, as he was entitled to do; the surplus allowed plenty of margin. He should then have had the full benefit of the capital expenditure of this amount, and would be able to deal with this capital expenditure as the Company's Acts and the general law permitted. Here, again, the fact that he could effect this operation was a fair element of value. They had to consider whether the Company's income would stand these conversions. As a matter of presumption, they had the strong fact that the Company had paid maximum dividends for the last twenty or thirty years, and that in the same period they had paid out of income all arrears of dividends, which must have meant a large sum. They had even paid income-tax in addition, filled the reserve fund, and accumulated large balances. Could any facts point more directly to stability? As to the income-tax, even if it were an illegal thing, as Mr. Balfour Browne said, the Court was not in a position to punish the Company—to say whether an action would lie against the Company or the shareholders to recover it, which was very doubtful. The Umpire's business was with the future—to state whether or not the possibility of paying the £4078 obtained in the past was likely to be continued. There were only two things that were likely to interfere with this possibility—viz., the electric light and the decay of Morley. In general, he thought they might say the electric light had injured no company except The Gaslight and Coke Company, whose case was very exceptional. There was no evidence whatever that the Company had lost by electricity, though it would have been easy for the Town Clerk to have given particulars as to the supply of the light. The use of gas multiplied from day to day, and it was that which prevented electricity having any very great effect on it. There was room for both. Even if electricity did hit the Company a little, the loss could be counterbalanced by the addition of 1d. or even 2d. to the price of gas, which, the price being so low, would cause no one to abandon gas or use less. Concerning the decay of Morley, there was the evidence of Mr. Gott (who was the nearest approach to a Morley man they had had) that the town was prosperous, though it had certainly suffered ups and downs. Still, the accounts showed that, taking the figures for the years 1895, 1896, and 1897, in each case ending with December, the profit had risen from £4286 to £4536, and then to £4900, which gave an increasing surplus amounting in 1897 to £1291. To this he was entitled to add the income arising from the investment of the reserve fund at 3 per cent.

(£138), also the income-tax (£151 a year) which had been paid in error. This made the total surplus £1580. All through the case, he had forgotten to add the interest on the temporary loan of £1800, which the Company ought to have raised, and could have raised, at 3 per cent. This would increase the surplus to £1634. Against this, he proposed to charge the three figures of £166, £126, and £406, which left the net surplus at £936. This sum, capitalized at 3 per cent., gave an amount of over £30,000 which would stand between the Company and any difficulty in paying the maximum dividends of £4078. Counsel did not agree that anything like £5000 ought to be spent on the works to make good deficiencies; but supposing he charged the surplus with the interest on that sum, it would only be reduced by £150. To destroy the position of the Company, the Corporation valuers adopted as a basis the figures for the non-natural year to June, 1898, and asked the Court to add £1015 to the Company's annual expenditure on repairs—that was to say, to calmly increase the working expenses by 25 per cent. Even if he accepted Mr. Chester's figure of £647 as a deduction, there was still a balance of £289, which would meet the £150 interest on the £5000, and leave £130 or £140. Then it was said the 2-inch mains were inadequate, and should be replaced. They no doubt served small property; but he had never heard they were not sufficient, except by a reference to the unaccounted-for gas, which was said to be increasing. That, however, was not the case, because the leakage was higher a decade ago, and had fluctuated considerably since. Further, if expenditure were incurred in preventing leakage, it would be remunerative, because gas would be saved. Regarding the 10 per cent., Counsel remarked that it did seem a little ungracious on the part of the Corporation to say that if the Parliamentary Committee intended the Company to have it, it was their bounden duty to see it was so stated in the Act. The Committee asked the Corporation Counsel whether the Lands Clauses Act covered the 10 per cent.; and on being told that it did, they passed the clause with the Lands Clauses Act in it. It was therefore clear that the Committee intended to allow it in full. Then as to what the meaning of expenses of re-investment might have been in the minds of the Parliamentary Committee, Counsel was ignorant; but he put it that the loss of income arising from capital lying idle for two or three months was part of such cost. On the whole, therefore, he insisted that the main position taken up by the Company was untouched. In every view of the situation, they had an ample surplus above what would be required to pay the £4078 practically in perpetuity, even if they did spend the £5000 suggested. Surely it showed that the Company occupied a unique position, and gave him good ground on which to defend the multiplier of 30.77. To say this number of years had never been claimed before, was not absolutely true, though he did not know how often it had been. If the Umpire was of the Company's opinion, he would agree that the undertaking was in a very high position of stability indeed; and having regard to this fact, and considering that every year the value of money was likely to increase, Counsel held that 30.77 years' purchase was not any too much to ask. This, used as the Company's witnesses applied it, and adjusting the other figures as they suggested, would give the sum of £133,688 as the value of the concern.

The proceedings then terminated; the Umpire reserving his award.

#### SUFFOCATION BY GAS IN BELFAST.

Last Wednesday morning, a young woman named Susan Harper, a servant employed at Hinkley House, Maryville Park, Belfast, met with her death under very melancholy circumstances. She retired about the usual hour, in good health, on Tuesday night. On the following morning she failed to rise at the time expected, and it was thought by her mistress that she had overslept herself. She was then called, but no reply having been made, the door of her apartment was opened, when it was discovered that she was lying dead in her bed. In the room there was a strong smell of gas; and the conclusion arrived at was that the girl had been suffocated. A medical man was speedily summoned; but all he could do was to pronounce life extinct. An inquiry into the matter was held on Thursday by the Coroner (Mr. E. S. Finnigan). Evidence of identification having been given, Mr. T. K. Patterson, the employer of deceased, described the circumstances under which the body had been found. He said the room was 7 ft. 3 in. long, 6 ft. 1 in. wide, and 7 ft. 6 in. high; and it was not very well ventilated. The gas-jet was found to be half turned on. He believed the deceased understood turning the gas on and off. Dr. J. Tennant said he had made a post-mortem examination of the body, in conjunction with Professor Lorraine Smith. He saw no marks of violence, and nothing to account externally for death. The body was well nourished, and all the organs were healthy. The blood showed evidence of gas poisoning, which was the cause of death. In answer to questions put by the Coroner, witness said he knew the poisonous element in the city gas was carbon monoxide. It was present in small proportion in ordinary gas, and large proportion in water gas. In a mixture of the two gases, it was found in considerable proportion. From the post-mortem examination, he could see that deceased had been exposed to a fatal mixture of water gas and ordinary gas. Such a mixture was much more dangerous than ordinary gas alone. The Coroner asked whether ordinary gas would be sufficient to cause death in a small room without the other gas. Witness replied that it was very difficult to answer the question without knowing the exact amount of the ventilation and of the escape of gas. He had heard of persons being exposed to ordinary gas and not being poisoned. There was a much greater chance of death ensuing where there was a mixture of the gases. The Coroner said there was no doubt death was caused by gas poisoning. The Jury returned a verdict in accordance with the medical evidence, attaching no blame to anyone.

At the Health Exhibition in connection with the congress of the Sanitary Institute recently held in Birmingham, noticed last week, the following obtained silver medals: Messrs. Burt, Boulton, and Haywood, for their exhibits of coal tar and ammoniacal liquor products; the Cannon Hollow-Ware Company, for enamelled cast iron; Messrs. J. Defries and Sons, Limited, for a Pasteur-Chamberland filter.



## EDINBURGH AND LEITH GAS COMMISSION.

## The Price of Gas—A New Market for Coke.

A Meeting of the Edinburgh and Leith Gas Commission was held on Monday, the 3rd inst., for the purpose of fixing the price of gas for the ensuing year. Bailie KINLOCH ANDERSON presided.

The TREASURER (Mr. John S. Gibb) submitted estimates of income and expenditure, as follows—Expenditure: Coal, 149,500 tons, as compared with 155,240 tons last year, £79,550, as against £83,490. Gas oil, 2000 tons, as compared with 1373 tons, £6250, as against £4262. Purifying materials, oil, water, &c., £8200, as compared with £7995. Salaries and wages at works, £39,880, as compared with £39,868. Repairs of works and plant, £11,943, as compared with £11,786. Total manufacturing charges, £145,823, as compared with £147,403; distribution of gas, £24,100, as compared with £23,656; management, £9180, as compared with £8258; feu-duties, rates, and taxes, £9800, as compared with £6899; pensions and allowances, £1150, as compared with £1013; law expenses, £50, as compared with £10; accidental damages, £200, as compared with £170; discounts, abatements, and bad debts, £4600, as compared with £4537. Fixed charges: Annuities, £34,560, as compared with £34,703; interest, £9650, as compared with £6768; expenses of mortgages, £600, as compared with £252; annuities sinking fund, £8000, as compared with £7706; and mortgage sinking fund, £2760, as compared with £1944. Total expenditure, £250,523. Revenue: Sale of gas, 1,578,362,000 cubic feet, as compared with 1,557,256,300 cubic feet last year, £232,109, as compared with £228,061; coke, £5800, as compared with £5613; tar and ammoniacal liquor, £13,650, as compared with £12,966; waste lime, £20, as compared with £29; rents of properties and transfer fees, £370, as compared with £377. Total revenue, £251,949, as compared with £247,047 last year. Estimated surplus, £1426. The Works Committee, having considered the estimates, recommended that the price of gas be fixed at the existing figure of 3s. per 1000 cubic feet, subject to the present rates of discount.

Bailie KINLOCH ANDERSON moved the approval of the recommendation. He said they had, in Committee, gone very fully into the estimates prepared by Mr. Gibb. There were some increases in the expenditure. They would observe that general establishment charges were up something like £800. He might say that this included the expenses in connection with the several visits which two or three deputations of the Commissioners had made to England and the Continent. They expected that this increase would more than cover the outlay in that direction. In rates and taxes there was an increase of something approaching £3000. This was mainly on account of the very large surplus—over £14,000—which they had last year, and on which they had to pay not only income-tax but poor rates and city taxes. This was the penalty of their success. There was a slight increase in allowances during the pleasure of the Commissioners. They had several of their staff who had been superannuated—he was pleased to say not many through accidents, but from long service—and they had done what was within their power, in giving them some little contributions to comfort them during their declining years. The estimate under this head had thus been raised from £563 to £700. In annuities there was a decrease. They had redeemed a number of annuities during the year, as the result of which they required £142 less than last year to pay them. This was not, however, the first year in which they had redeemed annuities. As to interest, there was a very large increase—from £6789 to £9650. This was entirely due to their recent purchase at Granton. They took possession of the land early in August, and interest ran from that time. As they knew, they had obtained a temporary loan, at a very moderate rate of interest, till Nov. 11. They would then either issue mortgages, or, which was perhaps more likely, they would get money from the Corporation, at a low rate of interest, to pay the debt. The interest charged here was till May 15 next. The expenses of mortgages were increased considerably. They had estimated on the possibility of their issuing mortgages. In any case, a considerable number of mortgages fell in at May, and would require to be renewed; so Mr. Gibb had wisely made a wide provision for that. The mortgage sinking fund was considerably increased, in view of their issuing mortgages instead of borrowing from the Corporation. In the event of their borrowing, the loan would be repayable in thirty years. If they borrowed from the Corporation, the sinking fund would therefore be increased; but, on the other hand, the expenses of mortgages would be decreased. Taking all in all, they would be about the same, either way. On the revenue side of the account, they had reckoned on an increase of over 20 million cubic feet of gas. This was a very moderate estimate, and they expected that it would be attained. As to residual products, there was a slight increase in the sum to be received for coke. It was the first word he should say in respect of their visit to the Continent, that he thought they had opened up, or possibly might open up, a market for coke there, which would be a very great benefit to them, as they would not be obliged, as they were at certain seasons, to dispose of their coke for very little. He was not at liberty to say to what country they would send it; but if they could complete the arrangement which they anticipated, the yield from coke would be very different in the future from what it had been. Tar and ammoniacal liquor were estimated to yield about £700 more. He was very hopeful that from this source also they would have a much better result. Waste lime was the bugbear of every gas-works. In their recent visits, they found that many places had done away with lime altogether, because they could not get quit of it, and had adopted oxide of iron instead. But they knew that with oxide the purification was not so efficient; and they had therefore kept to lime. Mr. Herring estimated that he would be able to get quit of the waste lime without loss, which was very satisfactory. It was pleasing that they were able to submit estimates which enabled them to continue the price of gas at 3s. per 1000 cubic feet, considering the large increase they had in their expenditure. He brought it before the Works Committee, and he repeated it there, that they had power to utilize the surplus which they carried forward, and which Mr. Gibb always regarded as floating capital. It amounted to £18,000. By using this surplus, they might have been able to reduce the price of gas by about 3d. per 1000 cubic feet. But he thought they would agree with him that this would be a very unwise thing to do at the present time. The larger their floating capital was, the less they had to pay for an overdraft at the bank. Indeed, it was

desirable, for the proper working of the undertaking of the Commissioners, that their floating capital should be nearer £50,000 than £18,000. It was, he thought, their duty, instead of expending this money, to try to increase it. In any case, they saved a good deal by having the money in hand.

Mr. J. JAMIESON seconded; and the motion was agreed to unanimously.

## PROPOSED NEW GAS-WORKS FOR GLASGOW.

At a Meeting of the Glasgow Corporation Gas Commission last month, a report was presented by Mr. W. Foulis, the Gas Engineer to the Corporation, as to the construction of new gas-works to meet the rapidly increasing requirements of consumers within the city and the suburban areas supplied by the Corporation, and the extension of the residual products works at Dawsholm. The report stated that the question of acquiring additional ground for the purpose of gas-works extension has been under consideration for several years. The necessity for this is shown by the following figures: In 1874 the maximum consumption of gas in 24 hours was 9,162,000 cubic feet; in 1884, 13,700,000; in 1894, 22,853,000; and in 1898, 31,354,000. The annual consumption has increased in the same period from 1305 millions to 4800 millions. The existing works have been gradually extended in order to meet this increase in demand, until there is no further space for extension; and the acquisition of additional land can now no longer be delayed. The most suitable position for a gas-works is on the low-lying ground in the valley of the River Clyde. All the most likely sites in this locality were, therefore, carefully examined, and mining engineers were consulted as to the condition of the underground mineral workings—a consideration of the greatest importance, as a slight subsidence of the ground which would not prejudicially affect buildings of ordinary construction, Mr. Foulis pointed out, might produce serious defects in structures such as gasholders measuring over 250 feet diameter and 150 feet high, which must be maintained perfectly level, and the tanks thoroughly watertight. A number of sites were examined; and the conclusion ultimately arrived at was that the most suitable spot was the ground lying alongside the Glasgow branch lines of the Caledonian Railway between the Monkland Canal and the main line. The extent of ground which it is recommended should be acquired is about 98 acres on the west side and 12 acres on the east side of the Caledonian Railway Company's branch line—in all about 110 acres. Levels have been taken over the surface of this ground, and preliminary plans made to ascertain its suitability for the purpose of a gas-works. As already stated, the maximum daily demand is 31 million cubic feet. At the present rate of increase, in about 15 years it will be not less than 60 millions. The Dalmarnock works are very inconveniently situated; and appliances for effecting economy in the cost of production cannot be well introduced into these works. The difference in cost of manufacture as compared with the Tradeston and Dawsholm works amounts to not less than £9000 per annum. If the Dalmarnock works were closed, and the manufacture transferred to the new works, a saving of at least this amount would be effected. A portion of the ground at Dalmarnock could be retained as a gasholder station, and the remainder might be sold. It is proposed to design works which, when completed, will be capable of manufacturing 40 million cubic feet of gas per day. The quantity of gas made at the Dalmarnock works is 6 million cubic feet per day. Deducting this there would remain a producing capacity of 34 million cubic feet per day to meet increased demands. This is the minimum quantity which it would be advisable to provide for. The works would be constructed in eight sections, each complete in itself, and built from time to time as required. At the present rate of increase in consumption, the available producing power of the existing works will be completely exhausted within the next three years; and it will take at least that number of years after parliamentary authority is obtained before any new works could be ready for gas manufacture. If, therefore, the recommendations now made be agreed to, it will be necessary to get parliamentary authority in the ensuing session for the purchase of the ground, and for the construction of the necessary roads, railway sidings, and other subsidiary works. It will also be advisable to obtain power to acquire land at Dawsholm for an extension of the residual products works, with the necessary railway connections. The Committee, after deliberation and discussion, resolved that, before making any recommendation to the Corporation, a Special Sub-Committee should be appointed to consider and report on the several matters referred to in Mr. Foulis's statement, and that, with a view to the subsequent determination by the Corporation as to applying to Parliament in the ensuing session for authority to acquire the necessary lands, and to construct the proposed works, the Sub-Committee should report within a fortnight.

At a meeting of the Corporation on Thursday last, Mr. R. M. Mitchell, in moving the approval of the minutes, remarked that the report by Mr. Foulis was the result of several years' consideration by a man in whom they reposed complete confidence; and he did not doubt that it would, when the Committee reported, be very favourably considered by the Council. If the Committee's report was a favourable one, they would be able to go forward and seek parliamentary sanction for the scheme. The motion, after some discussion, was agreed to; approval of the report being delayed till the Sub-Committee's report is received.

**Wadebridge Water Supply.**—An inquiry into an application by the newly constituted Wadebridge Urban District Council for powers to carry out works of water supply has recently been held by Colonel Hepper, one of the Local Government Board Inspectors. It was explained that the scheme originated with the old governing body, the St. Columb Rural District Council, who proposed to spend £4000 in supplying St. Breock, part of the present urban district, with water. The Wadebridge Council desired, however, also to supply the Egloshayle portion of the district, and for this purpose wished to have the loan increased to £5000. Mr. G. Harris, the Engineer of the scheme, explained the plans, which included the construction of a reservoir, and said there was an ample supply of water for the whole district.



**THE PRICE OF GAS AT LEEDS.****Reduction Confirmed by the Council.**

The decision of the Gas Committee of the Leeds Corporation to reduce the price of gas to consumers within the city from 2s. 2d. to 2s. per 1000 cubic feet, and to consumers outside the city from 3s. to 2s. 10d., as from Jan. 1 next, came before the Council last Tuesday for confirmation.

Mr. LOWDEN, the Chairman of the Gas Committee, said he had great pleasure in moving the adoption of the resolution, because it meant not only a reduction to the consumer but that gas was to be brought down to a price at which it had never been before. [A VOICE: "No."] True, they knew as a matter of fact that gas at one time was charged to the consumer at the rate of 1s. 10d. per 1000 cubic feet, but reckoned on the same basis the charge from Jan. 1 next would be only 1s. 9½d. When gas was at 1s. 10d., there were meter-rents to pay; and there was no discount of 5 per cent. The success the Gas Committee had attained, indeed, was greater even than he had anticipated. It might be gauged by the fact that, during the years that gas was at 1s. 10d., coal was much lower in price than at present, the income from residuals was much greater, and the workpeople laboured twelve hours as compared with eight hours now. A few months ago, a resolution was proposed by an irresponsible member of the Committee without the consent of his colleagues for the reduction of the price of gas. The mover did not attempt to justify his proposition, because he was unable to adduce reasons why at that time a reduction should be made. As Chairman of the Committee, he (Mr. Lowden) had no alternative but to oppose the resolution; but the reasons he gave for doing so did not now exist. The position, in fact, was so different from what it was three months ago that the Committee had no hesitation in recommending a reduction. One of his reasons for opposing the former resolution was that then no one knew whether or not there would be a strike of coal miners. This alone was sufficient to cause them to stay their hands. Thanks to the moderation of the miners, as well as to the conciliatory spirit displayed by the coal proprietors, there was now not the slightest probability of a strike for some time to come. Apart from this consideration, the stock of coal at the gas-works was now 32,000 tons—nearly double what it was when the last coal strike took place. Moreover, they had purchased sufficient coal for their needs until Jan. 1, 1900; and it would be found that the cost per ton was not greater for the ensuing year than it had been for the last year. Again, there had been doubts with regard to their income from residuals; but luckily the market value of ammoniacal liquor had since advanced. Another item about which he had been concerned was the disposal of the coke. This had always been an important matter. At times coke had been a drug in the market. They had even had as much as 10,000 tons stacked; and it was only comparatively recently that they had been able to dispose of it. They had also succeeded in disposing of the whole of the surplus coke for the coming winter at a considerable advance over last year's price; and unless something unforeseen occurred, there would be no stacking. In the first six months of last year, the profits amounted to £1623; but this year they had reached £14,638. As soon as he knew this, he made up his mind that there should be a reduction in the price of gas. The reforms and alterations carried out on all sides had led them to believe that they would experience successful results; but in a business of 1½ millions of money, it was impossible to gauge with accuracy what the profits would be. It was sometimes said that the surplus should be applied to a reserve fund; for they employed methods of carbonization which might become obsolete. But it would be noticed that on March 25 last, they had actually a reserve of £31,258; and the sinking fund amounted to no less than £300,280. From this the Council would gather that the Committee were in a sound financial condition. He thought that probably the consumption of gas would be increased now that the price was lowered. It was significant that the only year since 1870 when any decrease took place in the sale of gas was the year when the price was advanced to 2s. 4d. But there were other reasons why an increase might be expected. There had, for instance, been great reforms in the laying of mains. And if any department had needed reform more than another, it had been this. There were at one time many mains altogether inadequate for the supply of gas. Now, however, the mains had been made large enough; and the consumers were able to get all the gas they required. As illustrating the character of the reform instituted, one had only to look at the fact that, instead of 162 pipelayers as last year, there were now 235 employed. As for the prospects of the undertaking, he considered them remarkably good. During the last six months, the Committee had sold 200 cubic feet more gas per ton of coal carbonized than ever before. Then there would be a reduction in the cost of carbonization on account of the new installation of inclined retorts at Meadow Lane. This installation was not intended to supplant existing methods. It was required by the gradual increase in the demand for gas; and an extension of it might be necessary in the future. Another reason why the consumption of gas was likely to increase was the encouragement which the Committee had given to the use of gas-stoves and coin meters. If they could encourage the use of gas-stoves, they would not only promote employment, but would also have the benefit of a purer atmosphere.

Alderman WALKER, in seconding the motion, said there was no reason to be afraid as to the future of Leeds. Within the past six months, they had laid mains in 12 miles of new streets, and had replaced 3½ miles of mains by larger ones.

Mr. BROWN, the "irresponsible member" referred to by Mr. Lowden, made a speech of some length with the object of showing that the Council could well have consented in June last to the reduction in price then proposed by him.

Mr. HENRY said he rose to support the resolution, and to offer one or two criticisms. He took exception to Mr. Lowden's statement as to the quantity of coal, pointing out that the Committee could not store sufficient to last three or four months; and even if that were possible, it would not be worth while. Mr. Lowden said that gas at 2s. per 1000 cubic feet would be cheaper than ever before; but he heard Mr. Lowden declare in that chamber in July, 1893, that gas sold at 2s. 2d. which was 18-candle power was no cheaper than gas of 19-candle power which was sold at 2s. 7d. As to the cost to them of 1-candle power, he was told by a responsible official—the Committee's Engineer—that it meant £20,000.

Mr. LOWDEN: That statement has since been withdrawn.

Mr. HENRY said he had no faith in engineers who acted on the principle of the "Vicar of Bray." He did not suggest that the authority he quoted had so acted; but he should require a formal correction in writing before he discarded figures given to him by a responsible official. He still held, therefore, that there had been a clear saving in that respect of £20,000 a year. The profit last year was £12,232; and the year before, £7000. But if they had been supplying gas of 19-candle power, the two years' profit would have been absorbed in one.

Mr. SMITH thought that people who used prepayment meters were entitled to more consideration. They ought not to have to pay 2s. 6d. for what other people obtained for 2s.

Other members having spoken,

Mr. LOWDEN, in reply, denied the correctness of Mr. Henry's figures as to the cost of an extra candle in the illuminating power. As to the additional charge for prepayment meters, he could furnish Mr. Smith with figures to show that the extra expense of collecting and book-keeping made this necessary.

The resolution was adopted.

**GAS AND ELECTRIC LIGHTING AT LOUGHBOROUGH.****Proposed Acquisition of the Gas-Works and Electric Lighting Powers by the Corporation.**

Subsequent to the public meeting of the Loughborough Town Council on Monday last week, the members sat as the General Purposes Committee to consider a report from the Gas and Electric Lighting Committee on the subjects referred to above. The Committee stated that they had entered into communication with the Gas Company with a view to obtaining the terms upon which they would sell their undertaking to the Corporation; but the Directors replied that the Company had no desire to enter into negotiations for the sale of their property. The Committee further applied for permission for an Engineer to inspect the works; so that the Corporation might name a price they were willing to give for the undertaking. But the Directors took the usual course of declining to give such permission. The Committee thereupon consulted a Gas Engineer with a view to obtaining his advice upon the advisability of the proposed purchase, and the value which would be likely to be placed on the undertaking in case of arbitration having to be resorted to. The Engineer visited Loughborough, and made himself acquainted so far as possible with the nature of the works externally, and also with the local circumstances which would have any bearing on the valuation, and had now advised the Committee thereon. He strongly urged the Corporation to take steps to purchase the undertaking. The Committee—in view of the fact that the borrowing powers of the Company were exhausted, and that they would shortly have to apply for an extension of their powers—believed that the present afforded a favourable opportunity of purchase which should not be missed. The Committee were advised by the Engineer, whose advice in this respect was confirmed by a Parliamentary Agent, that, in an arbitration under a Bill to purchase, the value fixed would not be such as to render the purchase a burden on the ratepayers. The Engineer said: "With the purchase price determined by arbitration, you may rest assured that you would not be called upon to pay an unfair sum; and although you could hardly expect to make much, if any profit, for a year or two, I am convinced that, with economies which I believe could be effected, such purchase would result in a very short time in considerable benefit to your ratepayers." The Committee, therefore, unanimously recommended the Town Council to empower them to take such steps as might be advisable to acquire the undertaking. In a Bill to effect this object, clauses could also be inserted giving the Corporation the powers required to enable them to establish the electric light. In any case the Committee were of opinion that some of the street lighting, as well as the lighting of public buildings and business premises in the centre of the town, might advantageously be done by the electric light. The Committee therefore also asked for authority to take such steps either by Bill or Provisional Order to obtain electric lighting powers. The report and recommendations were approved.

**THE FALMOUTH CORPORATION AND THE GAS AND WATER WORKS.**

A Statutory Meeting of the Falmouth Town Council was held yesterday week—the MAYOR (Mr. C. Deeble) presiding—to consider the question of the promotion of a Bill in Parliament for the purchase of the gas and water works.

The MAYOR, in moving the formal resolution, remarked that the period of ten years given by the Gas Company's Act in which the town had the option of taking over the gas-works, was about to expire; and he did not think they would be doing their duty if they did not give the ratepayers the opportunity of saying "Yes" or "No" to the proposal.

Mr. T. G. MEAD, in seconding the motion, said it had been ascertained that Penryn would not be likely to oppose the purchase of the water-works by the Falmouth Corporation. Negotiations had also been opened with the Water Company, and though no information had been received from them of their willingness to treat, it was not altogether unlikely that they might be able to agree with the Company, and avoid the cost of an opposed Bill. As to the gas-works, it was fortunate for the ratepayers, if they decided to purchase, that the rate of increased consumption fell off last year. From 1893 to 1896, the average rate of increase in the consumption of gas was 1,540,000 cubic feet; from 1896 to 1897 there was the remarkable increase of 3,234,000 cubic feet; but for 1897 to 1898, the increase was only 640,000 cubic feet. Such a drop in the rate of increase could not fail to have an influence on the mind and figures of the valuer. They were, he believed, all pretty well agreed as to the advisability of the Corporation obtaining control of the water supply. He thought also a majority of the councillors were in accord as to the wisdom of purchasing the gas-works. His advice to the ratepayers was that they should purchase both.

Mr. W. W. PHILLIPS contended that the ratepayers should have been consulted before an expert was called in or legal assistance obtained. No



member of the Council said a word about this question in his election address. The scheme might be for the advantage of the ratepayers; but he would not pledge himself until he had the will of the people.

**THE TOWN CLERK:** This is the very way in which you can get the voice of the people.

Dr. BANKS regretted that they were not in possession of fuller information, and hoped the Gas and Water Purchase Committee would take pains to prepare a very definite scheme to submit to the ratepayers. He did not know whether Mr. Silverthorne's report of two years ago was to be accepted as still alive. If not, no member of the Council who was not on the Committee had any data on which to form his judgment. Having regard to the altered state of affairs with respect to the Gas Company, they ought to have the expert's report before them. He regretted that the two things were tied together, and that the vote of the ratepayers must be for the purchase of the two undertakings or none. This was a mistake in tactics.

Mr. H. S. MACKENZIE said they wanted the water-works for the sake of the public health, and the gas undertaking because it happened to be a paying concern.

Mr. PHILLIPS said it was a leap in the dark—a risky speculation.

The resolution was carried by 10 votes to 4. The Mayor decided to take the vote of one of the members who was said to be a shareholder in the Gas Company, as the legality of the vote could easily be tested at some future time.

## THE DEVONPORT CORPORATION AND THE WATER-WORKS.

### Possible Abandonment of the Purchase Scheme.

Owing, it is said, to the difficulty of completing the formalities and preparing plans in time for depositing a Bill next month, the Devonport Town Council have decided not to proceed with the scheme for the compulsory purchase of the water-works until the session of 1900. In the meantime, preliminary stages are to be completed, though the statutory meeting of the Council will not be held until after the 9th prox., when the number of councillors will be increased by the addition of the representatives of a district recently added to the borough. Two deputations waited upon the Council last Thursday—one in favour of the scheme, and one against it. Members of each deputation spoke at length; but the new points made were not numerous. Mr. G. H. E. Rundle, on behalf of the deputation favourable to the scheme, said the only point for consideration was what should be paid to the shareholders in addition to the value of the share capital. It was out of the question to suppose that any premium would be paid on the sums borrowed by the Water Company. Mr. C. W. H. Jago, another speaker on the same side, considered that the Water Committee were justified in withholding the report of the Engineer, because Plymouth would probably oppose the Bill, and would take advantage of any information it could acquire. On behalf of the deputation against the scheme, Mr. R. S. Smith said he was informed that Mr. G. H. Hill, the Water Engineer, had reported against the purchase of the works, and he was an authority more to be relied upon than Mr. Diggle. Turning to the calculations as to the income and expenditure of the undertaking, Mr. Smith said the works were now economically managed. If they came under the control of the Corporation, the working expenses would in three years be £8500 instead of £5800, the present amount. Mr. Whitfield, the Chairman of the Water Committee, said it was not true that Mr. Hill's report was adverse to the scheme. Mr. A. Stephens, another member of the deputation, complained of the scanty information furnished by the Water Committee, and said the particulars they now had convinced him that the water-works would be a burden on the ratepayers. The Mayor (Mr. W. J. Waycott) promised the deputations that their views should receive the consideration of the Council.

Events have now taken another turn; and it is possible that the scheme will be dropped. Mr. Whitfield, the Chairman of the Water-Works Purchase Committee, wrote to the Town Clerk on Friday a long letter severely criticizing the action of the opponents of the proposal. He says its tendency is to frustrate the scheme, and to so play into the hands of the Water Company as to make any future movement impossible. He continues: "To prevent the disaster which must follow the degradation of this question into a mere party and personal conflict, I have determined to resign my position as Chairman, and to ask you to call my colleagues together, so that I may propose that the resolution of our Committee may be abandoned." The suggestion that the scheme should be dropped has been received with more surprise because the Committee have hitherto expressed satisfaction with the progress which it seemed to have made in popular favour.

**Cowes Gas Supply.**—An application to the Local Government Board by the Cowes Urban District Council for sanction to borrow £7471 for the purposes of their gas undertaking was inquired into by Mr. F. H. Tulloch, M.Inst.C.E., last Thursday. The Clerk to the Council (Mr. H. C. Damant) explained that the application was made under sections 26 and 27 of the Cowes Gas Act, 1897, by virtue of which the gas-works were purchased for £58,511. Since it had been sent in, the amount had been increased to £7800, which the Council asked power to borrow for forty years. They had every reason to hope that the concern would pay for itself this year. There were at present 878 consumers, or an increase of 138 in the nine months. They had the whole of the public lighting, which was equal to the consumption of nearly 2 million cubic feet of gas, in addition to the private lighting. The manufacture of gas during the first nine months of 1897 was 15,044,000 cubic feet; and for the past nine months, 17,483,000 cubic feet. The net profits had also increased to a more than corresponding extent. In 1896 they were £1951; in 1897, £1849; and in the quarter ending March last, £809. Mr. W. Halliday, the Secretary to the Gas Committee of the Council, having explained the purposes for which the money was required, the Inspector said the Board were quite willing to sanction the whole of the amount; but the Council had better let him know how much they would want in the next two years. The Board were not willing to lend money for anticipated works for a longer period than two years. Mr. A. Thomas, the Manager, having submitted the plans and given evidence, Mr. Fellows, the Chairman of the Gas Committee, expressed the hope that the scheme would have the sanction of the Local Government Board.

## ALDERMAN MILES ON THE GAS SUPPLY OF BOLTON.

In the "JOURNAL" last week, brief reference was made to an address delivered by Alderman Miles, J.P., the Chairman of the Gas Committee of the Bolton Corporation, on the manufacture and consumption of gas. He began by giving a sketch of the introduction of gas lighting by Murdoch, and then described the process of manufacturing this illuminant. Having traced the gas from the retorts to the holders, illustrating his remarks by diagrams, he proceeded to furnish some particulars as to the undertaking with which he has been so long identified. He said that in Bolton they had now five gasholders, capable of containing sufficient gas to serve the town for from 24 to 27 hours, supposing they were not continually making and storing gas. They had 243 miles of mains. According to their Act of Parliament, the Corporation were bound to supply gas of an illuminating power equal to 16 sperm candles; but, as a matter of fact, they sent out gas of a quality equal to 18 candles—being two candles better than was distributed in London. Bolton gas was tested practically every hour of the day and night throughout the year. He advised consumers to pay particular attention to their burners, as many of the complaints made as to the quality of the gas were due to defects in these appliances. Therefore he said to consumers: "Carefully select your burner, and do not give it too much work." The Bolton Corporation took over the gas undertaking in 1872, in which year 359 million cubic feet of gas were made. Last year the make aggregated 885 million cubic feet. In 1872, there were 15,000 consumers; and the advance made was shown by the fact that last year they numbered 35,500. The profits made in the Gas Department and handed over in relief of the district rates, since the works were taken over by the Corporation, had aggregated £311,900. He expressed the hope that the undertaking would continue to be a source of great benefit to the ratepayers for many years to come; but he said they must bear in mind that, in future, the profits would have to be shared by a greater number, owing to the extension of the borough boundaries under the Act which took effect on the 1st of October. The output of gas was at present on the increase; but this was due less to the development in domestic lighting than to the augmented use of grills in the homes of the artisans. No fewer than 5000 of these appliances had been fixed in the houses of the people; and the demand was increasing.

## ELECTRIC LIGHTING NOTES.

The Electric Lighting Committee of the Middlesbrough Town Council have adopted the plans and specifications of Mr. Hammond for electric lighting works; and they propose that application be made to the Local Government Board for power to borrow £36,000.

It was decided at the meeting of the Tottenham District Council last Wednesday to apply to the Board of Trade for a Provisional Order to supply electricity within the district, and to oppose the applications that had been made for the purpose by several companies.

The Gas Committee of the Nelson Corporation reported to the Council on Wednesday that the present electric lighting plant is totally inadequate for the demands made upon it; and it was consequently agreed to apply to the Local Government Board for £11,000 for extensions.

The Garston District Council have not yet secured the sanction of the Local Government Board to the borrowing of the £25,000 required for a combined scheme of electric lighting and dust destruction. The Board consider that, if the Council adhere to the proposed combination, they should endeavour to obtain a site farther removed from the centre of a residential neighbourhood than that fixed upon.

The Shipley District Council last Tuesday agreed to apply to the Board of Trade for a Provisional Order to enable them to carry out an electric lighting installation. They did so at the instance of Mr. James Roberts, who seems to have convinced his fellow-members that "ample power could be generated by the burning of refuse not only for the pumping of sewage at the sewage-works, but also to provide electric light." On whose authority Mr. Roberts made this assertion, we have no information; but his fellow-members would certainly do well to inquire a little more deeply into the question.

Questions were asked at last Thursday's meeting of the Hampstead Vestry as to the failure of the electric light one day in the week in the Priory Road. "An accident on the short circuit in one of the mains," was the Chairman's explanation. This little drawback did not deter the Vestry from deciding to extend the street electric lighting at a cost of £2270, and to refer to the Finance Committee the question of raising a loan of this amount. It is interesting to note that the Vestry, after a long debate, passed the following resolution: "That it be referred to the Lighting Committee to consider and report whether a reserve fund should be formed in connection with the Vestry's electric lighting undertaking."

The Elland District Council are not at present favourably disposed towards the electric light. One of the members, Mr. Thornton, tried to persuade his colleagues last Tuesday to take steps to obtain a Provisional Order to enable them to establish electricity works; and Mr. Dyson, who supported him, calculated that something like 1000 lights would be required along the main streets. In opposition, Mr. Spencer argued that electric lighting was  $7\frac{1}{2}$  times as expensive as gas; and, to uphold his contention, he quoted from the prospectus of a firm dealing in incandescent gas lights. Other members also opposed the motion on the plea that the question had not been sufficiently discussed in Committee. Ultimately the resolution was defeated by eight votes to three.

Owing to difficulties with reference to the acquisition of a site required for the purpose, the Swansea Town Council have decided to defer the provision of a dust destructor in connection with their electric lighting scheme; and separate plans and estimates for the latter are now to be prepared by their electrical adviser, Mr. Manville. The original estimates were: Electric lighting station, on the low-tension system, £32,470; dust destructor, £11,287; land, £6000—making altogether £49,757. The Corporation applied for power to borrow £60,000, so as to have £10,000 for the purpose of carrying out extensions to more distant places, and meeting contingencies. The majority of the Council do not now appear very anxious to go in for the dust destructor; and it is probable that the loan applied for will be reduced to £42,000.



At the meeting of the Eastbourne Town Council, held last Tuesday, under the presidency of the Duke of Devonshire, the scheme originated by Mr. C. F. Simmons, a member of the Corporation, for utilizing the refuse destructor for the supply of electric light, came on for discussion. Mr. Maude asked whether those members of the Council who were interested in the Gas and Electric Lighting Companies were entitled to vote. The Town Clerk replied that they were not; and seven members then withdrew in a body. An animated debate followed, and it was stated that in respect of public lighting the scheme would yield a profit to the ratepayers of £1500 a year, even after setting aside £750 a year as a special depreciation fund. It was decided to apply for a Provisional Order, and to offer to buy up the Electric Lighting Company's undertaking on fair terms.

The estimates prepared for the projected electric lighting works of the West Hartlepool Town Council appear to have been a little misleading. At last Tuesday's meeting of the Council, Mr. Young inquired whether it was a fact that the estimate for the station was £6000, and if that amount had been increased to £17,000. He thought the Council were being misled, and it was time they were taken into confidence. The Mayor (Alderman J. F. Wilson) admitted that the cost would be in excess of the estimate, and said that Professor Kennedy had been asked to submit other plans. Mr. Sergeant said Professor Kennedy's estimate was £6000; but after the plans had been drawn, the tender sent in was about £18,000. The Committee thereupon returned the plans to Professor Kennedy, with a request that he should prepare plans according to his estimate of £6000. Mr. Robinson held that the Committee had not misled the Council; the station would not cost more than £6000.

Customers of the Cape Town municipal electric lighting works have of late been complaining loudly of the increase in the amount of their bills. The grumblers were certain that they had had less rather than more light, while the accounts showed an increase which in some instances perfectly astounded the consumers. The Electric Lighting Committee inquired into the matter; and they have now given the consumers the comforting assurance that the accounts were all right, and there will be no deduction. The consumers seem, in fact, to have been having the best of the department until recently. Owing, say the Committee, to the irregular working of the meters formerly in use, the energy consumed was not properly recorded, and consequently the Council sustained a heavy loss. At the beginning of last winter (which, of course, is concurrent with our summer), a number of reliable meters were installed, and they are registering accurately the energy consumed. Hence these tears.

The Urban District Council of Workop had the question of electric lighting under discussion at a special meeting recently held; the proposal before the Council being that they should apply to the Board of Trade for a Provisional Order empowering them to supply electricity. The Chairman (Mr. J. Thornton, J.P.) said he was perfectly satisfied that if a certain Bill [presumably that presented by the General Power Distributing Company] passed through Parliament Workop would be inconvenienced, and the ratepayers would find their electricity very much more expensive. For this reason he was strongly in favour of the Council providing the town with it themselves. If they did so, they would at any rate retain control over the streets, which, under certain circumstances, they might not be able to do. He moved a resolution sanctioning the application. Mr. Dougill, though not exactly opposed to the proposition, expressed the hope that the matter would be dealt with very carefully, as he did not wish to saddle the town with another white elephant. He thought there were other questions which ought to be considered before that of electric lighting. The resolution was eventually adopted *nem. dis.*; and the Council went into Committee to consider details.

By the casting vote of the Chairman, the Stretford District Council recently resolved to establish and work an electricity installation of their own, and not accept the offer of the Manchester Corporation to supply current on terms similar to those which have been agreed to by Moss Side, Withington, Levenshulme, Failsworth, Droylsden, and Heaton Norris. The decision of the Council has raised quite an indignant outcry among the ratepayers, who are of opinion that it will be years before they can hope to supply electricity at the same price as the Manchester Corporation. The terms upon which the latter are willing to serve the district are: (1) To supply the electric light at the same price as to the citizens of Manchester—that is, an average of 4d. per unit; the highest price being 5d. per unit, and the lowest 1½d. (2) To find all the capital required. (3) To take the lease of the Provisional Order for twelve years; the District Council then to take over the undertaking if they desire to do so, upon payment of the original cost, less depreciation, and without any charge for severance. (4) Manchester to pay all the cost of obtaining the Order. These conditions certainly appear very reasonable; and the ratepayers, in public meeting, have expressed their disapproval of the action of the District Council in rejecting them.

Last Friday evening, the City of London was, to use the words of a popular morning paper, "thrust a century behind the times" by being deprived of the electric light for about twenty minutes. The failure occurred shortly after six o'clock; and many of the shops in the principal thoroughfares were plunged in darkness. Where gas had been retained on the premises, it was promptly brought into use; in other cases, candles and oil had to be resorted to—bicycle lamps being utilized in one instance. In the restaurants, some funny scenes were witnessed. After an anxious interval of twenty minutes, which to the expectant tradesmen (particularly those who had much valuable property in their shops) seemed an hour, the light was restored. The district affected is served by the City of London Electric Lighting Company; and the accident is stated to have been caused by the fusing of bobbins on the armatures of two of the dynamos. It is an old saying that "Misfortunes never come singly." Curiously enough, there was a failure of the light on Friday at Norwich—all the lights in the city being extinguished. The proceedings of the Guildhall Court of Record were interrupted; but candles were procured and the sitting was continued. The Post Office work also had to be carried on by the aid of the same illuminant. Most of the shops closed their doors; but in those which remained open candles were resorted to. Where gas was available, it was quickly brought into use; and the incandescent burners at the Gas Company's office sent forth quite a blaze of light. The Engineer of the Electric Lighting Company (Mr. F. M. Long) was at the works when the accident happened, and promptly took steps to repair the mischief; the whole staff of workmen being sent out

to examine the cables and apply tests at the manholes. The damaged portion was located shortly before midnight. It is thought that a slight settlement in the ground within a few yards of the station disarranged a culvert, and occasioned short-circuit. The faulty part was cut away, the system quickly brought into working order, and the light restored.

At last Wednesday's meeting of the St. Pancras Vestry, Mr. Albert E. Pycraft, the Chief Clerk, presented an interim revenue account of the Electric Lighting Department for the six months ending the 30th of June. It shows that the total revenue for the period amounted to £17,408, which is an increase of £3088 over a similar period ending June, 1897. The expenditure on trading account was £11,556; leaving a surplus of £5852 to meet interest charges, &c., and instalments of loans, amounting together to £4686. The net result shows a profit of £1166, to which is added that brought forward from last year—£1717; making a total on June 30 of £2883. Unfortunately, this rosy state of things is rather spoilt by the subsequent announcement that the recent reductions in the charge for supply have resulted in an unpremeditated loss. The report states: "It will be noticed, upon reference to the accounts published at June, 1897, that the 6d. supply produced at that time £10,284 19s. 6d., and at June, 1898, £10,431 8s.—an increase of only £146 8s. 6d. The introduction of the maximum demand indicator and other rebates, has resulted in an actual reduction of income of £800. It is important to give due consideration to this result, in view of the fact that at the 30th of June only 163 consumers had adopted the demand indicator, of whom about half received a rebate—this being on the basis of a three-hour maximum." Those regrettable accidents and explosions are now beginning to make themselves felt financially, for we read that "the largest item of expenditure is that charged under the heading of 'repairs, mains, &c.' amounting to £2822 0s. 11d., which includes exceptional charges in connection with the re-arrangement and alterations of the public lighting mains, amounting to £1954 and £168 1s. 7d., in connection with changing over the pressure of supply to 220 volts." Nevertheless, Mr. Pycraft says that, "having regard to the exceptional charges included in the accounts for the past half year," he ventures to consider the result "eminently satisfactory."

The development of the Manchester Corporation electric lighting works is making tremendous headway. At present, the generating plant at the Dickinson Street station represents rather more than 6000-horse power; and within a short time two engines, each of no less than 2500-horse power, will have been added. When the generating strength has been brought up to 11,000-horse power, the station will rank second to one only in England—that owned by the City of London Electric Supply Company. The situation at the Dickinson Street station is convenient; and the Department fortunately owns land upon which can be placed as occasion serves other engines equal to 12,000 to 15,000 horse power. The station may accordingly be developed into one with about 25,000-horse power. This, however, is comparatively insignificant beside the proposals which the Electricity Committee have under consideration, in view of the requirements of Manchester with regard to electric tramway traction and street lighting. They will in the near future establish near Philips Park an electric generating station provided with machinery which will work up to about 100,000-horse power. At present the area covered by the Corporation electric supply is, in round figures, 4 square miles; but under the coming extension of electric power and light, the Corporation have before them the problem of how to supply something like 40 square miles. With the Philips Park and the Dickinson Street stations working conjointly, electric energy will be developed sufficient to extend anywhere within a radius of 12 miles. Levenshulme, Moss Side, Withington, Heaton Norris, and the other suburbs will be within the borders of the area of the supply. Incidentally, it may be stated that there are now in the city 2200 users or consumers of the electric light supplied by the Corporation, that over 200,000 8-candle lamps will be the working consumption this winter, and that some 150 applications for the light are in the hands of the Department. The Electricity Committee and their Engineer (Mr. C. H. Wordingham) are therefore particularly busy.

#### GAS v. ELECTRICITY AT ADELAIDE.

Readers of the "JOURNAL" will doubtless remember that the Corporation of Adelaide recently invited tenders for alternative schemes of electric lighting for the city; and the terms submitted were given in our issue for the 27th ult. A large portion of the public lighting, however, is now being done by the incandescent gas system, under a contract entered into by the Corporation with the South Australian Gas Company for supplying 880 lamps for five years from Sept. 1, 1897. This matter was alluded to by the Chairman of the Company (Mr. J. Acraman) when moving the adoption of the Directors' report, noticed a fortnight ago, at the recent annual meeting. He characterized the event as the chief one of the year, and said the price was a favourable one to the Corporation; the amount of £4100 being particularly low, considering the great size of Adelaide in proportion to its population. It required 53½ miles of mains to light the streets; so that the lamplighters had to travel 107 miles a day, or 40,000 miles a year. The price was £4 10s. per ordinary lamp; and the coal cost at least 50 per cent. more than it did in Sydney. The charge in that city for lighting was £4 5s. per lamp. In Adelaide there were 900 public lamps, and in Sydney 10,000; so that it was evident the Corporation had a favourable contract. The number of lamps in Adelaide for the great mileage of streets was quite insufficient whatever kind of lamp was adopted. In Liverpool they had 80 Welsbach burners to every mile of streets lit; but in Adelaide there were only 18. It had been admitted by electrical experts who had communicated with the Company that an arc lamp of 200-candle power was required for 100 yards of street; and if electric lighting were adopted, 941 arc lamps would be required. The Brush Company, in their tender, stated that each of these, at 5d. per unit, would cost £45 per annum; so that it would take £42,000 per annum to light the city by means of electricity, as against their own modest £4100. When the advertisements appeared, the Directors were approached by more than one electrical concern with the idea of going in for the business. The Board, after due consideration, unanimously decided not to embark in it. Having referred to the Welsbach Gas Company's new burner, which he pointed out would obviate damage to mantles through vibration, he



mentioned that, in a recent address delivered in Manchester, Sir Henry Burdett, the Chairman of the Welsbach Company, stated that, taking four hours a day as the average lighting period in the year, or 1500 hours a year, 90 units of electricity were required to produce a light of 16-candle power for 1500 hours, and that therefore 270 units were required to produce a light of 48 candles for 1500 hours. This, at a cost of 5d. per unit, would mean £5 2s. 6d. per year. At the present price of gas, a Welsbach burner giving 60 or 70 candle power light would cost £1 15s. per year of 1500 hours. In Sydney they had lately lit the new Victoria Markets with incandescent lights; and he was informed that it was the finest piece of lighting in all Australia. In Melbourne, the Melbourne Club and the "Argus" office had discarded electricity for incandescent burners. The Hon. S. Tomkinson, in seconding the motion, said the Directors were rather too hasty in making such a low-priced contract as they did with the Corporation; and he was sorry that this body, despite the concessions granted it, was now negotiating with electric lighting concerns for the illumination of the city. This was scarcely fair, considering the Company's contract had four years more to run. The motion was carried. In reply to a question, the Chairman stated that for years the Port Adelaide Corporation had not had a contract with the Company, and owing to this they had paid more for gas than they otherwise would have done, while they had thrown away £1500 of the citizens' money. In August, 1895, the Company offered to enter into a contract with the Corporation for five years at £6 per lamp per annum, or for seven or ten years at £729 per annum. The estimated expenditure of the Port Adelaide Corporation for 1899 for street lighting was £1000; so that they were going to spend £270 a year more in securing electricity.

The remarks of the Chairman brought out a letter to one of the papers from Mr. F. C. Howard, the Manager of the South Australian Electric Light Company, who explained, in reference to Mr. Acraman's statement that it would cost £42,000 per annum to light the city with electricity as against £4100 with gas, that in October, 1897, his Company offered to light Adelaide with 220,000 nominal candle power each night for £4500 per annum, and that the Gas Company offered to provide 64,890 nominal candle power for £4566 per annum; while the City Surveyor recommended a scheme of electricity and gas combined to produce 170,000 nominal candle power. With reference to the Welsbach burners, he said Mr. Acraman forgot to state that the makers claimed that the new mantle was applicable to electricity as well as to gas. He concluded by challenging the Chairman to satisfy any independent umpire mutually chosen that gas in England was making equal progress with electricity, the forfeit for failure being the payment of £10 to the Children's Hospital; Mr. Howard to pay a similar amount if his opponent were successful. Mr. Acraman declined to accept this absurd challenge; pointing out that it would involve a commission to England and some delay and expense, which he was not prepared to undertake. He said, however, that, if Mr. Howard wished it, he could furnish a long list of electric concerns which had had to wind up or write off large sums from their capital. With regard to the other points in the letter, he said: "Though the sums that were quoted by Mr. Howard are correct, he omits to say that the 220,000 nominal candle power which he mentions would have ceased at midnight, after which there would have been only 30,000 nominal candle power. As regards street lighting generally, I said the number of lamps in Adelaide was quite insufficient for the great mileage of streets, whatever kind of lamp was adopted, and that electrical experts who had been in communication with the Gas Company admitted that for efficiently lighting streets are lamps should not be more than 100 yards apart. To do this, 941 lamps would be required; and, having had no experience of the cost of such, I named that quoted by the Brush Company in their tender, £45 per lamp, which works out to £42,345—of course, a sum far beyond Adelaide finances."

## THE DRY WEATHER AND WATER SUPPLY.

### The London County Council and the Water Question.

At the Meeting of the London County Council last Tuesday—the first after the usual summer recess—the question of the supply of water in East London was under discussion. Mr. T. McKINNON WOOD occupied the chair.

Mr. W. CROOKS (Poplar) submitted the following motion as a matter of urgency: "That, in view of the existing difficulty in obtaining an adequate supply of water in a large portion of the County of London, it be an instruction to the Water Committee to forthwith submit its proposals with regard to legislation affecting the water supply in the ensuing session of Parliament." In moving the resolution, he said the Council knew the urgency of the case. They had been told over and over again that the Water Companies were quite capable of minding their own business, and of giving the people of London a full, adequate, and, above all, a pure supply of water. He asserted that it was not only inadequate, but impure. The water when freshly drawn had often a film upon it; and recently, in his own house, they had a worm 3 inches long delivered through the tap. If the Council could only realize what it meant to be without water for 20 hours out of the 24 in the crowded courts of the East-end, they would feel as strongly on the subject as he did. He was tired of the promises of the Companies and the platitudes of the Government; and he appealed to the Council at once to take the matter up. He hoped the Council would make itself a fighting power on the water question, and would go for a full, efficient, and pure supply from Wales, or from any other source that was capable of giving a supply. He trusted that the Council would compel the Companies to act up to the spirit of their obligations, and repeal the section of their Acts which enabled them to charge for what they did not supply. They had in their hands the lives of the people of London, who were looking to the Council for help. He trusted the Water Committee would not hesitate for a moment to move in this matter.

Mr. STUART, M.P., seconded the motion. He asserted that the present distress in the East-end was due to the culpable neglect of the East London Water Company to carry into effect the legislation which they themselves promoted for the purpose of avoiding a scarcity of water. The Local Government Board seemed to put itself into the hands of the Company by backing up the unfounded charge against the people of wasting the water. Only last year the Company obtained parliamentary sanction

to connect their mains with those of other Companies in case of urgency; and yet they failed, until a few days ago, to act upon that power. The speaker proceeded at length to show that there was no ground for the allegation that the famine was due to the action of the Council in opposing the Company's Bill of 1893. The loose statements of the Company induced Lord Balfour's Commission to report that the waters of the Thames and Lea would afford a sufficient supply of water for London. This had since been disproved; and it was now no longer a question of storage, but of a further supply. It was not until after a long series of warnings that the East London Company had been brought to acknowledge that fresh sources were necessary beyond the valley of the Lea. The Council would now have to take into account the question, not only of making up for the delinquencies of the Water Companies, but providing such a future supply as would meet the growth of population, and become a valuable asset to the Council.

Mr. BEACROFT said that no useful end could be obtained by attacking a particular Water Company. He was prepared to support the motion, but desired to see some practical point given to it. The Council had for years been unable to make up their minds as to supplementary sources of supply, although they had had elaborate surveys and reports before them. The motion was somewhat bald as it stood; and, in order to strengthen it, he would move to add the words: "And also to obtain the opinion of an engineer as to what works are required to provide for connecting the mains and works of the several Companies for use in cases of urgency."

Mr. H. P. HARRIS seconded the amendment.

Mr. McDUGALL felt he should not be doing his duty as a representative of the Council upon the Thames Conservancy Board if he did not say something about the general aspect of the Water Companies in the weeks to come. Lord Balfour's Commission stated that it was undesirable that water should be taken from the Thames unless at least 200 million gallons were flowing over Teddington Weir. They knew that the Lea was in a very disastrous condition, and, unfortunately, the Thames had become very much like it. On the 1st of July, the amount of water passing over Teddington Weir was 320 million gallons. But the average of the month was only 169 millions, which was reduced in August to 144 millions; and the figures for September, which had yet to be verified, but which he believed were quite correct, were only 86 millions. On one day, the quantity was 80 millions; on four days it was but 65 millions; and once it did not exceed 50 millions. Not only had the bulk of water diminished, but the Companies were taking from the river more than their statutory quantities. The Lambeth Company, for instance, were taking 6 million gallons more than their limit. Since the September figures had been prepared, there had been practically no rain; and if there were to be a few days' rain, it would only stir up the shallow water in such a way as to render it anything but pleasant for drinking. The Thames had never been so low as it was now; and this constituted a serious danger for London.

Sir A. ARNOLD said that no stronger condemnation of the Water Companies could be passed than that contained in the amendment; for it actually suggested that, in this awful crisis in the history of the London Water Supply, the Engineers of the Companies had not made every possible effort to meet the wants of the people. He felt certain the Council would unanimously reject the amendment.

The debate was adjourned.

### The Position at the East-End.

In the article on "Water and Sanitary Affairs" last week, reference was made to a statement by Dr. Sedgwick Saunders, the Medical Officer of Health for the City of London, relative to the former water supply to the City. It was contained in his recent report to the Sanitary Committee of the Corporation on the progress of events in connection with his department during the vacation (July 30 to Sept. 17). Of course, the condition of the water supply at the East-end was dealt with; and Dr. Saunders pointed out that the difficulties which had arisen in consequence of the enforced suspension of the constant service of the East London Water Company had not depended exclusively on a diminished supply, but rather on the absence of the means of proper storage of water for domestic and sanitary purposes. The abolition of cisterns in houses of any class would, he said, be bad enough, but in those divided into tenements for the occupation of the poor, the want of such receptacles involved an amount of suffering wholly inconceivable by persons possessed of such conveniences. It was a well-known fact that, whereas in the area supplied by other Companies the existence of cisterns in houses was practically obligatory, the system was objected to by the East London Company. To what extent the abolition of such receptacles for storing water was responsible for the misery inflicted upon the poorer customers of the Company need not be discussed. It was sufficient to say that when the day of reckoning came, the Company would have to show better reasons than had hitherto obtained for their actions in this respect. The area supplied by the Company in the City affected 133 houses, with a population (day and night) of 1709. Of these houses, 77 were without cisterns, and 33 had constant service, 43 were tenements, and 12 were empty premises. The water was turned on three times a day—viz., 6 a.m., 12 (noon), and 6 p.m.—for two hours each time; and when it was remembered that a very few years ago the New River Company's general supply to the City was only on for one hour a day, and often less, it seemed an absurdity to apply the term "water famine" to the East of London, more especially as the Company's representatives averred that the present supply equalled 24 gallons per head—an amount much in excess of that furnished to some of the most important provincial towns. The 77 houses without cisterns had no means of flushing the drains and water-closets when the water was turned off; and some of the latter were in an unspeakable condition. Dr. Saunders remarked that, in advocating the use of cisterns, it must not be inferred that a direct supply from the main for drinking and cooking purposes could be dispensed with. No cases of infectious disease had been reported from the district in the City during the vacation; and the health of East London compared favourably with that of the Metropolis generally. He had carefully analyzed the water of the East London and New River Companies, and, from a chemical point of view, the condition of the Company's supply in its present state was purer than it was in April, 1897, and as wholesome as the latter Company's water examined within a few days of the former under precisely the same circumstances as to supply and weather.

Owing to the continued absence of rain, the water consumers in East London still suffer inconvenience from the compulsory continuance of



the intermittent supply, though fortunately the health of the general community has been well preserved. At the present time, the East London Company are not drawing any water from the Lea, and are still relying on the assistance of the other Companies. It will be remembered that, in the course of Mr. Chaplin's reply to the recent deputation organized by the Social Democratic Federation, he stated that the Company had produced a scheme for increasing their supply to the extent of 16½ million gallons per day. The additional water will be provided in the following way: Connection with the Southwark and Vauxhall Company, 5 million gallons; assistance from the New River and Grand Junction Companies, 6 million gallons; supply through the Thames main by arrangement with the Grand Junction Company, 2½ million gallons; and from wells, 3 million gallons. These additions will suffice to carry the Company through the period of stress without relying upon the Lea at all. The quantity of water they will require daily will be about 46 million gallons; and it will be made up as follows: Wells, River Thames, and reservoirs, 10 million gallons each; new sources, 16½ million gallons—total, 46½ million gallons. With regard to the wells, five new ones are in course of construction. They are 12 feet in diameter, and are driven into the chalk 200 or 300 feet. One of these is nearly ready for use, and will serve as an auxiliary to the existing deep well at Lea Bridge. The next is also in an advanced stage of construction, and is situate at Tottenham. The machinery is being fixed, and the pumps will be in working order before Christmas. A third well is at Ponder's End, a fourth at Waltham, and the fifth at Old Ford. The Engineers of the Company are now engaged on a scheme for increasing the Thames supply. At present, the Company have power to take 10 million gallons of water per day from the Thames, but as they also draw about 2½ million gallons from the springs at Hanworth, in the neighbourhood of Sunbury, they are unable to take full advantage of their authorized intake from the Thames, for the reason that the 36-inch main connecting the works at Sunbury with the reservoirs at Waltham will not carry much more than 10 million gallons a day. The idea is to divide the main at some convenient spot on its route, and, by erecting new pumping machinery, to increase its carrying capacity by some 25 per cent. In this case the Company would be able to take their full share of the Thames water, and utilize the Hanworth springs to the utmost extent.

Last Friday afternoon, a deputation of representatives of various religious, trade, political, and friendly societies of the East-end waited on the Water Committee of the London County Council for the purpose of setting forth the serious condition in the East of London in consequence of the scarcity of water. The Chairman of the Committee (Mr. W. H. Dickinson) presided. The deputation was introduced by Mr. Stuart, M.P. Mr. H. R. Taylor, Secretary of the Water Consumers' Defence Association, dwelt on the general state of affairs caused by the absence of water in the district, and referred to the remarks of the Chairman of the East London Water Company at the meeting on the previous day. Although Mr. Banbury had said that his Company were giving a supply of 24 gallons a head daily, he would remind the Committee that this included the water supplied for the roads and factories, so that the statement was absurd. The supply given by the Company was ridiculous when compared with that in New York, where 84 gallons were allowed daily, and in Aberdeen, where the inhabitants received 60 gallons. Owing to the spread of sanitary ideas, and to the disastrous results which had attended the present water famine, it was obvious that the time had come when the Central Authority of the Metropolis should provide a proper supply of water. The Rev. J. E. Hands also urged the importance of immediate action on the part of the London County Council. Parliament, he said, had given the Water Company power to provide a constant supply of pure and wholesome water, but up to the present they had not done so. It was the business of the Company to provide against temporary shortages. In 1897, they were authorized to make connections with other Companies' mains; but no steps were taken to obtain water from other systems until the deficiency became acute. Against the assertion of the Company that householders should have cisterns, in spite of the condemnation of them by the sanitary authorities, he desired to point out that if the cisterns were there the Company would be unable to fill them, and a breakdown even worse than the present one would result. As it was clear that they had failed to carry out their contract, he considered they should be indicted by the Council in the Law Courts, in the interests of the public. Mr. Taylor produced a bottle of water which was very discoloured, and, in answer to the Chairman, stated that he had drawn it from his pipe the previous day. He added, in reply to a member, that it was not always like that, for if it had been they would not have survived. The Chairman briefly addressed the deputation, and said that their statements would be fully considered by the Committee. To a large extent the Council were prevented from action by the Water Commission who had been sitting for upwards of a year. They would soon resume; but the Council were not sanguine of any good results. It was stated that the bottle of water handed in by Mr. Taylor would be analyzed by the Council's Chemist.

#### The Position in the Provinces.

"If there is any consolation in contemplating the misfortunes of others, East London consumers already have it in abundance. Many country places are absolutely waterless, and have to fetch every drop from a distance of several miles; while the shortage in the large towns in the Midlands has assumed a very serious aspect." Such is the position of affairs in the Provinces as succinctly described by the able special correspondent of "The Times" who has been investigating the water question at the East-end. He points out that even Leeds, which lies outside the area of severe drought, and normally has the largest supply of all the great provincial towns in England, has been placarded with notices peremptorily forbidding the use of water for washing windows and doorsteps, and similar purposes, under a penalty of £5. He cites this as an instructive illustration of the advantage of having a public water authority which can enforce economy with a heavy hand when the public interest requires it. "One shudders to think of the indignation meetings and the denunciations that would ensue if a London Water Company dared to take such a step; and yet the Leeds people pay their water-rates all the same, whether they get their full supply or not." He adds that perhaps the aggrieved Londoner may find some balm in the reflection that even municipal engineers have "miscalculated" their resources, and that the consumer has to suffer without redress. In the Rotherham Town Council last Wednesday, a recommendation from the Water-Works Committee was

brought up that the water should be no longer turned off each night, but that the supply should be given in full to the borough as hitherto, whereupon Mr. Cox moved an amendment to the effect that the water be turned off between 11 p.m. and 5 a.m. He said there were only 20 days' supply in the Ulley reservoir, and the quantity being taken from the Sheffield mains was 500,000 gallons per day, whereas what they should take was 300,000 gallons. If this went on, it would increase the cost of the water to an enormous sum; and he thought, in the interests of the ratepayers, there should be economy. To prove what the saving would be, a test was taken on the previous Sunday night, and between 11 p.m. and 5 a.m. there were no less than 82,000 gallons of water consumed. How did this loss occur? There were 17 public urinals where water was running during the night, apart from leakages in other ways. There was great need of inspectors to detect leakages and to prevent the enormous loss going on. He was in favour of giving a full supply as soon as circumstances would permit after rain had fallen. Mr. Gummer contended that, as the ratepayers paid the water-rate, they had a right to a full supply at all hours. There was abundance of water in the Sheffield mains, if they would pay for it; and the Corporation had entered into a bargain with the Sheffield Corporation to obtain it. He did not think the health of the town should be jeopardized by the water being turned off during the night. The voting on the motion and amendment being equal, the Mayor (Alderman Neill) gave his casting vote in favour of the latter.

The Rev. F. C. Clutterbuck, writing from Culham Vicarage, Abingdon, to "The Times," gave the following account of the condition of a well sunk into the upper greensand at Long Wittenham, Berks. He wrote six months ago expressing his fear that the water supply in many parts of the country would be short during the summer of this year; and this has, unfortunately, proved only too true. He based his prediction on the state of this well, which in a record of measurements beginning with 1868 had always shown a rise of water in the first three months of the year. In this year no rise had taken place; but, on the contrary, the water had continuously fallen, and at the end of last month the well was very nearly dry. He had never known it before with less than 7 or 8 feet of water during the middle six months of the year. He wrote: "The drought of the past summer has aggravated, but has not caused, the short water supply, for we have had such droughts before. It is due to the dry time from October, 1897, to April, 1898. The percolation into the deeper water-bearing strata during the six months from April to October is almost nil. This is a fact of which many people are unaware. In proof of this, I may evidence the measurements of the well in the year 1891: The well was exceptionally low on Jan. 1; but it rose 2 ft. 9 in. by the end of March. From April 1 to Oct. 1, 14 inches of rain were registered; and yet the well kept continuously falling. October was a very wet month (more than 6 inches of rain fell in the month); but the well did not begin to rise till the middle of the month; and then it rose very rapidly. This year only 7 inches of rain has fallen from April to the present time. It will take, therefore, quite 10 inches of rain, or more, to affect the deeper springs. In proof of this, I may quote the year 1896, in which the summer drought up to Aug. 19 was as bad as this year. The weather broke then, and from that date to the middle of October we had 10½ inches of rain; and it was not till then that the well began to rise. There has been a great outcry about the water supply in the East-end of London; but, as Mr. Chaplin lately said, there are many parts of the country which are worse off than they are. I have been told that on the Oxfordshire Hills people are paying for water by the pailful."

The present state of the Bradford water supply is arousing grave apprehensions; and it is feared that the reservoirs will before long be practically exhausted unless there is a heavy rainfall. Since July, the service has been restricted to twelve hours; and owing to the continued drought, the supply was to be further curtailed yesterday to eight hours. In notices enforcing the necessity for the utmost economy, the Water Committee of the Corporation express the hope that, with the co-operation of the public, they will be able to avert a stoppage of the supply.

**Sales of Stocks and Shares.**—Last Tuesday, Messrs. Penney and Clark offered for sale, in accordance with instructions received from the Directors of the Portsmouth Water Company, 1500 £5 shares, being the first portion of the new 5 per cent. capital which the Company have lately obtained power to raise. The shares were put up in lots of five, and were sold at the rate of £7 to £7 5s. per share. The total amount realized was £10,615; being a premium of £3115.

**Mysterious Underground Fires at Sunderland.**—A mysterious and extensive underground fire was reported at the meeting of the Sunderland Rural District Council last Wednesday. The sewers at Grangetown are in a very heated condition, and water-pipes are also affected—the drinking water coming warm from the taps. The Surveyor has been instructed to examine and report upon the outbreak, which, it is feared, will be extinguished only with great difficulty. Since the great conflagration in July last, there has been quite an epidemic of fires occurring almost daily in Sunderland; and the Corporation are making public trials of fire-engines from leading firms.

**Gift of a Village Water Supply.**—The village of East Oghwell, in South Devon, has received from Mr. D. R. Scrutton, a local landowner, the gift of an excellent supply of water. Mr. Scrutton's idea was to commemorate the Diamond Jubilee; and to ensure that it might be held in lasting memory, he carried out, at a cost of about £3000, water-works which promise to afford an abundant supply under all circumstances. Formerly the village was dependent on questionable wells from which the water had to be carried a considerable distance. Mr. Scrutton employed Mr. Leicester Gataker, the water diviner, who indicated that water would be found in a hill about a mile from the village; and he undertook to provide it on the principle of "no water, no pay." A well 94 feet deep has been sunk, and a supply of from 8000 to 10,000 gallons a day has been found. The water is pumped by a windmill into a reservoir capable of holding 40,000 gallons, whence it is conveyed in pipes to the village, to all the farms, and to troughs placed in the fields for cattle. Mr. Scrutton formally handed his gift over to the village last Thursday, when Mrs. Seratton turned on the supply with a gold key, which was given to her as a memento of the occasion; while an address was presented to Mr. Seratton. Though this was the formal recognition of the gift, the water has been actually supplied for several months, and has been a great boon during the drought.



## THE PROJECTED WELSH WATER SUPPLY SCHEME FOR LONDON.

The Report of Sir B. Baker and Mr. G. F. Deacon.

The last annual report of the London County Council contains, as would naturally be expected, a reference to the subject of the water supply of the Metropolis. The principal feature of the remarks made is an allusion to the important report presented to the Council early last year by Sir Benjamin Baker, K.C.M.G., and Mr. G. F. Deacon, M.Inst.C.E., on the London Water Supply. The report is the result of a reference made to them by the Council on the 19th of June, 1896. They were requested to consider the detailed proposals, plans, and estimates contained in the report of the Chief Engineer (Sir A. R. Binnie) dated June 8, 1894, in connection with his scheme for obtaining water from the valleys of the Usk, Wye, and Towy, and their tributaries,\* and to advise the Water Committee as to their suitability and sufficiency or otherwise. They were further requested to report on the question of the practicability and the cost of carrying out schemes of storage for providing 200, 300, and 400 million gallons of water per day respectively from the Thames, on the lines of the suggestion in the report of the Royal Commission; also, taking into consideration the whole of the circumstances of the case, and having regard to the increasing rate of consumption per head, to give their best advice to the Council as to whether it would be more advantageous to bring into London from the proposed Welsh sources than from the Thames the quantity of water, over and above that at present supplied, which will be required for the supply of the population of 11½ millions, as estimated by the Royal Commission. The following further question was also proposed, upon which, if Sir B. Baker and his colleague thought it expedient, the Committee expressed a desire to have a short preliminary report: Whether in their opinion there is any other source of supply for the Metropolis which presents such *a priori* advantages over either the scheme proposed by the Engineer of the Council or the suggested scheme of storage in the Thames Valley, as would justify the selection of such other source in preference to both of the last-mentioned schemes. The Engineers in due course presented their report, and it has been published, although, pending the sitting of the Royal Commission on Water Supply, the Water Committee have deferred its consideration. We gave in the "JOURNAL" for the 13th ult. (p. 597) the general conclusions of the report; and we now purpose dealing with the document itself.

The Engineers had placed before them the report and evidence of the Royal Commission; notes of evidence and speeches in the case of the Staines Water Bill (Session 1896); all the reports of the Chief Engineer relating to the Staines scheme and to the proposed Welsh supply; and all plans, sections, estimates, and rainfall observations which he had made since 1890, as well as the various reports of the Water Committee. In addition to these documents, they considered the report and evidence of the Royal Commission of 1869 (the Duke of Richmond's) and numerous other papers bearing upon the question of whether a better source of supply could be found than either the scheme proposed by the Chief Engineer of the Council or the suggested scheme for storage in the Thames Valley. They had thus an almost overwhelming mass of evidence and suggestions to deal with in considering the history of the water question up to the date of the report; but they say the investigation was instructive as showing that, owing to increase of engineering experience and the progress of science generally, many of the conclusions of the earlier inquirers demand important modifications, and that works which in the earlier days would have been considered by high authorities as of startling boldness, would now be accepted without comment as very ordinary and obvious affairs.

On the 7th of August, 1896, Sir B. Baker and Mr. Deacon, accompanied by the Chief Engineer and his assistant (Mr. Seymour Rumble), commenced their tour of inspection by proceeding from Abergavenny to Brecon; noting on the way the general features of the hills and streams and the proposed routes of the intercepting conduits to convey the rainfall to the Llangorse reservoir. On the following and subsequent days they made a thorough examination of the whole of the sources of supply proposed by the Chief Engineer. After gauging the flow of the Usk at Brecon, they proceeded to inspect the proposed site of the eastern dam of the Llangorse reservoir, and found it unexceptionable as regards quality of rock foundation and in other important respects. Their next work was to thoroughly examine the alternative sites proposed for the dam of the Usk (compensation) reservoir; and they found that no engineering difficulty would arise in carrying out the proposed works.

The route over the hills from Llangorse to the Yrfon and Towy afforded a fine general view of the whole country, and confirmed the opinion expressed by the Chief Engineer as to the facilities afforded by the district for the construction of reservoirs which would be amply supplied with pure water from the neighbouring hills. The Engineers first inspected the site of the proposed dam and tunnel for diverting the upper waters of the Towy into the Yrfon; then proceeded to look into the conditions under which the compensating reservoir at Ystradffin would have to be established; and, lastly, inspected the site of the proposed great reservoir itself. In their opinion, no engineering risks or contingencies apply to any of the proposed works; but the extensive railway and road deviations involved will require very careful consideration and negotiation to minimize opposition from those locally interested therein.

The Engineers then proceeded to inspect the proposed sites for the Edw, Ithon, and Upper Wye reservoirs—the whole of those proposed by the Chief Engineer in his report; but, in accordance with the terms of the reference to the effect that they should consider whether any better sources of supply were available, they extended their inspections to the Mid-Wales and North Wales districts, and included Bala Lake, as well as the reservoirs proposed by Mr. Bateman in 1865 at Trefeglwys on the Taranon, and the Rivers Carno, Clywedog, and Dulas, tributaries of the Severn, which it was proposed to intercept for the service of that reservoir, as also the sites for reservoirs at Garthbibio and Llanerfyl on the River Banw, a tributary of the Severn, and on the Nant-y-Eira, a tributary of the Banw. They likewise visited the works in progress for the supply of Birmingham on the River Elan, a tributary of the Wye, and the completed works for the supply of Liverpool on the Vyrnwy, a tributary of the Severn. Particulars of these works are given.

The introductory portion of the report closes with brief references to the lake districts of Cumberland and Westmoreland, as well as to Dartmoor, as sources of water. But owing to their distance from London, and for other reasons, these districts are not favourably regarded by the Engineers.

(To be continued.)

## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The event of the week has been the promulgation of the scheme of Mr. William Foulis, for the erection of new gas-works for the Corporation of Glasgow. A year ago, the Gas Committee had all but secured a site for new works, on the banks of the River Clyde, near Rutherglen. It was in every way desirable; and great disappointment was consequently experienced when it was discovered, by means of boring, that the site was full of underground workings. It had, therefore, to be abandoned. Since then the search for a site has been going on without interruption; and now Mr. Foulis has settled upon one at Blochavin, which is almost direct north of the Rutherglen site, and at about the same distance from the city. It is not nearly so good a situation for a gas-works as was the Rutherglen one; being at a considerable elevation above nearly the whole city. It possesses the enormous advantage, however, of having no workable coal below it, and of being served by the canal, which has been found to be exceedingly useful before now in times of strikes. The subject was introduced to the Gas Committee on Friday of last week, when Mr. Foulis submitted a report upon it. A Sub-Committee were then appointed to consider and report upon Mr. Foulis's recommendations. The Committee visited the site on Tuesday; and on Thursday the subject was brought up in the Council. There is a standing order in the Town Council of Glasgow, that all proposals for going to Parliament must be before the Council not later than the first week in October. It was necessary, therefore, to have the matter under the notice of the Council this week. This was all that was done; further consideration of the subject being delayed till the report of the Sub-Committee has been received. It need be no matter for surprise that the proposal is not meeting with unqualified approval. One Councillor objects that it is too near the Alexandra Park. Another, who resides in the district, considers that they are bad enough off already in that quarter; and he objects to the smoke being added to. Of course, the latter is a strange doctrine. According to it, anything which is objectionable should be put down in the most beautiful spots. I think there will be general agreement that gas-works are not desirable neighbours, though they are by no means a nuisance; and that, if they are to be put anywhere, it should be where there are works already, which are not the most beautiful. Now, in this locality there is already a large steel-works, a refuse destructor, a distillery, and a prison. The addition of a gas-works should not spoil the amenity of the district very much. On this ground, therefore, the proposed site is not open to objection. The probability is that it will be approved, provided the price can be agreed upon, as to which there is as yet no information. As showing the great difficulty there is in getting a suitable site for a gas-works in the neighbourhood of Glasgow, I may mention that this place is stated to be the only spot within nine miles of the city which is not troubled with underground workings.

The Edinburgh and Leith Gas Commissioners take a hopeful view of their future, as was shown by the tone of the speeches at their meeting on Monday, at which they continued the price of gas at 3s. per 1000 cubic feet.\* They have good reason for this attitude. It is ten years now since they acquired the gas undertakings; and though they have not been without adversities, and particularly have had to work under disadvantageous conditions, their business has prospered immensely. That it will continue to grow, there is not the faintest occasion to doubt; and that it will be more economically conducted is equally certain. The chief difficulty which the Commissioners have to face in the near future is that of finance. At present, the suggestion which finds favour is to make the Corporation of Edinburgh their banker, and to borrow from them whatever is required. This is probably the cheapest method which they could adopt for the raising of money. Where care will require to be exercised is to get the funds into a position in which the price of the old works, when sold, will be immediately available for reduction of the debt upon the undertaking. Corporation loans require to be repaid, in stated proportions, in thirty years. Mortgages, which are also spoken of, are similarly repayable at stated periods. Probably the Commissioners will not borrow all that they require, either from the Corporation or upon mortgage. In this event, there will come a time, as the new works are nearing completion, when it will be advisable to obtain a floating loan, repayable at any date, or at short notice. The price of the old works would be available, when it came in, for wiping this out. It is matter for consideration, however, whether this should be the method; or whether it would not be as cheap, or cheaper, to borrow at a low rate of interest for a fixed period, and, when the old works are sold, invest the money in such a way that it could be used to pay off instalments as they fall due. The first plan would be the simpler of the two, but the second would give more freedom as to the time when the old works would be exposed for sale; this being a matter of probably as much importance, as implying loss or gain, as any question of rate of interest can be.

A public inquiry was held in Dundee Sheriff Court, on Thursday, into the circumstances which led to several fatal results to workpeople. One of these related to the death of David Pearson, a stoker in the employ of the Corporation of Broughty Ferry, which took place in the gas-works on the evening of Friday, Sept. 9 last. Pearson was working in an excavation, 9 ft. 9 in. deep, in front of the retort-bench, when a fellow workman observed him fall backwards. This man was unable to get his unfortunate comrade out of the pit, and so ran for the Manager. The poor man was dead when rescued. The medical evidence was to the effect that death was due to suffocation through inhaling carbonic acid gas. It is supposed that the man was overcome by some sudden ailment, which led to his falling. The oven he was working at had been out for several months, and had just been re-lighted when the accident occurred. Had the fire been properly started, the Manager said, the draught caused by it

\* See "JOURNAL," Vol. LXVI., pp. 406, 449, 497, 548.

\* See page 822.



would have prevented the accumulation of noxious gas in the pit. Sheriff Campbell Smith remarked that, in his experience, fatal accident inquiries were useless for the purpose of getting information. All they pointed to was the necessity of protecting workmen against themselves. He did not know that they had got any information that day which would be of use to them, except it might be in the first case, in regard to the danger of going into a cavity or any place where carbonic acid might gather, or where oxygen might be burned out by fire. He thought that if the first witness had held Pearson's head up, instead of running for help, he might have saved the man's life. It was, however, very easy to be wise after the event. He questioned very much if the man knew anything about carbonic acid.

The Perth Gas Commissioners seem to be getting under way at last in the matter of the erection of new gas-works. A deputation of their number have been to Glasgow to see Mr. Foulis, whom they had consulted as to the plans. This deputation reported to the Commission at a private meeting on Thursday; and it is said that, after considerable discussion, Mr. Foulis's recommendations were adopted. Of course, they have yet to take estimates; and it was at this stage that the proceedings collapsed last time.

The North Berwick Gas Commission have decided to retain the price of gas for the year at 4s. 2d. per 1000 cubic feet. At this figure, though coal is 8d. per ton dearer, it is expected that there will be a surplus of about £100. Mr. Black, the Manager, reported that between thirty and forty gas-cookers are in use in the burgh; and that if more provision for producing gas be not made, it will be impossible to overtake the work next year. The Commissioners have appointed a Committee to treat with Mr. Hamilton-Ogilvy, with reference to the acquisition of a site for a new gas-works. The Commissioners some time ago sent out queries to the householders, to ascertain the feeling of the community upon the subject of the introduction of electric lighting. Only 51 replies were received. Of these, 25 were against; and it was found that the probable number of consumers would be 13, and the number of lights 794. On account of want of interest in the proposal, the Commissioners decided to abandon it.

The Town Council of Stirling had a feast upon the lees on Friday night, when they spent three hours considering the report of their Committee upon the Bill of the Gas Company. This report was laid before the Council early in August. It was, of course, a glorification of the Committee from beginning to end. A majority of the Council, however, considered that, before disposing of the report, they should have fuller information before them. They called for the production of all letters passing through the hands of the Committee on the subject of the Bill. A fortnight ago the Committee informed the Council that they had not printed the correspondence, chiefly because of "the enormous cost," which cost was estimated at only £15 to £20. The Council, on that occasion, were obdurate, and insisted upon the correspondence being produced and printed. Thereafter the Committee, or their supporters, seemingly afraid of their reputation should too much publicity be given to the correspondence, promoted a requisition to the Provost calling upon him to summon a meeting of the Council for the purpose of rescinding the order to

print. It is strange that, though the Council had, on two occasions, directed the letters to be printed, when the requisition was hawked round among the members, means were found for inducing a majority of the Council to support it. This settled the question of rescission; and when the Council met, the opposition to the proposal was very easily and promptly crushed.

Then the Council took up consideration of the report on its merits. The discussion which ensued may well be described as having been both loud and long. Though the letters could not be had in print, they could not be altogether withheld from the members of the Council; and consequently several passages from them were read by the gentlemen who believe that the opposition to the Gas Company's Bill was carried too far. The most notable revelation in the reading of these passages was that, before the Bill was considered by the House of Lords Committee, Mr. Herring, of Edinburgh, advised that the Corporation should offer the Gas Company £55,000 for their undertaking. Mr. Herring was one of the Corporation witnesses. His suggested price was only £7000 below Mr. McGilchrist's valuation a year before. This represents about £200 a year; but the probability is that, if the offer had been made, the £55,000 would have been increased, and the difference lessened. The Committee were advised by their Counsel, before that time, to offer to adopt the Burghs Gas Supply Act in November. They did not give this undertaking; neither did they offer the £55,000. They thought they could do better. But these two incidents show (1) that Mr. McGilchrist's valuation of £62,000 was exceedingly near the mark; and (2) that the Corporation acted foolishly in not going in for a transfer of the undertaking. The discussion ended in the report of the Committee being adopted by 12 votes to 7. The Committee are thus acquitted; but this result has only been reached by their own votes. Had they not voted themselves, their report would have been rejected. I do not question their right to vote; but when the previous Council resolved to acquire the undertaking of the Company, the motion was only carried by the votes of some members who were also shareholders of the Gas Company. This circumstance was laid hold of by the party who are now in power; and it was used by them, with all the force they could exert, to alarm the public. And it succeeded. They should, therefore, in accordance with their own principles, have abstained from voting in this instance. But here, as elsewhere, circumstances alter cases.

The Cowdenbeath (Fife) Gas Company have substituted acetylene gas for coal gas, as the illuminant they supply. The plant they employ is that of the Home and Colonial Acetylene Gas and Engineering Company, of West Regent Street, Glasgow. The new gas was turned on on the 3rd ult., by Mr. Jas. McConehy, the patentee of the plant. The change has been a popular one in the little town; the demand for acetylene gas having been such that the Directors of the Gas Company have placed orders for the duplication of their apparatus. Acetylene gas is also being introduced in Portsoy. A trial of it was made in the street-lamps last Saturday night, and was considered to be quite satisfactory. Workmen are meantime giving a general overhaul to service-pipes and fittings; and it is expected that by the end of next week lighting by acetylene gas will be general in the town.

## GAS AND WATER COMPANIES STOCK AND SHARE LIST.

Referred to on p. 805.

| Issue.    | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME.                      | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue.    | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME.                      | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|-----------|--------|-------------------|-------------------------------|----------------------------|-----------------|---------------------|------------------------|-----------|--------|-------------------|-------------------------------|----------------------------|-----------------|---------------------|------------------------|
| £         |        |                   | p. c.                         | GAS COMPANIES.             |                 |                     | £ s. d.                | £         |        |                   | p. c.                         | GAS COMPANIES.             |                 |                     | £ s. d.                |
| 590,000   | 10     | Apr. 15           | 10½                           | Alliance & Dublin 10 p.c.  | 22-23           | -½                  | 4 11 4                 | 75,000    | 5      | June 29           | 6                             | Malta & Medn., Ltd.        | 43-51           | ..                  | 5 14 3                 |
| 100,000   | 10     | "                 | 7½                            | Do. " 7 p.c.               | 16½-17½         | ..                  | 4 5 9                  | 541,920   | 20     | June 10           | 5                             | Monte Video, Ltd.          | 13½-14½         | ..                  | 6 18 0                 |
| 300,000   | 100    | July 1            | 5                             | Australian 5 p.c. Db.      | 105-107         | ..                  | 4 13 6                 | 617,946   | Stk.   | Aug. 31           | 9½                            | Newcastle & Gateshead Con. | 230-240         | ..                  | 4 1 3                  |
| 200,000   | 5      | May 26            | 6                             | Bombay, Ltd.               | 6½-7            | ..                  | 4 5 9                  | 252,355   | Stk.   | Jan. 3            | 3½                            | Do. 3½ p.c. Db. Stk.       | 113-117         | ..                  | 2 19 10                |
| 40,000    | 5      | "                 | 6                             | Do. New, £4 paid           | 4½-5            | ..                  | 4 16 0                 | 150,000   | 5      | May 26            | 8                             | Oriental, Ltd.             | 7½-8            | ..                  | 5 0 0                  |
| 880,000   | Stk.   | Aug. 12           | 12                            | Brentford Consolidated     | 275-280         | ..                  | 4 5 9                  | 135,000   | 5      | "                 | 8                             | Do. New, £4 10s. pd.       | 6½-7            | ..                  | 5 2 11                 |
| 240,000   | "      | "                 | 9                             | Do. New                    | 210-215         | ..                  | 4 3 9                  | 15,000    | 5      | "                 | 8                             | Do. do. 1879, £1 pd.       | 1½-1½           | ..                  | 4 11 5                 |
| 50,000    | "      | June 10           | 4                             | Do. 5 p.c. Prf.            | 140-145         | ..                  | 3 9 0                  | 60,000    | 5      | Sept. 29          | 7                             | Ottoman, Ltd.              | 5-5½            | ..                  | 6 6 2                  |
| 159,375   | "      | Sept. 15          | 11½                           | Do. 4 p.c. Db. Stk.        | 130-135         | ..                  | 2 19 3                 | 500,000   | 100    | June 1            | 5                             | People's Gas 2nd M.        | 103-108         | ..                  | 5 11 1                 |
| 220,000   | Stk.   | Sept. 15          | 11½                           | Brighton & Hove, Orig.     | 262-267         | ..                  | 4 6 2                  | 848,070   | 10     | May 26            | 6                             | of Chicago J. Bd.          | 92-93           | ..                  | 6 3 1                  |
| 226,320   | "      | "                 | 8½                            | Do. A. Ord. Stk.           | 190-195         | ..                  | 4 7 2                  | 250,000   | Stk.   | June 29           | 6                             | River Plate Ord.           | 99-101          | ..                  | 3 19 3                 |
| 933,500   | Stk.   | Aug. 31           | 5                             | Bristol, 5 p.c. max.       | 125-130         | ..                  | 3 16 11                | 250,000   | 10     | Sept. 29          | 10                            | San Paulo, Ltd.            | 14½-15½         | ..                  | 6 9 0                  |
| 420,000   | 20     | Sept. 23          | 10                            | British                    | 50-52*          | ..                  | 3 16 11                | 135,000   | Stk.   | Sept. 15          | 10                            | Sheffield A.               | 242-245         | ..                  | 4 1 8                  |
| 50,000    | 10     | Aug. 12           | 11½                           | Bromley, Ord. 10 p.c.      | 25-27           | ..                  | 4 5 2                  | 209,053   | "      | "                 | 10                            | Do. B.                     | 242-245         | ..                  | 4 1 8                  |
| 75,000    | 10     | "                 | 8½                            | Do. " 7 p.c.               | 20-22           | ..                  | 3 17 3                 | 447,427   | "      | "                 | 10                            | Do. C.                     | 242-245         | ..                  | 4 1 8                  |
| 500,000   | 10     | Apr. 29           | 6                             | Buenos Ayres (New) Ltd.    | 9-9½            | ..                  | 6 6 4                  | 5,600,000 | Stk.   | Aug. 12           | 5½                            | South Metrop. 4 p.c. Ord.  | 140-143         | ..                  | 3 14 7                 |
| 98,122    | Stk.   | June 29           | 4                             | Do. 4 p.c. Db. Stk.        | 98-100          | ..                  | 4 0 0                  | 1,460,000 | "      | July 14           | 3                             | Do. 3 p.c. Db. Stk.        | 102-105         | +1                  | 2 17 2                 |
| 150,000   | 20     | July 14           | 8½                            | Cagliari, Ltd.             | 29-30           | ..                  | 5 10 0                 | 60,000    | Stk.   | Aug. 31           | 12                            | Tottenham & A.             | 280-290         | ..                  | 4 2 9                  |
| 100,000   | 10     | Sept. 29          | 7                             | Cape Town & Dis., Ltd.     | 15-16*          | ..                  | 4 7 6                  | 60,000    | "      | June 10           | 7                             | Edmonton J. B.             | 200-210         | ..                  | 4 5 9                  |
| 50,000    | 50     | May 3             | 6                             | Do. 6 p.c. 1st Mort.       | 58-60           | ..                  | 5 0 0                  | 182,380   | "      | July 10           | 5                             | Tuscan, Ltd.               | 10½-11½         | ..                  | 6 1 9                  |
| 550,000   | Stk.   | Apr. 15           | 13½                           | Commercial Old Stock.      | 315-325         | ..                  | 4 3 1                  | 149,900   | 10     | July 1            | 5                             | Do. 5 p.c. Dbs. Red.       | 100-103         | ..                  | 4 17 1                 |
| 200,750   | "      | "                 | 10½                           | Do. New do.                | 252-257         | ..                  | 4 1 8                  |           |        |                   |                               |                            |                 |                     |                        |
| 200,750   | "      | June 10           | 4½                            | Do. 4½ p.c. Db. do.        | 148-153         | ..                  | 2 18 10                |           |        |                   |                               |                            |                 |                     |                        |
| 800,000   | Stk.   | June 10           | 12                            | Continental Union, Ltd.    | 207-212         | ..                  | 5 13 2                 |           |        |                   |                               |                            |                 |                     |                        |
| 200,000   | "      | "                 | 9                             | Do. 7 p.c. Prf.            | 193-198         | ..                  | 4 10 11                |           |        |                   |                               |                            |                 |                     |                        |
| 51,600    | Stk.   | Aug. 31           | 14                            | Croydon A 10 p.c.          | 305-310         | ..                  | 4 10 4                 | 746,164   | Stk.   | June 29           | 10½                           | WATER COMPANIES.           |                 |                     |                        |
| 168,400   | "      | "                 | 11                            | Do. B 7 p.c.               | 255-265         | ..                  | 4 3 0                  | 150,000   | "      | "                 | 5                             | Chelsea, Ord.              | 313-318         | ..                  | 3 6 0                  |
| 555,000   | Stk.   | Aug. 12           | 5½                            | Crystal Palace Ord. 5 p.c. | 125-130         | ..                  | 4 0 9                  | 160,000   | "      | "                 | 4½                            | Do. 6 p.c. Prf.            | 170-175         | ..                  | 2 17 2                 |
| 60,000    | "      | "                 | 5                             | Do. 5 p.c. Prf.            | 140-145         | ..                  | 3 9 0                  | 175,785   | "      | Sept. 29          | 4½                            | Do. 4½ p.c. Pf. Stk., 1875 | 148-152         | ..                  | 2 19 3                 |
| 486,090   | 10     | July 28           | 11                            | European, Ltd.             | 23-24           | ..                  | 4 11 8                 | 1,720,560 | Stk.   | Apr. 15           | 7½                            | Do. 4½ p.c. Db. Stk.       | 155-160*        | ..                  | 2 16 8                 |
| 854,060   | Stk.   | Aug. 12           | 12½                           | Do. £7 10s. paid           | 17-18           | ..                  | 4 11 9                 | 654,740   | "      | June 29           | 4½                            | East London, Ord.          | 215-220         | ..                  | 3 3 7                  |
| 5,922,230 | "      | "                 | 4                             | Gaslight & Coke, A. Ord.   | 292-297         | ..                  | 4 2 6                  | 390,000   | "      | "                 | 3                             | Do. 4½ p.c. Db. Stk.       | 157-160         | ..                  | 2 16 3                 |
| 100,000   | "      | "                 | 4                             | Do. B, 4 p.c. max.         | 120-125         | ..                  | 3 4 0                  | 700,000   | 50     | June 29           | 7½                            | G'd Junction, 10 p.c. max. | 108-105         | ..                  | 2 17 2                 |
| 665,000   | "      | "                 | 10                            | Do. C, D, E, 10 p.c. Prf.  | 307-312         | ..                  | 3 4 1                  | 310,000   | Stk.   | Sept. 29          | 4                             | Do. 4 p.c. Db. Stk.        | 115-118         | ..                  | 3 3 7                  |
| 30,000    | "      | "                 | 5                             | Do. F, 5 p.c. Prf.         | 152-157         | ..                  | 3 3 8                  | 708,000   | Stk.   | Aug. 12           | 14                            | Do. 4 p.c. Db. Stk.        | 140-145*        | ..                  | 2 15 2                 |
| 1,300,000 | "      | "                 | 7½                            | Do. G, 7½ p.c. do.         | 230-240         | ..                  | 3 2 6                  | 160,000   | "      | "                 | 7                             | Kent                       | 365-370         | ..                  | 3 15 8                 |
| 463,000   | "      | "                 | 7                             | Do. H, 7 p.c. max.         | 195-200         | ..                  | 3 10 0                 | 1,043,800 | 100    | June 29           | 10                            | Do. New, 7 p.c. max.       | 212-217         | ..                  | 3 4 6                  |
| 476,000   | "      | "                 | 10                            | Do. J, 10 p.c. Prf.        | 307-312         | ..                  | 3 4 1                  | 406,200   | 100    | "                 | 7½                            | Lambeth, 10 p.c. max.      | 300-305         | ..                  | 3 5 7                  |
| 1,061,150 | "      | June 10           | 4                             | Do. K, 6 p.c. Prf.         | 185-190         | +3                  | 3 3 2                  | 350,000   | Stk.   | Sept. 29          | 4                             | Do. 7½ p.c. max.           | 227-232         | ..                  | 3 4 8                  |
| 294,850   | "      | "                 | 4½                            | Do. 4 p.c. Db. Stk.        | 131-133         | ..                  | 3 0 2                  | 500,000   | 100    | Aug. 12           | 13½                           | Do. 4 p.c. Db. Stk.        | 140-145*        | ..                  | 2 15 2                 |
| 958,000   | "      | "                 | 4½                            | Do. 4 p.c. do.             | 148-153         | ..                  | 2 18 10                | 1,000,000 | Stk.   | July 28           | 4                             | New River, New Shares      | 435-440         | +3                  | 3 0 2                  |
| 70,000    | 10     | May 12            | 8                             | Do. 6 p.c. do.             | 198-203         | ..                  | 2 19 1                 | 902,300   | Stk.   | June 29           | 6                             | Do. 4 p.c. Db. Stk.        | 140-145         | ..                  | 2 15 2                 |
| 8,800,000 | Stk.   | "                 | 4                             | Hongkong & China, Ltd.     | 14-15           | ..                  | 5 6 8                  | 126,500   | 100    | "                 | 6                             | Southw'k & V'xhall, Ord.   | 166-171         | ..                  | 3 10 2                 |
| 376,400   | 100    | Aug. 2            | 4                             | Imperial Continental       | 228-233         | +8                  | 4 5 10                 | 489,200   | Stk.   | "                 | 5                             | Do. do. 7½ p.c. Prf.       | 160-165         | ..                  | 3 12 9                 |
| 473,600   | Stk.   | Aug. 12           | 3½                            | Do. 4 p.c. Dbs. Red.       | 98-101          | ..                  | 3 19 3                 | 1,019,585 | "      | Apr. 15           | 4                             | Do. do. 5 p.c. max.        | 170-173         | +1½                 | 2 17 10                |
| 560,000   | 100    | Oct. 1            | 5                             | Do. 3½ p.c. Db. Stk.       | 101-104         | ..                  | 3 7 4                  | 1,155,066 | Stk.   | June 10           | 10                            | Do. 4 p.c. A. Db. Stk.     | 141-144         | ..                  | 2 15 7                 |
| 250,000   | 100    | "                 | 4½                            | Met. of Mel. 5 p.c. Db.    | 110-112*        | ..                  | 4 9 3                  | 200,000   | "      | "                 | 4½                            | West Middlesex             | 300-305         | ..                  | 8 5 7                  |
|           |        |                   |                               | bourne, 4½ p.c. Db.        | 105-107*        | ..                  | 4 4 1                  | 200,000   | "      | Sept. 15          | 3                             | Do. 4½ p.c. Db. Stk.       | 162-165         | ..                  | 2 14 7                 |
|           |        |                   |                               | * Ex div.                  |                 |                     |                        |           |        |                   |                               |                            |                 |                     |                        |

† Next dividend will be at this rate.



CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Oct. 8.

**Sulphate of Ammonia.**—There has again been a slow market. Prices have, however, been fairly well maintained; but more because of small supply than by reason of demand, which has been very limited, and mainly for covering sales for immediate delivery. Consumers have been altogether indifferent; being able to buy cheaper ahead, and their requirements being in no way urgent. In the forward position, speculators have been offering abroad freely at a substantial discount on spot prices. But buyers seem still inclined to wait for larger production and the chance of a further decline; and only a moderate business has actually been done. Scotch makers continue to quote £9 17s. 6d. per ton, ordinary terms, October-March delivery, f.o.b. Leith; but London, Beckton terms, may be had at £9 12s. 6d. for months ahead.

**Nitrate of Soda** is firm in all positions. Spot quotations are 7s. 7½d. per cwt. for good, and 7s. 9d. for refined quality.

LONDON, Oct. 8.

**Tar Products.**—This market is very disappointing. Benzols, it was hoped, might see some improvement as the season advanced. But they are weaker than ever; and, if the enormous quantities of naphtha and benzols, which are coming on the market, continue, there seems but little hope of improvement. Crude naphtha, however, has reached a price that must surely find for it an outlet in other channels. Pitch is moderately steady; but the price does not improve. No interest is taken in anthracene; but it continues to be quoted nominally at an unremunerative figure. Carbolic acid does not gain in price. But there is a regular consumption apparently of what is produced; and the parity between crude and crystals is more uniformly maintained than formerly. Speculative prices are being paid for tar; and, unless some improvement comes over products, buyers will regret their purchases.

Business during the week may be marked as follows: Tar, 14s. to 19s. Pitch, east coast, 25s.; west coast, 23s. Benzols, 90's, 8½d. to 9d.; 50's, 9d. Toluol, 1s. 1½d. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 1d. Crude, 30 per cent., naphtha, 3½d. Creosote, 2½d. Heavy oil, 45s. to 50s. Carbolic acid, 60's, 2s. Naphthalene, 55s.; salts, 32s. 6d. Anthracene, "A," 4d.; "B," 3d.

**Sulphate of Ammonia.**—There is a determined effort to depress this article; and, so far, dealers have been successful. But it is doubtful if any important business is being done at the reduced quotations. Makers were never less troubled about stock; and many are well sold at higher prices than now mentioned. To-day's market values are from £9 10s. to £9 13s. 9d. per ton, less 3½ per cent.

**Bangor Gas Supply.**—The Bangor City Council have received the sanction of the Local Government Board to the borrowing of £3000 for the purpose of improving the gas-works.

COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—Business is moving on steadily and very satisfactorily throughout the coal trade of this district, with prices all round not only levelled up to the advance which was partial last month, but firm at the full rates. The better qualities of round coal are moving off pretty freely; and though perhaps here and there in some qualities the whole of the output is not just at present being disposed of, only very small quantities of stock are accumulating, and pits are being kept on full time. The lower qualities of round coal continue in active demand; and no difficulty is experienced in maintaining full prices for these. Good ordinary qualities of steam coal average from 7s. 6d. to 8s. per ton at the pit. With regard to engine classes of fuel, there is a decidedly stronger tone since the commencement of the month. Notwithstanding the activity in the round coal trade, supplies of slack are in some quarters becoming scarce; and one explanation of this is that a considerable quantity is now being shipped for use in steamers, as during the protracted South Wales dispute this class of fuel has been found very adaptable and economical, under certain conditions, for marine boilers. A fairly large quantity of slack is also being exported to the Continent. The result is that prices are hardening; and, on forward contracts especially, advances on current rates are being very generally quoted. At the pit, common slack now averages 3s. 9d. to 4s. per ton; medium, 4s. 3d. to 4s. 6d.; and best sorts, 4s. 9d. to 5s. 3d. In the shipping trade, there is a very perceptible slackening off in the demand for round coals; and prices continue to ease down. Inferior sorts are now obtainable at 9s. to 9s. 3d. per ton, with better qualities quoted 9s. 6d. to 9s. 9d., delivered at Mersey ports.

**Northern Coal Trade.**—There has been a very full demand for coals; but the scarcity of steamships has rather limited the quantity sent out, and has caused a slight weakness in the price of one or two classes for very prompt delivery. Best Northumbrian steam coals are now quoted 9s. 9d. to 9s. 10½d. per ton f.o.b.; second qualities, 9s.; and steam smalls, 6s. The latter are scarce. In the manufacturing coal trade, the demand is steady and the prices unaltered. Gas coals have varied in the last few days, owing to one or two collieries accepting rather lower prices to obtain early shipment; but the price for forward delivery is still steady. Quotations for gas coals have thus fluctuated between 9s. 6d. and 11s. per ton f.o.b. according to time of delivery. Gas coke is scarce; and for shipment higher prices are quoted—about 12s. 6d. per ton f.o.b. being named as obtainable. The local prices of gas coke are unaltered.

**Scotch Coal Trade.**—The coal market was not so strong last week; but what fall had taken place in prices was looked upon as only temporary. The demand continued good, and is likely to remain so. The prices quoted were: Main, 8s. 3d. to 8s. 6d. per ton f.o.b. Glasgow; ell, 9s. to 9s. 3d.; and splint, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 206,415 tons—an increase of 17,044 tons over the previous week, and of 13,642 tons over the corresponding week of last year. For the year to date, the shipments have been 7,451,763 tons—an increase upon the same period of last year of 1,395,967 tons.

# CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

## The Economical Gas Apparatus Construction Co., Ltd.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.

American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETETED, LONDON."

### CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

|                                | Cubic Feet Daily. |                                  | Cubic Feet Daily. |
|--------------------------------|-------------------|----------------------------------|-------------------|
| BLACKBURN . . . . .            | 1,250,000         | TORONTO (Second Contract;        |                   |
| WINDSOR STREET WORKS, BIR-     |                   | Remodelled) . . . . .            | 2,000,000         |
| MINGHAM . . . . .              | 2,000,000         | MONTREAL . . . . .               | 500,000           |
| SALTLEY WORKS, BIRMINGHAM      | 2,000,000         | BELLEVILLE . . . . .             | 250,000           |
| COLCHESTER . . . . .           | 300,000           | OTTAWA (Second Contract) . .     | 250,000           |
| BIRKENHEAD . . . . .           | 2,250,000         | BRANTFORD (Remodelled) . .       | 200,000           |
| SWINDON (New Swindon Gas Co.). | 120,000           | ST. CATHERINES (Remodelled) .    | 250,000           |
| SALTLEY WORKS, BIRMINGHAM      |                   | KINGSTON, PA. . . . .            | 125,000           |
| (Second Contract) . . . . .    | 2,000,000         | PETERBOROUGH, ONT. . . . .       | 250,000           |
| WINDSOR STREET WORKS, BIR-     |                   | WILKESBARRE, PA. . . . .         | 750,000           |
| MINGHAM (Second Contract) . .  | 2,000,000         | ST. CATHERINES (Second Contract) | 250,000           |
| HALIFAX . . . . .              | 1,000,000         | BUFFALO, N.Y. . . . .            | 2,000,000         |
| TORONTO . . . . .              | 250,000           | WINNIPEG, MAN. . . . .           | 500,000           |
| OTTAWA . . . . .               | 250,000           | COLCHESTER (Second Contract) .   | 300,000           |
| LINDSAY (Remodelled) . . . . . | 125,000           | YORK . . . . .                   | 750,000           |
| ROCHESTER . . . . .            | 500,000           |                                  | Cubic Feet.       |



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## EDITORIAL NOTES.

## The Non-Abatement of Smoke in London.

THE consequential teaching and effects of the Welsh coal strike are numerous and often surprising. One of the most impressive of these lessons was the disclosure that very much of the supposed advance of smoke abatement in connection with steam raising in the Metropolitan district, which had been ascribed to the use of improved mechanical devices, was illusory. It is quite true that London factories made less smoke than, for instance, Manchester or Sheffield factories; but this was only because the former burnt smokeless Welsh coal. The moment the supply of this clean fuel was interrupted, London factories became as smoky as similar establishments anywhere. Particularly was this the case with electric lighting central stations. The water-tube boiler is largely used in these electrical factories; and this is a steam generator which is desperately given to smoking, when it has the smallest opportunity. Consequently, complaints have been heard that the vaunted cleanliness of the electric light is greatly discounted by the dirtiness of the generating station, with its tall chimney poisoning the atmosphere over a wide area. It has been the same with the steam-vessels plying on the River Thames above bridge. A resident of the Temple complains that "for six months and more this intolerable nuisance has "been going on." Factory and steamship owners have been prosecuted upon all sides; but the majority of them have elected to pay the fine rather than alter their furnaces. Perhaps they are wise in their generation. Now that the Welsh coal is in the market again, the complaints of smoky factory chimneys will die away.

Meanwhile it is worth notice that public opinion has given up belief in electric lighting as a guarantee of the cleanliness of a town atmosphere, where the factories do not burn a smokeless coal. A curious commentary upon this state of things has appeared in the "Hospital." The writer has drawn attention to the connection between a smoky atmosphere and window-cleaning accidents. He observes that in London the windows require cleaning at least three times as often as would be necessary if the atmosphere were not so highly charged with smoke; so that "a very "considerable proportion of deaths from window-cleaning "must be put down to the account of the smoke fiend." He does not see any remedy for this deplorable concomitant of the smoke nuisance—"unless, indeed, the Gas Companies "will kindly let us have gas at such a price that it shall be "cheaper to use than coal." As a matter of fact, this is actually the case in respect of many thousands of the fires that business London needs during the daytime. It has been pointed out in the "JOURNAL" every autumn for some years past that gas-fires are not only much more convenient, but are as a matter of fact cheaper than coal-fires for offices and those commercial establishments which are not provided with steam or hot-water heating plant. Taking sixpence a day as the minimum charge for a coal-fire, or for a scuttle of coal—as the case may be—it can be easily shown that less than sixpennyworth of gas burnt in a properly-fitted "fire" serves the same purpose with greater convenience, inasmuch as it does not require attention. A gas-fire is the very thing for a City office. It is cleanly, always available, and can be dispensed with at any moment. All the undeniable recommendations of a cheery, fitful coal-fire for domestic use are beside the mark in the case of a business establishment. The business or professional man has something else to do besides poke the fire; nor does he want to sit beside his hearth and gaze at the faces he can see in the hollows of the glowing coals. He merely wants a warm room, and no trouble in keeping it so.

This being the case, whose duty is it to wait upon the City man during the summer or early autumn and recommend gas-fires? Does anybody take the smallest trouble to push this line of business? Here, as usual, the gas company are out of it. The electric lighting company call and try to book an order—nobody takes the trouble to look up the gas-fittings, and see that they are likely to give continued satisfaction. The fires? Oh! they are the house steward's or the housekeeper's business. City men have other things than office fires to occupy their thoughts until the first cold raw morning comes; and then they choke themselves with the smoke of kindling wood and coal purchased at the rate of sixpence the scuttle—and a tiny scuttle at that. It is a common experience of those who have occasionally to work late in the City, to go on the prow round the office rooms

## TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.



in search of a few knobs of coal to keep one fire alight withal. The City man pays about £5 a ton for his coal, under this system. Decidedly, gas is cheaper; but the pity of it is the truth is not generally known.

#### The Gas Supply of Vienna.

THE remarkable experiences of the Imperial Continental Gas Association in respect of their Vienna property have been mentioned several times in these columns. We have been compelled to tell the story of the conflict between the Association and Dr. Lueger, the Burgomaster of Vienna, as it has been unfolded by ordinary newspaper reports; because, of course, the Association could not supply any official information concerning their proceedings for the protection of their property other than is contained in the reports of the Directors. This has been no disadvantage to anybody, seeing that the proprietors and friends of the Association have perfect confidence in the Administration. It may also be observed that English spectators of the development of the Vienna Gas Question have been loth to believe that Dr. Lueger, whatever his opinions and his position, would be able to outrage the laws of property, assuming Austria to be a civilized State. Dr. Lueger has been engaged in his campaign against the Association for the last two years; and the result up to the present was recounted in last week's "JOURNAL." To-day the story is rounded off by what we are able to reproduce in another column of a communication from the Vienna Correspondent of "The Times." Dr. Lueger has failed to carry out his boast of driving the English out of Vienna, and, instead, has been digging the grave of his own Administration in the superfluous trenches for the municipal gas-mains which have disfigured the city. The Municipality might have obtained the whole of the undertaking of the Association for £1,350,000; whereas now the new so-called competing works will cost more than £3,000,000, and even so will only be able to serve a portion of the city. The Municipality have even been constrained to interfere in order to prevent the Association from lowering the price of gas during the remainder of the period of their concession. It is a most remarkable instance of mismanagement of municipal interests for the sake of a political cry. Truly, the Empire of Austria has many vicissitudes to endure by reason of the factions raging among its heterogeneous population; but for downright superfluity of mischief and waste of money, this Vienna gas business cannot be paralleled in history. There is little satisfaction in congratulating the Association upon their victory over Dr. Lueger. It has been too bad a business throughout to leave any pleasant impression behind; albeit one must be glad that the cause of justice and law prevail against the forces of passion and prejudice. It is the people of Vienna who have to suffer for it all; and they can ill afford it.

#### An Old Rule of Law Overlooked.

A FINE old crusted legal maxim tells us *de minimis non curat lex*; but the world seems to be changing its views of what constitutes the littleness that is exempt from legal cognizance. There is a Departmental Committee of the Home Office charged with the serious duty of investigating and reporting upon dangerous trades. Most people would agree that it is highly desirable for periodical inquiries to be held into the methods of industry and trade, in order to make sure that commercial enterprise, goaded by competition, does not transgress the laws of sanitation and outrage the rules of public security. Accordingly, the objects of the Home Office Committee are most likely to commend themselves to public support, so long as they are sought with due regard for proportion as well as the essential character of their subject-matter. The Committee are addicted to issuing interim reports, which is a very praiseworthy means of reminding the world of their existence. Last year they created a small sensation among the interests concerned by listing the generation of electricity at central stations among the "dangerous trades;" but this year they have no similar surprise to disclose. Instead, they place upon record the fact of their attention having been drawn to "sole-stitching by American machinery," which does not at the first glance suggest anything dangerous. It seems, however, that representations were addressed to the Committee "that the heat from the gas-jet causes vaporization of the mercury, and that the inhalation of this vapour is injurious to the health of the operators." Accordingly, the Committee visited boot and shoe factories in London, Leicester, Manchester and Salford, and in Scotland, and

took a considerable amount of evidence upon the subject. They admit having received complaints of "disagreeable" results from the escape of coal gas, most commonly "caused by an insufficient supply of mercury in the socket. The evidence as to mercurial poisoning was "limited to two cases, and was not conclusive." As a matter of fact, these were both old cases; and fellow-workmen were of opinion that in one instance the death was due to consumption, and in the other to drinking. What one would like to know is who laid the information concerning these cases before the Committee, and thus caused all the waste of time, trouble, and expense. This does not appear; but it would probably be near the mark to look to the Shoemakers' Trade Union for the instigating cause of this very ridiculous inquiry. It is just like Trade Union cunning to raise a ghost of this sort, after having failed to keep-out the machine by the crude device of not working it to its full capacity. Mercurial poisoning through the evaporation of the mercury seal of a gas connection forming part of a sole-stitching machine! It is a Trade Union idea all over; but the Home Office Committee must have forgotten the old maxim when they started a long and serious inquiry upon so slender a suggestion.

#### A Bricklayers' Protest.

WHEN commenting in this column last week upon the brooding trouble in the building trades, we remarked that nothing short of the remedy applied to the engineering trade will be found competent to cure the evil of Trade Union domination. Something that has transpired in London during the past week may be taken as indicating that it is high time the remedy in question was exhibited. The Vestry of St. Mary, Newington, are having an electric lighting station built in the district of Walworth; and upon it a gang of 31 bricklayers were employed. They were all Society men; but one of the number, named James Bushell—all honour to him!—was too quick in getting up his quoin for the rest, who are described in a newspaper report by the expressive title of the "Wait-a-Bits." Accordingly, 26 of the noble crowd informed the foreman that Bushell must be discharged, or they would all lay down their trowels and take their money. The modest demand was rejected, in terms which are not reported; and the men's threat was duly carried into effect. Bushell was sublimely unconscious of having committed what, in the guarded language of diplomacy, might be called "an unfriendly act." He did not hurt himself, and, indeed, has declared that he "wasn't working over hard—" in fact, he could have done much more, and considered "he had one of the easiest jobs he was ever on." Yet the great majority were unable to keep up with him; and so, by the doctrine of the "greatest good for the greatest number," this pestilent fellow ought to have been suppressed. If he had been working for the London County Council, an Alderman would have warned him that "something might happen" if he persisted in manifesting such inconsiderate energy. In the engineering shops under the A.S.E., such a man would have been liable to have something dropped on him from the travelling crane; or a red-hot iron would have accidentally come in contact with his leg. The resources of the "Wait-a-Bits" are many and various. The good bricklayer James Bushell may still have cause to rue his independence of the law of the "Union stroke," unless the employers in the building trades make up their minds that such men as he are to be protected, though they were but as one against hundreds. Matters cannot go on for ever in the groove revealed in this example; the employers must deliver themselves from the tyranny of the Union. Certainly nobody can do it for them.

#### British Trade Methods.

NOTICE has been taken by the newspapers during the past week of a remarkable Blue Book just issued, which preserves in a collected and orderly form the opinions lately expressed by Government Agents abroad upon British trade methods. From time to time, as is well known, Her Majesty's Diplomatic and Consular Agents in foreign parts take the trouble to send home their views regarding the state of British trade competition with the rival traders of other countries. Scattered as they naturally are through a variety of official statements, these observations are very liable to lose their proper value; and it is a great advantage to have them brought together for reference. The first impression produced by this useful compilation is that British goods are undersold in many instances by



the simple expedient of sacrificing quality to cheapness. Those who are in the gas-fittings trade, for example, know that this is so all over the continent of Europe; and that the German manufacturers can, and do, turn out a class of cheap and showy articles which English makers would certainly decline to make at any price. At the same time, the question is pertinently asked whether English firms are not too rigid in such matters. "Complaints have been made by German business men who carry on a large and regular trade with England, of the lack of willingness on the part of English manufacturers to meet their wishes." The Englishman considers he knows what is best for the purpose; and he is probably right nine times in ten. But it is nevertheless irritating for the would-be purchaser to be told that he cannot have the commodity he wants. It is the same in retail trade. Who does not know the annoyance of being told by a pert shopman that something he has to sell is much to be preferred to the article asked for, but which does not happen to be in stock? Complaints are also made that the British manufacturer is blind to the merits of the metric system of weights and measures; but this is a large and debatable question. It is much more to the purpose to hear that the tendency of the British workman to indulge in strikes is driving away orders from British manufacturers. Not that strikes are unknown in foreign countries, but it is contended that they more rarely go to the length of interfering very seriously with trade. This also is a questionable matter. Still, the Blue Book supplies numerous instances of orders for machinery having gone abroad owing to the engineers' strike; and a trade connection once lost and gained in this way is not easily altered afterwards. Plenty of evidence is also given to demonstrate the necessity for personal representation in trade. It is the commercial traveller, not the catalogue—the agent, not the circular—who gets the trade. The English manufacturer is accused of being committed to the system of "take it or leave it." This attitude answered well enough once; but it has become obsolete. It seems incredible that English makers should send to Spain catalogues of gas-engines with the cost of working stated in "pence per horse power." Yet this stupidity is reported by the Consul at Barcelona.

#### The New Judicial Procedure in Criminal Cases.

LARGE employers of labour and owners of industrial property are accustomed to suffer heavily in the aggregate from incessant small pilferings of stores and tools. The evil is not worse in gas-works than in the case of other factories; but still a good deal of it goes on, particularly at such times as outside contractors' workmen have the run of the place. The trouble of prosecuting, and the difficulty of securing convictions, deter works' managers from taking legal steps in many instances when the cause of justice would be served by their doing so. It has notoriously been difficult to make out a clear case against several men charged with conspiring to commit a petty larceny; and as most works robberies require the collusive action of two or more thieves, they often go unpunished. It is worthy of notice that the new system of procedure in criminal cases came into operation last week. Under this new rule, an accused person is permitted to give sworn evidence in his own defence. When several persons are charged together, any or all of them may offer their own testimony, which may be the subject of cross-examination. Although the new law has only been in force for a few days, reason has already emerged for the belief that it will work very beneficially for the cause of justice in prosecutions of the kind now in question—charges against several defendants for petty pilferings in industrial establishments. Under the old system, practically all the delinquents who really knew the facts of the case were shut up in the dock together, and their mouths were closed. In that position, they could enjoy the floundering of the witnesses, who were only able to tell a small part of the tale, and were consequently often made to look foolish by the cross-examining counsel. Now the temptation for every one of the accused to try and save himself, regardless of the others, will usually prove irresistible; and where there is actual guilt, it will be made manifest in quick time. A writer in the "Daily News," after spending a day in the Central Criminal Court, came away with two very strong primary impressions respecting the operation of the new system. "One is that it will probably prove very good for justice. The other is that it may be very bad for the

"prisoner whose partner in mischief elects to go into the box." This is precisely the point; and it is well brought out by an account of the trial of two men, who stood in the relation of master and man, on a charge of felony committed at a wharf. It was a plumber and his labourer, who had been employed by a firm of wharfingers to repair a roof and put wire netting (supplied by the firm) over some skylights. When the job was over, and the men had packed their handcart with all their paraphernalia, the foreman of the wharf came up and had the contents of the cart turned out. It was found to contain a sack with about 25 feet of wire netting, and some Chinese tea-sticks that had been abstracted from a cargo stored on the premises—both wire and sticks being the wharfingers' property. Under the old procedure, it would have been extremely difficult to convict these men of the theft. The master declared he had merely put the surplus piece of wire netting in the bag for convenience in getting it along the roof, and had no intention of taking it away. The labourer had packed it into the cart without orders. For his part, the labourer's case was that he thought the wire belonged to his master. Both tales were conceivably true; and a jury might have hesitated to reject them. But then there was the matter of the tea-sticks to explain; and the upshot was that both men elected to give evidence, and they managed to convict one another of guilty knowledge of the whole business. "The net result of the two appearances in the witness-box was to create a very strong impression that both men knew very well that each was taking what did not belong to him." This is what may be expected to happen in a good many similar cases; so that those who hold that the law should be a terror to evil-doers may congratulate themselves on the new reform in judicial procedure.

#### WATER AND SANITARY AFFAIRS.

THE County Council has decided that the recent restriction of the East London water supply to four or six hours per day affords a sufficient reason for "forthwith" launching a plan which shall revolutionize the entire water supply of the Metropolis. What the plan is to be we are to learn from the Water Committee, whose propositions, however, make no appearance in the Council's agenda for to-day. In the debate last Tuesday, Mr. Dickinson, as Chairman of the Water Committee, acknowledged that it was "a strong action on the part of the Council to ask Parliament for legislation while the Royal Commission was yet sitting." As a good justification for this extreme course, it was urged that "the claims of East London" were so paramount that Parliament ought not to be without a definite scheme to deal with the matter. But if the Water Committee propose, as everybody seems to expect, that a supply shall be brought from Wales, the claims of East London will have to stand over for several years to come. Mr. Beachcroft's amendment, which was adopted along with the original motion, though really unnecessary, considering that the Companies are already fulfilling what it contemplates, was far more likely to benefit East London than the scheme of a Welsh supply. Yet it certainly seems a little out of place for the Council to ask their Engineer what works, in his opinion, are required to provide for connecting the mains and works of the several Companies for use in cases of emergency. The Engineers of the Companies are quite likely to have an "opinion" of their own on this subject, founded on an intimate and practical acquaintance with the facts. But the proposal need do no harm; and it rather directs attention to the most reasonable way of meeting the exigencies of the case. Those exigencies are now substantially provided for; and if a restricted supply in East London is to furnish the reason for an application to Parliament, this ground of action may soon slip from under the feet of those who make it their starting-point.

It has been said that on this water question there is at last something like an approach to unanimity in the County Council. We shall see what this unanimity amounts to by the time the report of the Water Committee appears. It is intimated that the projected supply is to be of a supplementary character. Is this to be sent on in bulk to the Water Companies, or is there to be a supplementary system of distribution? The latter arrangement must of necessity involve competition, and it is certain this will not be sanctioned. Hence the "Chronicle" says that the scheme of a supplementary supply from Wales will be "probably



"accompanied by the purchase of the present undertakings." But "purchase" is a big affair; and we can hardly expect that the Water Committee have an explicit plan for dealing with it. Connected with the main question in all its bearings there is the complicated subject of the outer areas. The authorities of these outlying parts will have a voice in the matter, though the Council will doubtless repeat its former policy of satisfying these authorities at the cost of the London ratepayers. Again, if purchase takes place, to whom shall the undertakings be entrusted? We find it suggested that a revival of the Water Board scheme would smooth the way for a transfer of the supply. If there is to be a change, it seems inevitable that there should be an authority to comprehend the whole of "Water London." But this idea is not popular at Spring Gardens. To fight the Companies, with the chance of seeing the spoils of victory, if ever accomplished, pass into other hands, is not the sort of campaign to suit the Progressive idea.

On the benefits likely to accrue from an amalgamation of the Metropolitan Water Companies, we publish this week a letter from Mr. C. E. Jones, who, as having been until lately, and for many years, Engineer and Manager of the Chesterfield Water and Gas Company, is able to speak with some authority on the subject. The engineering and financial advantages of such an amalgamation are concisely pointed out, together with the administrative facilities that would be secured, and the greater degree of resistance that could be offered to the attack of the agitator. That the interests of the London Water Companies, as well as those of the consumers, would be promoted by an amalgamation of the undertakings, could it be accomplished, is a view which we have presented to our readers on several occasions. A combination of supplies would seem to point very distinctly in the same direction; and there is something significant in the efforts of the County Council to place the action resulting from such combination under restraint through the intervention of the Local Government Board. The Companies may link up their mains, but the water must only flow as permitted by the Board; and the Board may only give permission when there is an "emergency." Mr. Jones includes in his letter some useful statistics on what he properly terms the recent "rain-famine" in the Midland and Eastern Counties. We commend the phrase to the notice of the "Chronicle." Happily there are signs that this "famine" is now drawing to a close. How severe the drought has been is shown by the September report of Sir W. Crookes and Professor Dewar, by which it appears that from the 1st of January this year the deficiency in the rainfall in the Thames Valley amounted to more than 44 per cent. The observations of Mr. Jones in regard to the Lea Valley show a record of 50 per cent. below the average.

Mr. H. S. Samuel, the member of Parliament for the Limehouse Division, who gave the Government warning the other day that if they did not bring in a Bill to reduce the charge for water in East London in proportion as the supply was restricted someone else would, has prepared a Bill of another kind for the coming session. This projected measure provides that the Metropolitan Water Companies, "each and all of them," shall forthwith connect their several mains. The Companies are at the same time to be enabled to enter into agreements for the intersale of water; but there is inserted a proviso, after the manner of the County Council, that a supply from one Company to another shall only take place with the consent of the Local Government Board, and during such period as the Board may prescribe. All the rights of the Thames Conservators are reserved, including the limitation of the water to be taken from the river. Then there comes a repeal of the 35th section of the Metropolis Water Act, 1871, in order to provide that the Local Government Board shall be able to appoint a "competent person" to inquire and report, not only as to the quality of the water furnished by any of the Companies, but also as to the quantity in the reservoirs and the pressure in the mains. The Local Government Board are to have power, in cases of emergency, to compel the Companies to assist each other by a supply through the junctions. If the Companies fail to comply with any of the provisions of the Act, they are to be liable to heavy penalties; and every penalty is to take effect in reduction of dividend. We can only say of the proposed Act that it is either superfluous as requiring the Companies to do what they are already doing, or it is

absurd and tyrannical as interfering with matters which properly come under their control, and for which they alone must be held responsible. It seems to be inferred that the Companies do not understand their own business, and that somebody must manage it for them. But, of course, Mr. Samuel, as having an East London constituency, must make a show of doing something; and this is the result. We almost wonder he did not go a step further in framing his Bill, and empower the competent person to inquire into the pressure in the steam-boilers of the pumping-engines. The Bill is professedly designed "to make provision for the due supply of water to the Metropolis." But care is taken to preserve the limits of the supply which may be taken from the Thames. More water is to go into London; but no more is to come out of the river. It is a little odd that, while the Thames is thus carefully guarded, nothing is said about the Lea and its Conservators.

A correspondent of the "Zeitschrift für das Gas und Wasserfach" deals out the most unmeasured abuse to the East London Water Company for their failure to give a continuous supply of water during the recent drought. He instances their conduct as a typical example of the evils of the English system of granting monopolies to gas, water, and telephone companies. The irony of his remarks—which bear a striking resemblance to the outpourings of certain Progressive English organs—is discounted, however, by his concluding sentence, which doubtless crept in from some less inspired source. From it we learn that the water supplies at Dresden, Frankfurt-on-the-Main, and other German towns, also proved inadequate during the hot weather. The evils of the English system of monopolies are thus substantiated!

**Sugar Synthesized from the Constituents of Water Gas.**—A short time since M. Slosse reported to the Belgian Association of Chemists that he had prepared sugar, by exposing to the dark electrical discharge in a Berthelot ozonizer a mixture of carbonic oxide with twice its volume of hydrogen. The sugar formed answered to all the customary tests for cane sugar. It was necessary that the gases should be dry and perfectly pure. The discovery does not appear to have any immediate practical value.

**The Secretaryship of the Sheppy Gas Company.**—We understand that, in response to the advertisement in the "JOURNAL" for the 4th inst. inviting applications for the secretaryship of the Sheppy Gas Company, the Directors received communications from 86 candidates. Most of these were found suitable for the office; and consequently the task of the Directors has been a difficult one. They have, however, selected three of the candidates for an interview; so that very possibly we shall be in a position to announce the name of the successful one in our next issue.

**The Humphreys and Glasgow Carburetted Water-Gas Plant.**—It cannot be said of Messrs. Humphreys and Glasgow that they have failed to keep the members of the gas profession informed on the subject of the special system of gas manufacture with which they are identified. Publications already issued by the firm have dealt generally with the efficient and economical production of carburetted water gas; and they have just added to the list a book of illustrations (No. 8) of a number of typical installations of plant, accompanied by descriptive matter, plans and diagrams, and testimonials from engineers as to its working. The book furnishes just the information a manager requires who is contemplating the introduction of the new system into the works under his supervision. The illustrations and text, which occupy 150 oblong pages, are exceedingly well printed on highly-finished plate paper; and the book is gilt-edged and lettered, and handsomely got-up generally.

**Blast-Furnace Gas for Gas-Engines.**—Writing on this subject in the current number of "Cassier's Magazine," Mr. H. Savage says: "Each ton of pig iron run from the hearth of a blast-furnace is accompanied by the evolution from the furnace top of from 150,000 to 180,000 cubic feet of combustible gas. It was long disputed that this gas, the combustion of which in an ordinary boiler flue was sometimes a matter of difficulty, possessed sufficient heat-producing capabilities to allow of its use as a motive agent. Another insuperable objection to the employment of blast-furnace gas in the cylinder of a motor engine was supposed to lie in the difficulty of ridding it sufficiently of dust. Both these objections have, however, been set at rest. We thus have in every large modern iron-works an almost unlimited source of power, the means of utilizing which have been placed at our disposal, thanks to the progress accomplished in the construction of gas-engines of large size and efficient type. The final result is nothing short of an industrial revolution. The gas-fired boiler, the recognized mainstay of all iron mills or smelting works, is in this way threatened with extinction."



## ESSAYS, COMMENTARIES, AND REVIEWS.

## GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 877.)

THE Stock Exchange had a very dull time last week. A tone of alarm was set at the opening by the publication of the Fashoda papers which had a depressing influence; but it soon became considerably less acute. However, it put a stop to enterprise; and business fell very quiet. The settlement, also, had something to do with checking fresh business. The general tone was improving about mid-week; and Consols were rising when the advance in the Bank-rate came and upset calculations. Thenceforward extreme quiet and weak markets were the rule; but the worst was over before the close of the week. The Money Market was strong with a good demand. The rise in the Bank-rate, from 3 per cent. (fixed on Sept. 22) to 4 per cent., was a complete surprise at the time; but the Directors have so often found a  $\frac{1}{2}$  per cent. advance ineffectual to stop a run, that its wisdom is pretty well recognized now. Business in the Gas Market was not up to the level of the preceding week, but relapsed into quietness in common with the rest of the markets. Movements were few and irregular; and though the advances outnumber the recessions, yet it was the leading issue that receded. Gaslight "A" was very moderately dealt in daily at about 293 or 294; but failing to improve the quotation at the close, was put down a couple of points, though actual prices marked did not alter. Business was light in the secured issues; but all the 10 per cents gained a point. South Metropolitan changed hands moderately every day at steady figures. In Commercials, only the debenture was touched; stock being scarce. The Suburban and Provincial group would have been quite stagnant but for a few dealings in Brighton original, which advanced a point. The Continental Companies were steady and unchanged; some extent of profit-taking having checked the advance in Imperial. None of the rest presented any remarkable feature; but Buenos Ayres continued in favour. The Water Companies were almost quieter than ever; and the only changes were those arising from *ex div.* quotation.

The daily operations do not require a detailed notice; being at one dead-level and at unvarying figures until the closing day of the week. The only change, except those arising from *ex div.* quotation, was an advance of  $\frac{1}{2}$  in Buenos Ayres. But Saturday was the most conspicuous day, for Gaslight "A" fell 2; and ditto "C, D, and E," and "J" rose 1 each; and Brighton and Hove original, 1. There were no changes in Water.

## ELECTRIC LIGHTING MEMORANDA.

**The Persistent Unreliability of the Electric Light—Mishaps in Sunderland and Norwich—The Splendid Example in Municipalization of Edinburgh and Glasgow.**

FROM time to time the electric light provides irritating reminders that the unreliability which has always characterized it remains an incurable weakness of the system. Like epilepsy in the human subject, this liability of the electric light to "go out" without warning, at inconvenient moments, persists from youth to middle age, and is completely destructive of confidence in its serviceability. Nor is there the smallest prospect of the system outliving this detrimental character. Only the other day, while Alderman Lennard, the Chairman of the Leicester Corporation Electricity Supply Committee, was engaged in moving at a Town Council meeting the adoption of the report of the Committee, the electric lighting of the Council Chamber took the opportunity of going out and leaving its official apologist to deal as best he could in the dark with the irony of the situation. Last Friday week, in the City of London, the electric light, supplied by the City Company, failed between 6 and 6.30 p.m. over a considerable part of the district. Of course, this was just when the light was most wanted. The explanation of the occurrence offered by an electrical contemporary is worth giving. It might serve as the text for an examination paper in electrical engineering. "For the Western district there are eight Mordey alternators, with Ferranti coils, six of which machines were running at the time of the accident. At a few minutes after six, a coil on each of two of these machines burnt out; and the machines were immediately switched off from the 'bus bars.' The remaining four machines were not, however, sufficient to cope with the load, slowed down, and got out of phase. It was thereupon necessary to switch off the machines and the sub-stations, synchronize the former anew, with a fifth machine added, and connect on the sub-stations again, one after another, as the successive machines were paralleled." Now the student knows all about it.

At Sunderland the indifference of electricity supply to considerations of "system," when it is a question of lights going out, was illustrated on Sunday week. In the City of London it was the alternating-current plant that broke down; in Sunderland, where both systems of supply are in use, it was the continuous current that went wrong at an awkward time: A large concentric cable suddenly developed a fault at 6.10 p.m., just as the places of public worship were lighting up for evening service. When the mischief was first of all perceived, it was attempted to

"clear the fault"—whatever this may mean—by "burning out;" but the only result of this heroic operation was to "extend the burn-out over a length of 50 yards." No previous indication of the existence of a short circuit had been observed, "the station ammeter having remained at zero during the whole of the afternoon until the breakdown occurred." At Norwich also, on the evening of Friday, the 7th inst., a short-circuit took place between the positive and neutral mains, which pulled up the machinery and necessitated shutting down for a few hours until the fault was located and cut out. It was due to the bare strips of copper composing the mains having buckled and thus come together. Matters were all right again by midnight. Of course, all these mischances can be explained, and their recurrences from the same cause, or in the same way, guarded against. Unhappily when a man is an epileptic, there is always the haunting fear of his falling into the fire, which is against his prospects of succeeding as a public or domestic servant.

The example of the municipal electric lighting of Edinburgh may be cited as one of the strongest refutations yet offered of the puerile contention sometimes advanced in the electrical press that municipalities owning gas undertakings are apt to starve electricity supply, through fear of it. The Edinburgh Corporation began to supply electricity for lighting and power purposes in 1895—about the same time, practically, as they came into possession of the city gas undertakings. They have laid out nearly £300,000 upon the electricity works and plant; and are supplying current for private lighting at 3 $\frac{1}{2}$ d. per unit, subject to discounts up to 25 per cent. They are doing the street arc lighting at £14 per lamp per annum; and for the first time in its history, Edinburgh has, in places, public lighting which does more than render its darkness visible. Last year the Committee made a working profit of £20,648; and after providing for interest and redemptions of loans, they put aside £4000 for depreciation—being 1.54 per cent. on the capital expended. This is not much; but it is a piece of financial virtue such as few municipal authorities engaged in the business display. After this, the Committee had £3024 to give in aid of the city rates. Doubtless, the Committee wished to have this proof of financial prosperity to offer to the ratepayers; and inasmuch as the Corporation forthwith reduced the price of current, the bonus is not likely to be repeated. In truth, Edinburgh does not want it. Scottish municipalities recognize the truth that cheapness and efficiency of all public services that can fitly be municipalized is infinitely more desirable than a fictitious profit, such as anybody can make who has a monopoly. Thus a Scottish city corporation would sooner provide its citizens with a halfpenny tramway service than charge a penny and show a "profit." So it is with electric lighting and gas. Here is the Edinburgh Corporation cutting down the price of electricity to the lowest margin, while actually contemplating a vast outlay upon new gas-works. Glasgow is in the same case. Now, if ever, it might be imagined that both Edinburgh and Glasgow would like to feel sure of the stability of their gas property, and would be exposed to the temptation of putting gas forward at the expense of electricity. The public spirit of these cities is, however, above all such petty considerations. The Municipalities know full well that the people are not likely to need less gas because they can get cheap electricity if they prefer it. Both services are necessary and desirable for the districts supplied; and each can take care of itself, provided it is allowed fair play and full scope. It is a wonderful thing that so few English Municipalities, comparatively, see the matter in this light. Their Committees want to make "profits," forsooth! By all means let gas and electricity supply be carried on at a "profit;" but the profit should be in the shape of the best and cheapest possible service for the community as a whole, not a dole to be spent by a Corporation Committee ashamed to depend for support upon the rate fund.

**The Somzee-Greyson Intensified Gas Light.**—An installation of this light has been made for illuminating the entrance to the London Pavilion Music Hall. It is surrounded by a number of electric lights; so that it is in a good position for making a comparison between the two illuminants. It is an effective illustration of what can be done by gas when it is given fair play. The quantity of gas consumed by the twelve burners fixed is 120 cubic feet per hour; giving a light of 3600 candles.

**The Manufacture of Carbide in the Blast-Furnace.**—Numerous attempts have recently been made to produce calcium carbide without the aid of the electric furnace. In a blast-furnace supplied with ordinary atmospheric air, a sufficiently high temperature for carbide manufacture cannot be attained; but air richer in oxygen has lately been used successfully. Such air can be readily obtained by the help of the Linde machines for the liquefaction of air. The more readily volatile nitrogen can be, to a large extent, separated from the more easily condensable oxygen by the simple working of these machines; and a mixture of 50 per cent. of oxygen and 50 per cent. of nitrogen can be produced without any difficulty from the atmospheric air. Such a mixture, which is becoming known as "Linde air," suffices to give a sufficiently high temperature to produce carbide when used as a blast in a furnace fed with lime and carbon. The Linde air promises to have many other uses in the manufactures, and may perhaps be of value for the revivification of oxide and Weldon Mud *in situ* in gas purifiers.



### ENGINEERS AND CONTRACTORS—THE QUESTION OF SPECIFICATIONS.

THE old alarmist cry "The country's in danger!" with which our grandfathers were so painfully familiar, has in these later days undergone variation. It now strikes the ear in the form "British trade supremacy is in danger!" and whenever newspapers have nothing else to discuss, they raise this cry, and usually end it with a commendation of "technical education" as a preventive measure. Students of history know that one British Administration, in order to pacify the alarmists of the period, expended vast sums upon the construction of useless Martello towers along the South-Eastern coast line, and supplemented the Straits of Dover by a so-called military ditch. History, as we know, has a knack of repeating itself; and unless certain first principles are steadily kept in view, the panacea of "technical education" will prove with respect to British trade what the Martello towers and the military ditch were to the fighting England of Pitt and Wellington. This reflection is suggested by two contemporary newspaper readings. The first was a pompous leading article laying down the proposition that the Government are pledged to deal with secondary and technical education, "in which our people are lamentably deficient," and declaring that this pledge had better be redeemed during the ensuing session. The second was a law report referring to the case of a Rotherham steel manufacturing firm, who were fined under the Merchandise Marks Act for using a false trade description. The latter affair is so important that we may well take notice of the circumstances.

Messrs. Steel, Peach, and Tozer, Limited, of Rotherham, were sub-contractors for the supply of steel tyres for railway rolling stock ordered by the Government for Africa and India. The specification for the tyres required that the goods should pass three separate tests—(1) the drop test; (2) the tensile test; and (3) the analytical test. The inspector for the Consulting Engineer in due course marked some tyres for the second test, which involved cutting strips out of the solid steel. When he attended the works for the purpose of seeing the strips packed off for testing, he discovered that those produced were not the same pieces that he had marked. Other pieces of metal had been substituted, and a forged stamp in imitation of his own put upon them. The fact could not be disputed; but when the inspector interviewed the firm on the subject of the substitution, they refused to take steps to discover and disclose the actual perpetrator of the act. The matter was referred to the Consulting Engineer (Sir Alexander Rendel), who in the first place addressed an inquiry to the firm, with a request for an explanation. The reply was that "the irregularity" had so much disturbed the firm's feelings of security in the proceedings of the workmen in the tyre department that, rather than have any more testing of this sample, the firm would prefer to destroy all the material already made and replace it under their own personal supervision. A further reply was sent later in which it was admitted that one of the firm's "contractors, the foreman of the department," had substituted test-pieces for those selected by the inspector "in his desire to get the work through, knowing that the casts put in by him for the particular lot of tyres in question were not quite up" to the specification. After this confession, the firm had nothing else to do but to leave themselves in the Consulting Engineer's hands. He communicated the facts to his clients, and the matter was referred to the Solicitor for the Treasury. Once more the firm were given an opportunity for disclosing the actual offender; but they replied to the effect that the employees implicated had been dismissed, and consequently there was nothing to be gained by giving up the names.

Upon this information, proceedings were taken. The prosecuting counsel pointed out that it is no defence under the Merchandise Marks Act for an employer to say that an illegal act was committed by a servant. For the defence, it was urged, in extenuation, that the tampering with the test-pieces was a trick of a foreman in the position of a sub-contractor. But the defendants pleaded guilty, and were fined £10 on each of three summonses, with 50 guineas costs. The importance of a matter of this kind to every engineer and contractor for metal work needs no magnifying. The considerations attaching to it lie at the very root of the science and practice of civil and mechanical engineering, and affect one of the greatest of the industries of this country. What folly it is to talk of the need for improved technical education for assuring the future of the British iron and steel industry, if all the while what is wanted is common honesty on the part of manufacturers and contractors!

No engineer or man of business would desire to be unduly hard upon the defendant Company in this particular case. Here are a firm, described as of 25 years' standing, with a connection for tyres and axles among all the railways of the kingdom. They have long been doing this class of work, as their Counsel said, "not under extraordinary tests, but where it was desired that a thoroughly suitable article should be supplied." The employees of the firm number 1400; and the work is split up into departments, under foremen and sub-contractors, who are paid so much tonnage on the completed work. There is nothing uncommon in all this. On the contrary, it is the customary way of working in all such establishments. It is very easy for an

outsider to point the finger of scorn at a firm who happen to be landed as Messrs. Steel, Peach, and Tozer were on this particular job; but there is nothing to be gained by making a display of cheap ethics at the expense of one firm. What engineers and manufacturers alike have to face is the system, and its dangers, which have just received so impressive a demonstration. For the sake both of engineering and of British industry, the questions arising out of this conviction ought to be gone into from top to bottom.

In the first place, what is the reason for the sub-contracting or piecework system of production in iron-works and engineering shops? Simply to save labour—that is, wages. The firm pay so much tonnage on their steel castings, or their iron castings, or whatever it is; and they should for their part see to it that they get money's worth, in quality as well as quantity. Unfortunately, they have dropped into the habit, in many instances, of leaving this care to their customers; and this is not fair. How many an iron casting has been sent to a job and actually erected, only to be discovered defective at the last moment. Take, for example, a large gasholder contract, with huge cast-iron guide-columns necessarily cast in tapering pieces. In the full swing of erection, everything is brought to a standstill for want of a particular connecting-piece. When it comes, it is found to be flawed—nothing serious, perhaps; but there is putty in a place where iron should be. What is to be done? What should have been done, of course, was to keep a sharper look out upon the foreman at the works.

Hence the trouble about inspection and inspectors. If the firms themselves looked after their own work, the inspectors would only have one party (not necessarily antagonistic) to deal with. As it is, he has two. The unhappy inspector must be on his guard against the tricks of workmen who have been in the trade all their lives; knowing the while that the firm will not thank him if he keeps their work in arrear, though their own men are to blame. The evil has been greatly magnified by the disappearance of the old-fashioned master, who was so in fact as well as in name, and his substitution by joint-stock companies managed by officials whose interest and knowledge are as limited as the responsibility of the shareholders. These concerns depend to a dangerous degree upon their foremen and sub-contractors; and what can the inspector effect in face of so many indifferent or hostile influences? Designers have fallen into the way of thinking that the method to secure sound materials and good workmanship is to stiffen the specifications. Knowing that circumstances conspire to deprive them of the safeguard of the possible contractor's personal reputation for the faithfulness of his work, they strive to make themselves secure by so drafting their specifications that it cannot matter who gets the job. Trust has to be placed upon the inspector for seeing that the requirements are satisfied. Thus the inspector is placed between two fires. It is hardly to be wondered at if the net result is after all disappointing.

The question of strictness in specifying, and rigidity in insisting upon conformity with the terms of a specification, is a very old one as between engineers and contractors. We quite agree with our contemporary the "Engineer" when, in commenting upon the Rotherham case, it remarks: "We have, of course, nothing to say in defence of a most reprehensible fraud; but none the less do we deprecate a system of specifying which tempts people to be dishonest." We cannot, however, follow our contemporary in its strictures upon the specification in this instance. The engineer required the steel to pass three tests—two mechanical, and the third one chemical. Upon this, the "Engineer" remarks: "We hold that it is at once unfair to the steel maker and unwise on the part of an engineer to stipulate not only that steel shall comply with given tests, but also that its chemical constitution shall be defined." Why? Surely, nothing is more common than a requirement that a commodity shall not only *do* certain things, but shall also *be* of a certain composition. Our contemporary pledges its reputation to the declaration that "it is a matter of no importance whatever to the engineer how a steel is made so long as its tensile strength, limit of elasticity, and other physical qualities are satisfactory." We should be very sorry indeed to commit ourselves to any such statement.

On the contrary, we hold that an engineer has every right to know, if he pleases, how the materials of construction he employs are made, and their composition. If he wants open-hearth in preference to Bessemer steel, shall he not have it? And if he has an objection to an excess (from his point of view) of sulphur or phosphorus, or both, may he not forbid it? The responsibility for working to a specification rests entirely upon the contractor who signs the agreement. It is open to him to decline to tender; but it is not open to him, having accepted an obligation with his eyes open, to try and get round it. It is greatly to be deplored that the "Engineer" should vacillate upon this cardinal point. What is true of steel, of course, is true of many other commodities. This is how our contemporary puts it: "So long as [a maker's] steel is just as good as that of other firms who do get out the sulphur and phosphorus, why should it be rejected by the engineer, probably on the ground that it contains nickel, which is excluded by the terms of the specification?" The answer is plain enough. That which the engineer specifies, is what he has a right to have. It is not for the contractor to supply something else, because it is "just as good." Who is to be the judge in this matter? If an engineer



specifies in ignorance, or unreasonably, it is for the would-be contractor to point out the difficulty in advance. To uphold any other rule of conduct in this regard is to favour the competition of unscrupulous contractors who treat specifications as unnecessary evils of their business. As it is, for one contractor who will take the trouble to weigh every word of a specification, and consult with the engineer as to what is really essential to success in carrying out the job, there are ten who will swallow any paper rule with the secret intention of having their own way in the end, even at the cost of "squaring" somebody.

It is not the strict specification that tempts contractors to be dishonest, but the arbitrary use of powers of control which, if actuated on the principle "live and let live," would be quite harmless. Different engineers have different standards of efficiency; and contractors do not all work to the same rule of meritorious performance. Engineers who are in the active pursuit of their profession, if they are worth anything, know more than they can commit to writing in the form of a specification—they know their men. It is the same with contractors. New men are constantly cropping up to dispute the supremacy of the old hands on each side; and soon these make their mark, or drop out of the running. It would be an evil day for British trade and industry, however, if it were once to become understood at home and abroad that a contractor, whether for the supply of steel tyres or anything else, having accepted with open eyes the conditions of his bargain, were to be at liberty to question them afterwards—to say nothing of masking deception by forgery. All the technical education in the world will not avail to save a tradesman who is shaky on the Eighth Commandment.

### THE GAS ACTS OF 1898.

(Continued from p. 807.)

THE City of Waterford Gas Act consolidates the capital of the Company into £56,400 of 5 per cent. stock, with power to raise £24,000 additional capital of the same denomination. By their Act of 1877, the Company were authorized to charge a standard price of 5s. 9d. per 1000 cubic feet of gas, subject to a discount of 15 per cent. for cash in a month. The standard price is now reduced to 4s. 9d., and becomes the initial price under the sliding-scale. The usual proportion of loan capital is authorized, with a limitation to 4 per cent. dividend if converted into capital stock. Sanction is given to the Corporation of Waterford for promoting a Transfer Bill within three years.

The York United Gaslight Company's Act enables the Company, with the consent of three-fourths of the votes of holders of present shares, to convert the existing capital into a general 4 per cent. stock amounting to £350,000, with power to raise £80,000 of additional capital. Payment of back-dividends is limited to the previous six years. The usual proportion of loan capital is sanctioned. All future mortgages, debenture stock, and other securities issued by the Company are to be redeemable at par in not exceeding twenty years. The maximum price of 15½-candle gas (as from Sept. 29) is to be 3s. 6d. per 1000 feet in an area comprised within a radius of two miles from the centre of Ouse Bridge in the city of York, and 4s. beyond. The sum of £12,000, being part of a sum of £33,696 the balance of net profit appearing in the Company's statement of accounts for last year, is to be applied before the end of the year in paying off money borrowed or owing on mortgage by the Company. Proceedings for the recovery of any demand not exceeding £50 may be taken in the County Court.

The Bakewell Gas Act authorizes the Urban District Council of Bakewell, Derbyshire, to supply gas, acquiring for this purpose the undertaking of the Bakewell Gaslight Company, formed in 1848. The capital of the Company consists of £1500, in 300 £5 shares. The existing gas-works are situated upon leasehold land with a term of 58 years from Sept. 29, 1854, held under the Duke of Rutland. An agreement is scheduled whereby the Council purchase of the Duke the site of the gas-works, with everything upon it, at the price of £1200, and also the undertaking of the Company. The district of supply is defined. The price of 15-candle gas is not to exceed 4s. per 1000 cubic feet within the district, or 5s. outside the district and beyond a radius of 1530 yards from the Bakewell Town Hall. Discounts of not exceeding 15 per cent. may be allowed. Three per cent. interest is to be paid on consumers' deposits. The sum of £20,000 may be borrowed for the purchase of the undertaking, and £5000 for the purchase of lands and the removal and reconstruction of the works.

The Drogheda (Corporation) Gas Act authorizes the transfer of the undertaking of the Drogheda Gaslight Company, Limited, to the Corporation. The Company was originally formed in 1839. The share capital consists of £16,190, all issued and paid up; and the Company have no mortgage debt. The gas-works are situated upon leasehold land, which is to be acquired within three years. The maximum price of 15-candle gas is 5s. 6d. per 1000 cubic feet, subject to 10 per cent. discount. Four per cent. interest is payable on consumers' deposits. Gas-rentals are recoverable in like manner as rates, or at the option of the Company as a civil debt. This section does not apply to any sums payable to the Company for fittings supplied and work done in respect thereof. No penalty is to be incurred for defec-

tive supply in case of unavoidable cause. The undertaking is sold to the Corporation for the sum of £21,000, with £1250 added for the book debts, cash in hand and at the bank, and coal stocks on Dec. 31, 1897. The reserve fund as it stood on that day and the books remain the property of the Company. In addition to the purchase-money, the Corporation are entitled to borrow £7750 for the purchase of land and the extension of works, and £2000 for parliamentary and other expenses. The borrowing powers of the Corporation under an Act of 1896 are commensurately reduced. The Company are to pay the costs of the Act; but the Corporation pay the costs of their own Parliamentary Agent, Counsel, and Solicitor in connection with the gas-works transfer.

The Filey Water and Gas Act authorizes the Urban District Council of Filey to acquire and carry on the undertaking of the Company, who obtained a Gas Act in 1891. The limits for the supply of gas are the district of the Council. The purchase price of the Company's undivided property is £55,000. The sale took effect on July 1; and from it were excluded "the uncalled capital and all calls and arrears of calls on the shares of the Company being unpaid, all rates due in respect of gas and water, . . . and the Company's reserve fund and all other moneys, securities for money and choses in action then belonging or due to the Company, and the stocks of coal, coke, and other residual products, meters, pipes, fittings, and fire goods in possession of the Company on the same day." The mortgage debt is taken over by the Council. Upon the actual transfer, an account is to be stated between the parties relating to the carrying on of the concern as from July 1 until the transfer; the sum of £293 being taken as the value of the stocks on the stated date. The maximum price of 15-candle gas is 4s. 6d. per 1000 cubic feet, subject to discounts. Four per cent. interest is payable on consumers' deposits. The sum of £10,000 is to be borrowed for the extension and improvement of the undertaking. Surplus profits are to be divided equally between reducing the price of gas and increasing the district fund.

The Market Harborough Urban District Council Gas Act provides for the transfer of the undertaking of the Market Harborough Gas Company, Limited, to the District Council. The Company was originally formed in 1833. The amount of the capital is not stated. The sale is to be by arbitration under the Lands Clauses Acts, as in the case of a sale and purchase by compulsion and not by agreement. The Council are also to pay all costs and incidental expenses, including compensation for officers and servants; it being provided that no officer or servant who has been in the employment of the Company for 25 years or upwards shall lose his right to compensation by reason of his declining to continue in the service of the Council. The purchase-money is to be paid on an agreed day, or, failing agreement, on June 30 or Dec. 31 next after the expiration of two months from the date of the award. The stock of gas, coal, and other tenant's stores at the date of the transfer is to be taken over at a valuation. Fifteen-candle gas is to be supplied at the maximum price of 3s. 6d. per 1000 cubic feet. Discounts are allowable of not exceeding 10 per cent. for prompt payment, and 20 per cent. for large consumption. No penalty is to be incurred for defective supply due to unavoidable cause or accident. The period of error in defective consumers' meters is limited to the last preceding quarter. The sum of £20,000 may be borrowed for extending and improving the works, repayable in forty years.

The Morley Corporation (Gas, &c.) Act empowers the Corporation of the borough of Morley to purchase the undertakings of the Morley Gas Company and the Churwell Gaslight Company. The paid-up capital of the Morley Company consists of £7500 original 10 per cent. stock; £3600 maximum 5 per cent. stock; and £35,000 maximum 7 per cent. stock, with a mortgage debt of £4700. The undertaking is to be compulsorily purchased by arbitration under the Lands Clauses Acts; and it is provided that, in determining the value of the property, due allowance is to be made for the reasonable expense of reinvestment. The Company are entitled to pay the reasonable costs of opposing the present Act, and also of a Bill of their own, out of their cash in hand or the reserve fund. The Corporation are to pay the costs of the winding-up; and the Chairman of the Company is appointed liquidator for the purpose at a remuneration of 50 guineas, to cover all the costs of the liquidation except legal expenses. The Corporation also pay compensation to any officers and servants (other than Directors) in the regular employ of the Company for whom no regular office or employment shall be found by the Corporation. Provided that no officer or servant of the Company who has been in their employ for 14 years or upwards shall lose his right to compensation by reason of declining service with the Corporation. The Churwell undertaking is transferred on payment of an agreed price. The mortgage debt of the Morley Company remains a first charge on the undertaking. The maximum price of 16-candle gas is to be 4s. per 1000 cubic feet. The period of error in defective consumers' meters is limited to the last preceding quarter. Power is given to inspect gas-fittings in new buildings. A loan of £45,000 is sanctioned for gas-works extensions, and £10,000 for working capital; the former repayable in forty years, and the latter in ten years.

The Yeovil Corporation Act contains a part relating to gas supply and the acquisition of the undertaking of the Yeovil Gas and Coke Company, Limited. The Corporation are to serve



on the Company within six months notice of their intention to purchase. In ascertaining the amount of the purchase price, under the Land Clauses Acts, regard is to be had to the capacity of the works and plant as being in excess of present requirements. All costs are to be paid by the Corporation, including those of the Company's Bill. Officers and servants are to be compensated. The terms of purchase are liberal and comprehensive. The maximum price of 15-candle gas is fixed at 4s. per 1000 cubic feet; and outside consumers are not to be charged a higher rate than those inside the borough.

#### THE REFEREES' NEW SYSTEM OF PHOTOMETRY.

DR. HUGO KRUSS, the experienced Hamburg photometrist, has contributed to a recent number of the "Journal für Gasbeleuchtung" an article on the method of testing the illuminating power of gas prescribed by the Metropolitan Gas Referees in the spring of this year.

He gives from our pages a description of the new apparatus, and the manner of making observations. He then remarks that the very numerous adjustments of position of the various parts on the table give ample opportunity for the misplacement of one or other part, and that in this respect the method is not a felicitous conception. He points out that, while the earlier "Notifications" of the Referees gave explicit instructions for the use of sperm candles in the closed Evans photometer with the Bunsen or Leeson disc, the whole of this apparatus has now been discarded at one swoop. He considers that the report of the recent Board of Trade Committee on Photometrical Standards\* completely discredited the sperm candle as a reliable standard of light, and that Mr. W. J. Dibdin's paper on a "Standard Photometer"† similarly discredited the closed Evans photometer. The new system in which neither the candle nor the Evans photometer is employed is, therefore, in his opinion, a fruit of the aforesaid report and paper. While the resemblance between the German and English methods of photometry has not been greatly intensified by the change, he thinks that the disappearance from the "Notification" of the English measures of length is a boon to all Continental photometrists who may wish to adopt the English system.

**Gas Companies' Protection Association.**—We learn from the Secretary of this Association (Mr. F. E. Cooper) that the first annual general meeting will be held at the Westminster Palace Hotel, on the 27th inst., to receive the report of the Provisional Committee and to elect a Committee.

**An Improved Underground Stopcock.**—Mr. W. C. Finch, the Outdoor Superintendent of the Brompton, Chatham, and Gillingham Water Company, has introduced an improvement in stopcocks and other valves placed underground. In order to prevent freezing, they are protected by means of short pipes, either of metal or stoneware, having flanges at each end. The bottom flange may be laid on a brick course or a bed of concrete; and slots can be formed in the sides of the pipe to allow it to be placed over a service-pipe.

**Conveying and Elevating Plant.**—The New Conveyor Company, Limited, of Smethwick, of which Mr. Gilbert Little is the Chairman and Managing-Director, have just issued a complete catalogue of their various kinds of plant and appliances. It is a book of 188 oblong pages, a large portion of which is devoted to the illustration of plant suitable for gas-works. The Company make the erection of inclined retorts, with "Eclectic" furnaces and automatic machinery, a special branch of their business; and the important installation of these retorts they have put up at Leeds, which is amply illustrated, constitutes an interesting feature of the book, in view of its extent and yesterday's visit to the works. The book is strongly bound and lettered.

**Production of Acetylene Gas in France.**—Writing on this subject, the American Consul at Havre says: "In regard to the production of acetylene gas from calcium carbide in France, there are no official statistics bearing upon the annual output of carbide, so that the amount furnished yearly by the different manufacturers has to be estimated. These estimates vary from 1000 to 5000 tons per year from each factory. There are ten factories at present engaged in the manufacture of carbide of calcium in France; and four factories are under construction. They will be able to produce, when running at their full capacity, from 2500 to 3000 tons per year. The wholesale price of carbide of calcium in France is from 350 to 400 frs. per ton, exclusive of the cost of packing. The cost of packing is 4.50 frs. per iron drum containing 50 kilos. (110 lbs.), 6 frs. per drum of 100 kilos. The carbide of calcium manufactured in France is guaranteed to give 300 litres (10.6 cubic feet) of gas per kilo. The output is constantly increasing, and the supply is fully equal to the demand. The retail price of the article is from 55 frs. to 60 frs. per 100 kilos., not including packing. There are two villages in France completely lighted by acetylene, by the Société Franco-Espagnole du Gaz Acétylène. They are Alzonne, in the department of Aude, a town of 1506 inhabitants, and Saurat-par-Tarascon, in the department of Ariège, a place of 3024 inhabitants."

#### GARCKE'S "MANUAL OF ELECTRICAL UNDERTAKINGS FOR 1898-9."

WE have received from Messrs. P. S. King and Son, of Westminster, a copy of the above-named work, which is the third annual issue of the Manual. From the commencement, the compilation of the contents of this valuable book has been done under the supervision of Mr. Emile Garcke, M.Inst.E.E., F.S.S., whose aim has been to make each edition better than its predecessor. This is evidenced by the fact that, whereas the first volume contained 490 pages, and furnished particulars as to 172 undertakings, the second numbered 598 pages, and the third contains 738 pages—the number of undertakings dealt with being respectively 274 and 412. The whole of the data are derived from official sources, and for the most part have been verified by responsible officers of the undertakings concerned. Among the improvements noticeable in the present volume may be mentioned the addition of the addresses in the Directory of Officials. The maps of the electricity supply areas within the County of London have been brought up to date by the insertion of all mains laid during the year. A large coloured diagram, showing the average revenue per Board of Trade unit of electricity sold and the cost of production at the various undertakings mentioned in the body of the work, furnishes at a glance much useful information. The general get-up of the volume ensures its retention of the position it has attained as a book of reference.

#### A SELF-IGNITING DEVICE FOR GAS-BURNERS.

THE self-ignition of gas has been a subject prolific in patents; but nearly all of the devices have been more or less imperfect. Some of the most ingenious of the arrangements have been the product of the inventive faculty of Mr. J. F. Duke; but his designs—at any rate his early ones—were not altogether free from objection. As was shown, however, by an abstract of a specification published in the "JOURNAL" for May 4, 1897, Herr H. Borchardt, of Berlin, devised means for the purpose of overcoming the weak points in Duke's original proposals; and the igniter which he designed appears to be (writing on only the briefest acquaintance with it) the most promising of those we have yet seen. The rights in the invention have been acquired by the Matchless Gas Lighting Syndicate, who have also purchased Duke's original patents, and others which in any way anticipated Borchardt's. The improved igniter is for a few days on view at the Holborn Restaurant, where its application to various kinds of burners can be seen and tested. It is particularly adaptable to incandescent burners; three of its advantages in this direction being that the mantle is gradually heated, there is no injurious shock to the mantle as is frequently experienced when lighting with a match or taper, and there is no deposition of carbon on the mantle as is often the case with the ordinary flash-jet. Of course, it cannot be denied that where incandescent lights are in careful hands, a nicely adjusted flash-light will be found equally advantageous in these respects; but the difficulty is to get people to give proper attention to the adjustment of the bypass, and so trouble ensues, which the igniter seems capable of obviating. On the point of economy, however, for ordinary domestic purposes, taking the cost of the igniter into consideration (4s. 6d.), there can be little to choose between it and the ordinary flash-jet, excepting where it effects a saving in mantles. The arrangement is enclosed in a brass casing which is readily connected to the fitting below the burner. The portion of the device under the burner contains a double-seated valve which is reversed by a one-armed lever in the interior of a tube projecting laterally from the casing, and ascending by the side of the burner. A connecting-rod in the vertical tube catches the lever by means of a lower eyelet, and is held fast by a wire running through a porcelain tube which surmounts the device. This tube is supported by a bush, which is moved in an upward direction by an adjusting-screw, so that the wire which rests on it at the top can be tightened by turning the screw. This check motion is naturally transmitted to the connecting-rod, which, in its turn, draws up the loose end of the reversing-lever, and is bent on to it with a sagging motion. As the valve is joined on to this lever, the tightening of the wire causes the valve to be pressed against its upper seat. Owing to this, the supply of gas passing from below into the device is prevented from flowing to the outlet to the burner. The gas consequently passes to the vertical tube, from a minute aperture in which a small stream is emitted. This comes into contact with a small piece of platinum sponge, which at once gets incandescent. The heat is communicated to platinum wires wound round the igniting agent; and the white heat of these wires causes the ignition of the outstreaming gas. The flame touches the porcelain tube; and the heat causes the wire in the latter to distend, so that the connecting-rod which has been pressing the valve against its upper seat, begins gradually to sink downwards, supported by the pressure of a spiral spring surrounding it. A supply of gas is consequently passed to the lighting burner; and, on being ignited by the small jet of flame on the vertical tube, it causes a still further distension of the wire, so that the valve sinks further down—leaving an entirely free passage for the gas

\* "JOURNAL," Vol. LXV., p. 1010. † *Ibid.*, Vol. LXVII., p. 1442.



to the burner, and completely stopping its access to the igniting circuit. On the lighting flame being extinguished, the cooling of the wire causes it to contract, and consequently the valve is lifted, and pressed once more against its upper seat. These are the main features of the construction of the appliance, which is really not so complicated as a written description would lead one to suppose is the case. All the parts are interchangeable, and can be renewed at a trifling cost. One can easily conceive many conditions under which this igniting agent could be usefully, and even profitably, employed. For example, in premises where inflammable goods are stored, it would be a safeguard against fire; where lights are situated at a high elevation, such as in public buildings, it would be of service; and, by its assistance, a saving of gas might be effected at railway stations and in gas-lighted trains, as it would be possible to control simultaneously from one central stopcock a large number of burners.

#### PERSONAL.

Mr. G. W. LACEY, the Secretary of the gas and water undertakings of the Corporation of Saffron Walden, has obtained a similar appointment at Oswestry. At the last meeting of the Town Council, when Mr. Lacey's resignation was tendered, the Mayor acknowledged his efficient services during the four years he had been at Saffron Walden, and expressed the regret of the Council at losing them.

**Subway Construction.**—A prize of \$250 has been offered by the "Cosmopolitan Magazine" for the best essay on the arrangement and construction of subways for carrying the sewers, water and gas pipes, and other conduits of great cities.

**Institution of Mechanical Engineers.**—At the next ordinary meeting of this Society, to be held at the Institution of Civil Engineers on the 26th and 27th inst., under the presidency of Mr. S. W. Johnson, one of the papers to be read will be on the "Electrical Installations for Lighting and Power on the Midland Railway," by Mr. W. E. Langdon, the Superintendent of the Company's Electrical Department at Derby.

**An Acetylene Test-Flame for Flashing Point Determinations.**—The want of a suitable flame for the ignition of the oil vapour in determinations of the flashing point of oil is keenly felt when coal gas is not available. In some forms of apparatus, an electric spark is used in place of a flame; and in others a small oil lamp furnishes the test-flame. But neither of these is so satisfactory as the small gas-jet which is commonly used with the Abel and Pensky-Martens forms of apparatus. When, however, coal gas is not at hand, a substitute has to be employed. Dr. P. Wolff recommends acetylene, which can be generated on the spot, and used not only to supply the small test-flame, but also to heat the oil to its flashing point.

**The Municipal Engineering Classes at University College.**—Last Wednesday, Professor Osbert Chadwick, M.Inst.C.E., delivered at University College the Inaugural Address on opening the course of municipal engineering and lectures on municipal hygiene instituted by the Trustees of the late Sir E. Chadwick, to which reference was made in the "JOURNAL" a fortnight ago. The Trustees have devoted £700 a year to the endowment of a professorship and a lectureship in connection with the above subjects, and a further sum of £1000 for the equipment of a laboratory. Mr. Chadwick explained the objects of the lectures, and stated that the laboratory would be open to students for practical experiments with air, water, gas, and other branches of practical chemistry. To assist the student to practical experience, the Chadwick Scholarship of £100 had been instituted to be paid as an honorarium to a practising engineer taking the student as pupil, or to augment the small salary a student might receive as improver.

**Water Supply Diagrams.**—In a recent number of the "Engineering Record," there was a description of the equipment of the Engineering Department of the Metropolitan Water Board of Boston, Mass. (U.S.A.), an interesting feature of which is the arrangement for recording the condition of the supply. The water for the Metropolitan district is drawn from Lake Cochituate, eight reservoirs on the Sudbury River, and the Nashua River, through three aqueducts. Daily reports of the elevation of the water surface of each reservoir and of the rate of flow through each aqueduct are sent to the Boston office. To exhibit this information conveniently for general reference, a large board neatly painted, suitably labelled, and provided with rows of hooks is hung in one of the office rooms. There is a wooden tablet for each reservoir and aqueduct, usually 3 in. by 10 in., with a groove  $1\frac{1}{4}$  inches wide and 5-16ths inch deep, extending from the bottom to within  $\frac{3}{4}$  inch of the top. On the left side of the groove the face is graduated to feet and hundredths, to show the elevations of the water surface above the datum of levels, and the right side is graduated to show capacities in millions of gallons corresponding to the heights opposite. In the groove is a spring sliding block carrying a double pointer. The tablets for the aqueducts show depths of water above the invert and corresponding rates of flow. The pointers are set each day when the reports are received. On one row of hooks hang the tablets of those reservoirs and aqueducts which are furnishing water, and on another row hang the others. Anyone can from this diagram at once read the state of the supply.

#### OBITUARY.

ROBERT HUNTER.

THE few lines which appeared in the last number of the "JOURNAL" with respect to the serious condition of Mr. Robert Hunter, of Chester, will have prepared our readers for the announcement which we regret to have to make to-day, that his illness terminated fatally on Tuesday morning. Mr. Hunter had not been in good health for about a year; but he was able to discharge his customary duties. He attended the meeting of The Gas Institute in Belfast; but it was then apparent that he was not so well as one could wish. In August his condition was such that it was deemed by his medical attendant advisable that he should take a sea voyage; and his Directors considerably arranged for a trip to the Canaries for a month. He started on the 19th of August, and arrived back in St. Katherine's Docks on the 16th of September, spent the week-end at Eastbourne, and reached Chester on the following Monday evening. In a letter received from him the next day, he said: "I am glad to say I feel very much better than when I started; but, unfortunately, I caught a little cold coming up the Channel, and have not yet been able to throw it off. I enjoyed the trip very much indeed." Unhappily, it was not productive of real benefit, for Mr. Hunter had not been again at his duties many weeks before he was seized with paralysis while sitting in his office. His medical man was promptly summoned, and a specialist was called in. But the case was seen to be hopeless from the first, and the patient gradually lost strength, and succumbed.

Mr. Hunter was born near Edinburgh, and commenced his professional career in the Metropolis in the service of the London Gas Company. He subsequently took the management of the Parā Gas-Works. On completing his engagement, he returned to England, and accepted an appointment with the Phoenix Gas Company. This he relinquished to become Gas Manager at Stalybridge—a position he held till ten years ago, when he went to Chester in succession to Mr. Fletcher W. Stevenson, who had obtained the appointment of Engineer to the Sheffield United Gaslight Company. While he was in the service of the Phoenix Company in 1874, he joined the British Association of Gas Managers; and he never severed his connection with the organization. Though not conspicuous by contributions to the proceedings, he was a very regular attendant at the annual gatherings. At the Bath meeting, however, as will be remembered, he read a paper on "The Spiral-Guided Holder at Chester." Mr. Hunter was one of the early members of the Manchester District Institution of Gas Engineers, having been elected in 1875; and for many years he filled the position of Honorary Secretary. In 1884 he succeeded Mr. Charles Eastwood as President, and during his year of office he read a paper on "Gas-Works Capacity in Manufacturing and Non-Manufacturing Districts." Mr. Hunter never aspired to be a public man; but among his own circle of acquaintances and business and professional colleagues he was highly respected. He was a Freemason, and, though resident in Chester, he maintained his connection with his Lodge at Stalybridge. He was a member of the Evening Star Lodge up to a year or two ago. Deceased was 59 years of age. He leaves a widow and large family, the youngest of whom is only about two years of age; and deep sympathy for them is felt in Chester—and we are sure it is shared by the members of the gas profession who knew Mr. Hunter—in their great bereavement. The funeral took place last Saturday at the Chester Cemetery, and was attended by many personal and other friends, including several members of the Manchester District Institution, and Masonic brethren from the Lodge at Stalybridge. The Chairman and officials of the Gas Company, with a large number of the employees, took part in the ceremony; the body being borne to the grave by one of the gangs of stokers.

**The Derivation of the Word "Gas."**—Some fresh light was thrown upon this subject in a paragraph which appeared in the "JOURNAL" early last year, where, on the authority of the "Daily Chronicle," it was stated that Dr. Franz Harder had discovered, in the Latin text of the works of Van Helmont, a distinct statement that the great chemist had derived "gas" from the Greek *Xāos*, and not from the Dutch *geest* as was generally supposed. We remarked at the time that, as Dr. Murray had not come to the letter "G" in his "New English Dictionary," we did not know what were his views on the subject. This stage of the undertaking has, however, now been reached; the double section of the fourth volume of the Dictionary issued on the 1st inst. extending from "Ga" to "Ger." It is the work of Mr. Henry Bradley, the joint Editor with Dr. Murray. In a Prefatory Note, the characteristic features of the section are enumerated; and mention is made of the derivation of the word "gas"—Dr. Harder being supported. The Editors say: "The true derivation of 'gas,' which rests on an express statement of the well-known inventor of the word, has not before appeared in any English dictionary, though it was stated in the great Dutch dictionary as early as 1873." Van Helmont's words are "*Halitum illum gas vocavi, non longe a chao veterum secretum.*" This disposes of the *geest* (spirit) and *geist* (ghost) derivations, which have been put forward by etymologists.



## TECHNICAL RECORD.

### THE EXTENSION SCHEME AT THE SALTLEY GAS WORKS, BIRMINGHAM.

The gigantic scheme of extension which the Birmingham Corporation Gas Committee have undertaken at their Saltley station, and which practically involves the construction of a complete new works, is, in its prominent parts, being rapidly advanced. It has not been taken in hand before necessity demanded it; and, costly though the scheme will be owing to its extensiveness, the drawings and the work so far executed bear testimony to the fact that the designer, while ensuring excellent and durable plant, has, by its admirable disposition and by applying, so far as he approves, the improvements that latter-day engineering knowledge has suggested, kept in sight the realization of economy in expenditure and ultimately the most remunerative working results. The consummation of the full scheme will entail some years of labour; but it is not even now too early to say that the important section of the work on which numerous hands are at present busily engaged will long in the future bear witness to the skill of its projector, Mr. Henry Hack, M.Inst.C.E., the Engineer of the Saltley works.

The extension of the storage plant is the principal work now in progress. At the time of the transfer of the old Companies to the Corporation in 1875, the greatest daily output of gas at Saltley was  $5\frac{1}{2}$  million cubic feet; and the storage capacity was a little under  $4\frac{1}{2}$  millions—viz., No. 1 gasholder (two lifts), 149 ft. 4 in. diameter by 32 ft. deep, and 1,030,000 cubic feet capacity; No. 2 gasholder (single lift), 187 ft. 4 in. diameter by 41 ft. 4 in. deep, and 1,065,000 cubic feet capacity; No. 3 gasholder (single lift), 187 ft. 3 in. diameter by 41 ft. 4 in. deep, and 1,075,000 cubic feet capacity; No. 4 gasholder (two lifts), 160 feet diameter by 32 feet deep, and 1,200,000 cubic feet capacity. In 1876 the Gas Committee authorized the construction of a telescopic holder (No. 5) of 197 ft. 6 in. diameter and 36 ft. deep, with a capacity of 2 millions, on the then recently acquired land at Nechells. This was designed by Mr. Charles Hunt, M.Inst.C.E., Engineer of the Windsor Street station; Mr. Hack being then engaged in designing and carrying out extensions of carbonizing and other portions of the plant. In 1878, the Committee further sanctioned the adding of an additional lift to each of Nos. 2 and 3 holders; increasing the capacity of each from about 1 to 2 millions. These additions brought up the Saltley storage to something like  $8\frac{1}{2}$  millions, at which it has remained up to the present. The daily output of gas, however, has increased from  $5\frac{1}{2}$  millions in 1875 to 14 millions in 1896; and consequently the storage shows a great deficiency. Until last year this has been met to an extent by the excess storage at Windsor Street, provided by the two large holders at that station; but owing to the growth of the Windsor Street works, this excess storage can no longer be permanently relied upon for the assistance of Saltley. The Committee therefore considered in what way the storage at Saltley could be best and most economically brought up to the right standard; and it was decided to add two more lifts to No. 5 holder (increasing the capacity from about 2 million cubic feet to 4 millions), and to construct an entirely new tank and four-lift holder alongside it for  $8\frac{1}{2}$  millions. This, when completed, will bring up the storage at Saltley to  $18\frac{1}{2}$  millions, or about  $4\frac{1}{2}$  millions in excess of the hitherto greatest daily output—an excess that, with the continued growth of the undertaking at its recent rate, will be overtaken in about six years.

Those of our readers who have interested themselves in the recent history of Birmingham gas affairs, as recorded in the "JOURNAL," will remember the discussion which took place in the City Council when the Gas Committee introduced Mr. Hack's extension scheme, and which discussion showed that some of the councillors had but a dim perception of the needs of the situation, notwithstanding the lucid statement of the Chairman of the Committee (Mr. Alderman Pollack). A short time since it occurred, or was suggested, to that gentleman that it would be a good thing if his Committee invited members of the Council to visit the works in progress, and the site of those for which the necessary expenditure was voted at the meeting referred to. The Committee cordially fell in with the idea; and accordingly arrangements were made for an inspection last Wednesday. A large number of the city fathers took advantage of this opportunity of making themselves acquainted with the details of the scheme under exceptionally favourable circumstances. They were accompanied by the Lord Mayor (Mr. C. G. Beale), Alderman Pollack, the Secretary of the Gas Department (Mr. Edwin Smith), and other Corporation officials. What the party saw and heard on the works must have considerably enlightened many of them, and should in a corresponding degree be of assistance to the Chairman of the Gas Committee in future in the Council Chamber. Having been received by Mr. Hack, the visitors were invited into a temporarily constructed building, in which were exhibited plans and photographs illustrating various portions of the new work. Here, in a neat little speech, Alderman Pollack welcomed the company; remarking that the Gas Committee felt proud at having been enabled to bring together

that day such a large number of the members of the Council. He also expressed the admiration of the Gas Committee for the many services which had been rendered to the department both by Mr. Hack and Mr. Hunt—particularly for the ability which they had shown in the designing of new works at their respective stations. Mr. Hack followed with an explanation of the work involved in the extension scheme; and the principal parts of his statement and further particulars with which he subsequently furnished us are embodied in the description of the works given below. The visitors were then divided into five parties; the first being headed by Mr. Hack and the others by Messrs. Morrison, Richmond, Hewett, and Chamberlain. These gentlemen were also assisted in affording information by Mr. Basil P. Ellis, of Messrs. John Aird and Sons, the contractors for the new gasholder tank, Mr. Alfred Featherstone, of Messrs. C. & W. Walker, the contractors for the new holder, and Mr. W. W. Skidmore Westwood, of Messrs. Westwood and Wrights, the contractors for the enlargement of No. 5 holder.

#### THE EXTENDED HOLDER.

The visitors were first conducted to see the work in progress on holder No. 5. This was only commenced in March or April last; and already the tank is being refilled with water, and the holder will be ready for service before the depth of winter sets in. Of course, before the actual extension could be taken in hand, a great deal of labour was involved in cutting out and removing the old work. The space required for the addition of the two lifts was provided by shortening the radius of the crown of what was the inner lift by 2 ft. 6 in., and applying a grip or inverted cup to the old side, which then became the third lift from the centre. An entirely new second lift with cups, grips, and stiffeners was next built up; and a new strong curb, sides, and cup, were added to the diminished diameter, thus forming the inner lift. Although the foregoing represents the bulk and principal part of the work, the extension involved a large amount of alterations and additions to the vertical guides, stiffeners, stays, rollers, and carriages. A combination of radial and tangential rollers has been adopted for the additions. Regarding the guiding of the extended holder, the Committee adopted Mr. Hack's recommendation to raise the framing one lift only; letting the inner lift run out, and keeping the junction of the inner and second lifts below the top of the framing. For this purpose, the top girders and entablatures of the columns of the old frame had to be taken down, new middle entablatures and a middle tier of girders provided, the columns lengthened, and the old girders (after having been considerably strengthened) raised and re-fixed at the top, together with the old entablatures and caps as a finish. In addition, the framing has been materially strengthened by making all the girders a continuous strong ring, and introducing a system of strong channel steel bracing. In order to ensure the top rollers of the inner lift coming back safely into the guide-run on the column in descending, a bell-mouthed steel casting has been formed at the top of each of the guide-runs. No wrought iron has been used in the gasholder work and girders, but steel, capable of resisting a tensile strain of 28 to 32 tons per square inch, and an elongation of 25 per cent. The cost of the original tank and holder came to £18 3s. 6d. per 1000 cubic feet for 2 millions; while the 2 millions provided by the duplication of the lifts will cost £7 15s. per 1000 cubic feet—bringing the average cost for the 4 millions storage to £12 19s. 3d. per 1000 cubic feet. The crown is non-trussed. The weight of the old material taken out and dispensed with was 72 tons; the weight of the new material in the floating portion is 375 tons; and of the new material in the framing 330 tons.

#### THE SECOND LARGEST HOLDER IN THE WORLD.

In close proximity to No. 5 holder is the partly constructed No. 6 holder, which is designed for containing  $8\frac{1}{2}$  million cubic feet, and will consequently rank next in size to the 12 million cubic feet holder at East Greenwich. Naturally a great deal of curiosity was evinced in this magnificent piece of work by the councillors, most of whom probably for the first time in their lives saw what the interior of a gasholder was like. There was the immense open tank, with its concrete and cement covered core, and with timber framing for supporting the crown of the holder spreading out like a huge umbrella frame, together with practically all the steel work of the four lifts in position—upon all of which the guides were plied with numerous inquiries. The tank, constructed by Messrs. John Aird and Sons, is 264 feet in diameter. The erection of the holder is proceeding apace; and the structure will be ready for service in good time before the winter of 1899. The first piece of steel work was placed in the tank by Messrs. Walker on July 6; and in the short time that has since elapsed, they have fixed in position 874 tons. The tank is constructed of brickwork and concrete, rendered entirely throughout in Portland cement. When selecting this method, Mr. Hack had to consider the nature of the ground, the facilities for obtaining clay, and sundry other circumstances. The first thing that was done in the present instance (a step which Mr. Hack considers should always be taken as regards all deep excavation work, where the nature of the ground is sand and ballast, and in which water abounds) was to sink a large square sump several feet below the deepest part of the excavation, having it finished, or nearly so, before the excavation for the walls was commenced; thus getting the water around well down ahead of the trench work, to which the sump was connected by a cross trench. In this way, what would otherwise



have been troublesome stuff to deal with was brought to a state easy to cope with; most of the sand coming out like sugar. The method adopted for constructing the walls was the usual one for large tanks. A continuous, well timbered, circular trench was first made. This Mr. Hack speaks of as a fine piece of work, of which any contractor might feel proud—every strut radiating truly to the centre of the tank, and each strut perfectly plumb one above the other from top to bottom. Notwithstanding this, there were one or two places in the silty sand level, which required great precautions at great expense. For the timbering, the contractors used 66,840 superficial feet of 3 inch and 4 inch planks and 46,856 cubic feet of timber for struts. As the building of the wall proceeded, the cross timbers were struck, and the back planks drawn; fresh shorter struts being placed between the inner ring of timbering and the wall, to keep up the earth on the inside—the whole of the wall being carefully backed up with sand in even layers, well watered and rammed. When the wall was built to the height of the level of the ground, the contractors commenced to take out the “dumpling,” and to shape it. The excavation being completed, the bottom of the tank, and all over the cone was concreted with part portland cement and part lias lime concrete, varying in thickness from 22½ inches at the bottom to 12 inches at the top; the space between the foot of the cone and the wall having in addition half brick paving on edge set in cement, in which at intervals of 13·75 feet in the circumference the landing stones for the gasholder are built. The next step was to render the whole of the walls from top to bottom, as well as over the entire surface of the cone, with portland cement rendering ¾-inch thick, finished to a smooth surface. Oak blocks are fixed in the wall for the attachment of the channel iron guide-runs for the bottom rollers of the outer lift. The bottom of the trench for the wall was in sandstone, and upon this was placed a solid platform of concrete in portland cement 10 ft. 3 in. wide, and 2 feet thick. When the excavation of the cone was being proceeded with at the foot, the edge of this concrete had to be bared; and it was found that the platform of concrete had set like flint. During the construction of the tank, it is estimated that 240 million gallons of good water have been pumped into the River Rea.

The following further particulars relating to the tank may be interesting: In excavating, the strata passed through were: Made up soil, 2 ft. 3 in.; sandy marl, 2 ft. 3 in.; sand and ballast mixed, 24 feet; silty sand, 12 feet; sand, 1 foot; then sand rock extending to the bottom of excavation. Depth of natural water line below coping level, 22 feet; total depth of sump below coping level, 51 feet; greatest depth of trench for the inlet and outlet pipes below the coping level, 53 feet; depth of other portions below the coping level, 47 feet; quantity of water pumped per hour, about 25,000 gallons; diameter of tank, 264 feet; thickness of wall between piers at bottom, 6 bricks; ditto at top, 3 bricks; thickness of intermediate piers, 7 bricks; width of intermediate piers, 6 bricks; thickness of main piers, 8 bricks; width of main piers, 9 bricks; excavation in timbered trench, about 20,000 cubic yards; excavation inside trench and on cone, about 47,000 cubic yards; concrete, about 4250 cubic yards; brickwork, 6886 yards; number of bricks used, 2½ millions; stone, 3000 cubic feet; tank framing, timber, 5500 cubic feet; tank framing, cast iron, 80 tons; tank framing, wrought iron, 32 tons; oak blocks for tank-guides, 700 cubic feet; hoop iron bond, 14 tons; cement used, 750 tons; lime, 450 tons.

The new holder consists of four lifts—41 ft. 6 in. deep, and 261 ft. diameter; 41 ft. 9 in. by 258 ft. 3 in.; 42 ft. by 255 ft. 6 in.; and 41 ft. by 252 ft. 9 in. respectively. Instead of cast-iron columns as in No. 5, steel standards, with steel pile iron struts and ties, have been designed. The standards are 5 ft. 5 in. by 4 ft. 6 in. at the base, tapering to 2 ft. by 1 ft. at the top; the whole being braced together with flat bar bracing front and back of the standards, studded apart at intervals. It is confidently hoped that the holder will be sufficiently advanced by the 30th inst. to admit of water being put into the tank to a sufficient height to allow of the adjoining tank (No. 5) being quite filled up about that date. In carrying out the two works simultaneously, this desideratum has been an important consideration; for, having regard to the nature of the ground, it would be risky to fill No. 5 without partially filling No. 6. The cost of the tank and holder together will, including work done and to be done by the Gas Committee, be about £72,000. This works out to £8 14s. 6d. per 1000 cubic feet capacity. It may also be mentioned that, in the floating portion of the holder, the total weight of steel will be about 1220 tons; and in the guide-framing about 933 tons. The estimated pressure that the holder will throw with one lift is 4·3 inches; and with four lifts, 10·5 inches. It may be mentioned that the managers for Messrs. Aird and Sons' work were Messrs. Powell and Robinson; for Messrs. C. & W. Walker, Mr. John Monk; and for Messrs. Westwood and Wrights, Mr. Rickard.

#### FURTHER EXTENSIONS.

The gasholders completed the actual work in progress so far as the gas plant was concerned; and the councillors were next shown the sites where further extensions are to be made. They first passed into the Nechells Recreation Ground, over the prospective absorption of which into the Saltley works there has been a good deal of agitation. It was purchased years ago by the Gas Committee with an eye to the future extension of the works; and, in their goodness of heart, they lent it to the

inhabitants of the district until such times as it should be required. Now, however, they have taken in a portion of it; and the residents think they are being hardly dealt with. But it will be some years before the Committee fully reclaim it; and in the meantime there is no doubt other suitable ground will be found for the purposes of recreation. Extensions of carbonizing and condensing plant are to be made on the Nechells ground, to which canal access is easy, reserving the available remainder of the Devon Street site for the exhausting, purifying, and measuring plant. Up to the present, the principal work let by contract for these extensions is the new retort-house. This will be 324 feet long, 114 feet wide, and 42 feet high from the ground to the roof shoe-plates; and it is intended to equip it with four benches of inclined retorts—in all 416—capable of producing a minimum of 5 million cubic feet per diem when all the retorts are in action. In all the subsequent plant between the retort-house and the gasholders (the details of which have not yet been completed), the most modern and best labour-saving appliances will be adopted. In connection with the extensions of the coal-gas plant, the attention of the councillors was called to the diversion of the River Rea sewer (now being carried out), which at present runs inconveniently through the Gas Department land; and also to the narrowing in to its original width, by walls, the course of the River Rea. The state of the Rea banks through the gas-works and beyond, to say the least, has been for a long time a subject of reproach. All this will be remedied by the improvements decided upon, between the Public Works Committee and the Gas Committee, although at very great cost to the latter—the work including the arching in of 300 feet of the Rea to form a coke-yard. The extensions on the Nechells site further include a canal basin, 240 feet long, and 25 feet wide, for facilitating the removal of coke.

Having completed their inspection of the last-mentioned work, a hasty visit was paid by the councillors to the water-gas plant, which was erected by the Economical Gas Apparatus Construction Company. It is capable of producing about 4 million cubic feet of gas per day; and there is room for an extension of the building to accommodate sufficient apparatus to yield a further 2 million feet.

By the kindness of Alderman Pollack, the visitors were afterwards entertained at tea, which formed a fitting occasion for the Lord Mayor and Alderman Hart to make some complimentary and approving remarks concerning the work of the Gas Committee and of Mr. Hack, and which remarks appeared to be cordially endorsed by everyone present. During tea, the works band played some selections of music, which were exceedingly well rendered.

#### RAILWAY CARRIAGE LIGHTING BY OIL GAS.

The change from oil lighting to gas lighting for railway carriages which has taken place upon most of the railways during the past few years has been fully appreciated by the travelling public, although the light has, in many cases, hardly been sufficient to make reading a comfortable operation; and now that the perusal of morning and evening papers has become an essential factor in the journeyings of business men to and from the City, it is of paramount importance that, even at the expense of a little more gas, the Railway Companies should do their best to give their customers in all classes the best light available. We have on more than one occasion drawn attention to the fact that several of the Railway Companies have adopted “Coligny” gas-lamps for lighting their carriages; but we have not had an opportunity of explaining their characteristics. The lamp is an application of the well-known recuperative principle to lamps for railway carriages, where, in view of the extraordinary conditions under which all the lamps run, the difficulties must necessarily be considerable. Unless the air for supporting combustion can be supplied at a very high temperature, the recuperation cannot, of course, be maintained; and while it was found to be a simple matter to do this when the speed of the train did not exceed 20 miles an hour, it was for a long time thought that the greater velocity at which main-line trains are now run in this country would prove an insurmountable obstacle in the way of utilizing this principle of gas lighting. The Lamp Manufacturing Company, however, seem to have overcome all the difficulties, and their “Coligny” lamps are now in use on most of the railways, in trains of which the speed attains to even 70 miles an hour. The light afforded can be more or less as desired without altering the burners, which it appears is not the case with the flat-flame burner lamps already largely in use. The Company have now adapted the same principle to these lamps, so that all the advantages of recuperation may be obtained by merely adding the new “Coligny-Welch” patent reflector. We are informed that, after exhaustive trials with these reflectors, the Paris, Lyons, and Mediterranean Railway Company have just ordered a considerable number of them, finding that the increased light with the same consumption of gas was very great; while some of the English Companies are trying the reflectors with a view to testing their adaptability and suitability. We may add that the Engineers of the above-named Company tested the “Coligny-Welch” reflector also with a mixed gas composed of 80 per cent. of oil gas and 20 per cent. of acetylene; and we believe the improvement was found to be even more marked than with oil gas alone.



THE VALUE OF SULPHATE OF AMMONIA FOR WHEAT GROWING.

In the "JOURNAL" last Tuesday, reference was made to the value of sulphate of ammonia in wheat and barley growing, as shown by the results of experiments carried out at the farm of the Royal Agricultural Society at Woburn, and communicated to the last number of the Society's "Journal" by Dr. J. A. Voelcker. More than usual interest attaches to these results in view of the large prize offered by the Sulphate of Ammonia Committee for the best essay on "The Utility of Sulphate of Ammonia in Agriculture;" and we therefore give the tables in which they are recorded.

Dr. Voelcker offers the explanation that, for the past twenty years, crops of both wheat and barley have been grown on the same land, and with the same manures applied, year after year. The produce of corn and weight per bushel have been duly recorded throughout; but until now no attempt has been made to compare the produce of the different plots in respect of quality or market value. Following, however, the precedent of Rothamsted, it was decided by the Chemical Committee of the Society to have the experimental wheat and barley crops valued

Permanent Wheat, 1897 (21st Season).

[Wheat grown year after year on the land; the manures being applied every year.]

| Plot. | Manures per Acre.                                                                                                         | Dressed Corn. |                    | Tail Corn. |            | Value per Quarter. |
|-------|---------------------------------------------------------------------------------------------------------------------------|---------------|--------------------|------------|------------|--------------------|
|       |                                                                                                                           | Bushels.      | Weight per Bushel. | Weight.    |            |                    |
| 1     | Unmanured . . . . .                                                                                                       | 7'10          | lbs. 63'50         | lbs. 38    | s. d. 37 0 |                    |
| 2     | Ammonia salts* (containing 50 lbs. ammonia). . . . .                                                                      | 11'80         | 62'37              | 59         |            | 37 0               |
| 3     | Nitrate of soda (containing nitrogen = 50 lbs. ammonia) . . . . .                                                         | 10'60         | 57'25              | 121        |            | 35 0               |
| 4     | Mixed mineral manures† (sulphates of potash, soda, and magnesia, with super-phosphate) . . . . .                          | 7'70          | 63'00              | 52         |            | 37 0               |
| 5     | Mixed mineral manures and ammonia salts (containing 50 lbs. ammonia). . . . .                                             | 20'65         | 62'56              | 81         |            | 38 6               |
| 6     | Mixed mineral manures and nitrate of soda (containing nitrogen = 50 lbs. ammonia) . . . . .                               | 17'60         | 59'87              | 138        |            | 36 0               |
| 7     | Unmanured . . . . .                                                                                                       | 7'70          | 62'75              | 31         |            | 37 0               |
| 8a    | Mineral manures and (in alternate years, 1897 included) ammonia salts (= 100 lbs. ammonia) in addition . . . . .          | 24'20         | 63'00              | 98         |            | 38 6               |
| 8b    | Mineral manures, ammonia salts (= 100 lbs. ammonia) omitted (in alternate years, including 1897) . . . . .                | 16'40         | 63'75              | 56         |            | 38 6               |
| 9a    | Mineral manures and (in alternate years, 1897 included) nitrate of soda (containing nitrogen = 100 lbs. ammonia). . . . . | 20'70         | 59'75              | 120        |            | 36 6               |
| 9b    | Mineral manures, nitrate of soda (= 100 lbs. ammonia) omitted (in alternate years, including 1897) . . . . .              | 9'80          | 63'00              | 46         |            | 37 0               |
| 10a   | 1889, rape cake (= 50 lbs. ammonia). No manure since . . . . .                                                            | 9'30          | 62'25              | 42         |            | 37 0               |
| 10b   | Rape cake (= 100 lbs. ammonia) every year since 1890 . . . . .                                                            | 22'40         | 61'62              | 90         |            | 36 6               |
| 11a   | 1877-81, farmyard manure (= 200 lbs. ammonia). No manure since . . . . .                                                  | 8'60          | 62'25              | 42         |            | 36 6               |
| 11b   | Farmyard manure (= 200 lbs. ammonia) every year . . . . .                                                                 | 16'00         | 61'25              | 92         |            | 36 6               |

\* Ammonia salts are equal weights of sulphate of ammonia and muriate of ammonia.  
† Mixed mineral manures are, throughout, 3½ cwt. of superphosphate of lime, 200 lbs. of sulphate of potash, 100 lbs. of sulphate of soda, 100 lbs. of sulphate of magnesia per acre.  
Remarks.—(1) Better grown than No. 2, but not so strong. (2) Stronger wheat than No. 1. (3) Worst of all plots. (4) Very similar to No. 9b, and nearly equal in strength. (5) One of the best; not quite so well grown as No. 8a. (6) Worst of all, except No. 3. (7) Nearly as good as No. 1; possesses some bloom. (8a) Best and strongest of all; stronger than No. 8b, and a miller would prefer it to that. (8b) Best grown of all, and freest from light corn. Not so strong as No. 8a, but would give more flour. (9a) A strong wheat, but low in produce of flour. (9b) Slightly preferable to No. 4. (10b) A little paler than No. 11b. (11a) About as good as No. 9a, but rather better grown.

by experts, and to deduce therefrom any conclusions that might be obtainable as to the influence which any particular manure had exercised on the quality of the corn produced over a period of a certain number of years. The services of two experts, one of whom had done similar duty at Rothamsted, were enlisted. The corn crops of 1897, after being threshed in the field, and the corn subsequently winnowed and weighed, had been kept in the barn—the produce of each plot still separate. The corn was once more cleaned, until its condition

was such that it could be offered for sale; and in May this year the two valuers went down to Woburn to inspect the samples, give their general observations on them, and affix money values. At the time of valuing, the price of corn of all kinds had received considerable impetus, on account of the war; but, seeing that the object was rather to compare on general grounds, and not as being influenced by special and temporary circumstances, the produce of plots differently treated, the valuers adopted as their basis of calculation the prices which the corn crops of the year might, under normal circumstances, be taken as being worth. The value adopted for wheat was 37s. per quarter. The figures in the table show the produce per acre.

Arranging the produce of the various plots in the respective order of merit they might be thus grouped: Above the average, 8a, 8b, 5; about the average, 10a, 9b, 4, 2, 1 and 7, 10b; below the average, 11a, 9a and 11b, 6, 3.

Commenting upon the figures in the table, Dr. Voelcker says: "As a whole, the wheat from the plots was of fair quality, and some—notably that from the plots manured with mineral manures and ammonia salts—was decidedly above the average. These were the best of all the series; and it is noticeable that there was but little difference of quality whether ammonia salts (the heavy dressing) had been applied in the year under notice (8a) or the year previous (8b). When a comparison was instituted between these plots, manured with ammonia salts, and those manured with nitrate of soda (3, 6, 9a, and 9b), a marked difference was found; the nitrate having produced the poorest quality samples of all, the corn being thin and shrivelled. Other noticeable features were the marked increase in the amount of tail corn in the plots manured with nitrate of soda, and the much lower weight per bushel of the dressed corn. Nor was the wheat grown with farmyard manure (11b) of good quality; while that with rape cake (10b) was no better—both being inferior in quality to the unmanured crops (1 and 7), and to the crop treated with mineral manures only (4). The unmanured plots, it will be observed, gave the least offal corn. The main points brought out are, therefore, the marked superiority of ammonia salts to nitrate of soda; the former producing a higher quality and good-weighted wheat, without excessive offal, while nitrate of soda has given a bad quality grain, of light weight, and containing much offal."

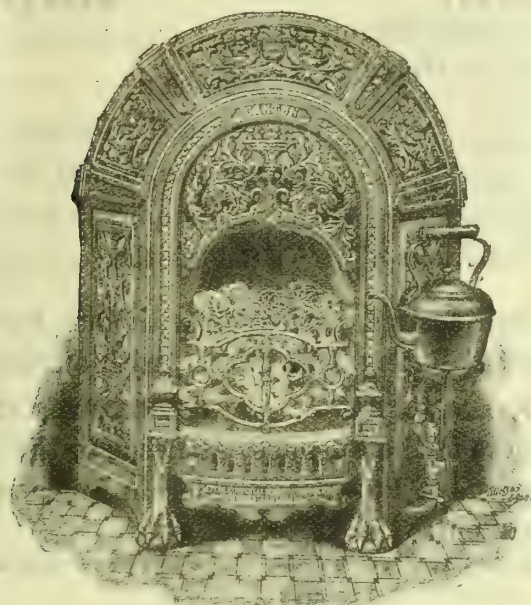
ANOTHER PURIFIER ARRANGEMENT.

Our readers may remember that at the last meeting of the Ohio Gaslight Association Mr. Irvin Butterworth, of Columbus, described a purifying-box on a new principle, devised by Mr. Henry L. Doherty, Manager of the Madison (Wis.) Gas and Electric Company, and introduced to the gas profession under their joint auspices. The oxide was not spread in a horizontal layer, but placed for the most part in two vertical beds separated by a long and narrow vertical outlet "cage," built within, and a little smaller than, the box itself; leaving a gas space about 4 inches wide all round. Gas also filled the space between the top of the oxide and the top of the box. The cage was of wooden framework, and consisted of a series of upright shutters placed edge to edge in contact with each other; each shutter being made of two vertical timbers, about 3 feet apart, between which were nailed horizontal fixed "slats" sloping downwardly and inwardly towards the oxide, so that the latter fell freely upon them by gravity when the box was being emptied. The slats were so inclined and spaced as to prevent the oxide from falling out of the retaining cage into the space surrounding it, while at the same time presenting a maximum area of oxide surface for the admission of gas. This, briefly put, was the general arrangement of the apparatus brought forward by Mr. Butterworth; and it was fully described and illustrated in the "JOURNAL" for the 26th of April last (p. 943). It is referred to here for the purpose of introducing another appliance of similar character which was submitted by Dr. E. Merz, of Cassel, to the members of the Association of Gas and Water Engineers of the Middle Rhenish Provinces on the occasion of their meeting at Kaiserslautern.

In considering the question of purification, Dr. Merz was led to agree with the conclusions arrived at by Herr Kunath, that the working capacity of a set of purifiers does not depend upon the number of boxes in use or upon the thickness of the layers of material, but solely upon the extent to which the surface of the material is attacked by the gas. In purifiers as generally arranged, Dr. Merz calculates that this is only 25 per cent. of the total surface; the other 75 per cent. being required to support the material. Moreover, the gas in passing through the grids, is divided up, so to speak, into streams, the material between which, though not inactive as a purifying agent, is less efficacious than that which is directly in the path of the gas, unobstructed by the woodwork of the grid. Evidence of this is afforded in practice. When the material is removed from the box, it is found not to possess the same homogeneity throughout; proving that all its parts have not been in contact with an equal quantity of gas. The conclusion Dr. Merz drew from this was that if it were possible to bring into direct contact with the current of gas the entire surface of the purifying material, every particle of it would become equally active, and consequently it would be utilized in a more rational way.



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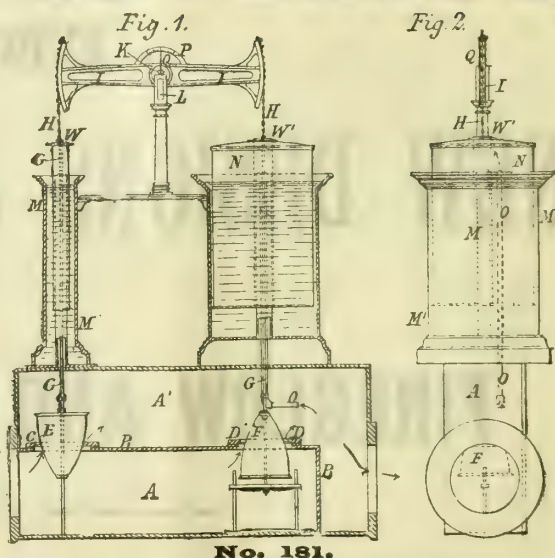
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Having arrived at this conclusion, Dr. Merz proceeded to show how the desired result could be attained. He pointed out that the utilization of the whole surface of the purifying material may be effected in two ways. The first method consists in making the grid of such a shape that the total area of the openings through which the gas passes into the material is equal to the base of the purifier. A grid of the kind indicated is shown in the accompanying diagram (fig. 1). It is constructed on the principle



FIG. 1.

of the Venetian blind; and as the angle of inclination of the blades is less than the angle of repose of the material, the latter cannot run down them to the bottom of the box. The second method is to make the gas enter the box at the top, under the lid, traverse the material from top to bottom, and pass out beneath the supports of the lowest grid. This would, of course, necessitate the alteration of the inlet and outlet orifices in most purifiers; but this could be done in a day or two. The original grids could still be employed. By each of the methods indicated, the desired end—viz., the utilization of the entire surface of the purifying material—may be attained; and Dr. Merz says that by their adoption better pressure and greater efficiency will be secured than with the system generally in use.

In many gas-works, it is necessary to charge the purifiers from 100 to 300 times in the course of the year; whereas, according to Dr. Merz, with gas which has been well cooled and washed, this operation is required only from 25 to 30 times where there is an adequate surface of purifying material. Works where the smaller number of charges is required only suffer from insufficiency of purifier surface; and in these the two methods of charging already described are not very helpful. The question,

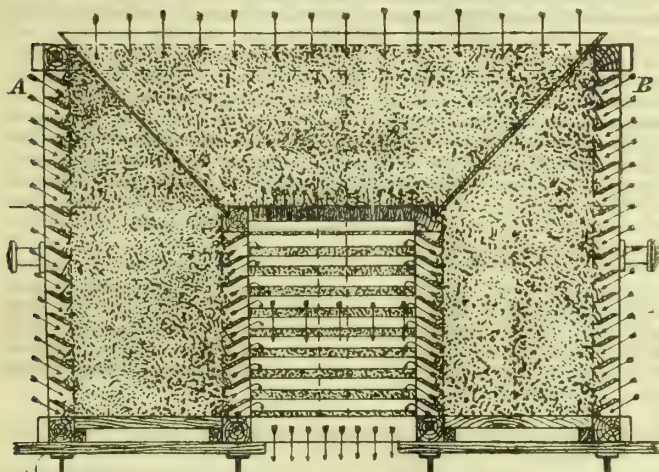


FIG. 2.

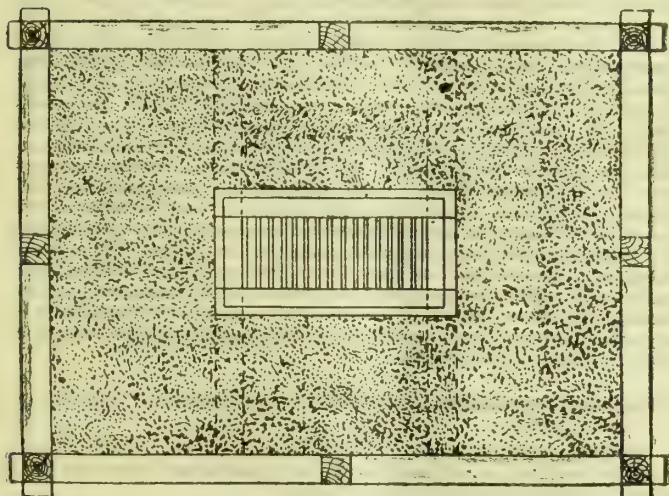


FIG. 3.

therefore, will be whether it will not be possible to get more work out of the existing plant. In order to do this, the box should be charged in a special way. We will suppose the purifier surface to be 20 feet square, the height of the box 3 ft. 6 in., and the gas entering at the top. If there is placed in the box a cage or frame constructed of upright and ordinary grids, as shown in figs. 2 and 3 (the latter being a horizontal section on the centre line in fig. 2), and so charged with purifying material as to form, with the four intermediate walls A B, a special upper layer, four

lower ones being formed by the sides of the box, it is clear that the gas arriving from above and laterally will encounter a much greater surface than that presented by the simple base of the box. Taking only the average between the exterior and interior surfaces as being really efficacious, there will be 45 per cent. more surface by this arrangement than that directly presented by the purifier. To raise the duty by 100 per cent., all that is needed is to increase by about 1 ft. 9 in. the sides of the purifier. Fig. 4 shows the frame in the box.

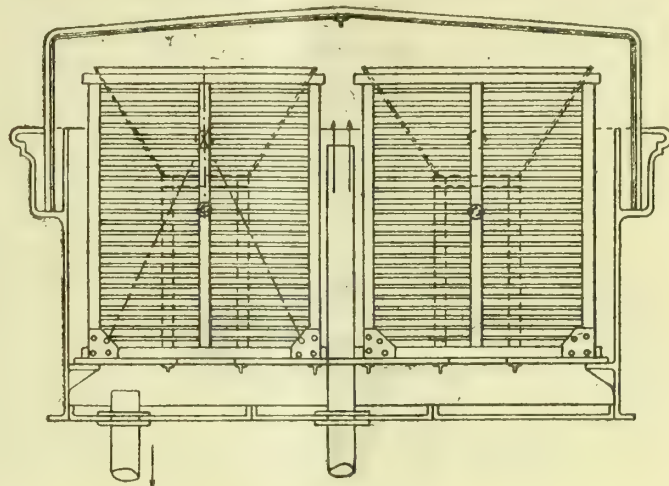


FIG. 4.

A question which arises in considering this subject is the possibility of performing, by a more simple method than that at present employed, the operations of filling and emptying the purifiers. When adopting the appliances above described, Dr. Merz says it is possible to economize time and labour by arranging them so that they can be raised bodily from the boxes with the material they contain, and be conveyed to the revivifying-shed. Reserve frames, ready filled, can in like manner be placed in the boxes. Moreover, instead of three or four purifiers being placed one after the other, two or three will suffice. The revivifying-shed need not be of greater area than that of two purifiers. If by employing these interchangeable frames the number of purifiers can be reduced, it will be necessary that their superficial area should be ample. Dr. Merz has found, in practice, that with a maximum production of about 883,000 cubic feet of gas per day, a purifier surface of 387 square feet is sufficient. He claims that, with his arrangement, the work of the purifier-house will be so simplified that it can be performed by ordinary yardmen.

**A Congress of Calcium Carbide and Acetylene Gas Specialists** was held at Frankfort-on-the-Main on the 27th and 28th ult., under the presidency of Professor Dr. Martin Freund. Among the papers read were the following: "The Chemistry of Acetylene," by Professor Dr. Erdmann; "A New Electric Furnace," by Dr. O. Froelich; "The Purification of Acetylene," by Dr. P. Wolf; and "The Position of Fire Insurance Companies in respect of Acetylene Lighting," by Herr J. Knappich. We hope to notice the proceedings more fully in a subsequent issue.

**The Composition and Technical Analysis of Water Gas.**—A correspondent has called our attention to two misprints in the article on the above subject in the "JOURNAL" for the 27th ult. The first occurs at the top of the right-hand column on p. 696, where

$$C_nH_m \left( n + \frac{m}{4} \right) O_2 \text{ is given for } C_nH_m + \left( n + \frac{m}{4} \right) O_2$$

The second is in the table showing the calculation of the heating value of 1 cubic foot of water gas, at the foot of the left-hand column on p. 697. The figures commencing the second line of the table should be 0.1170.

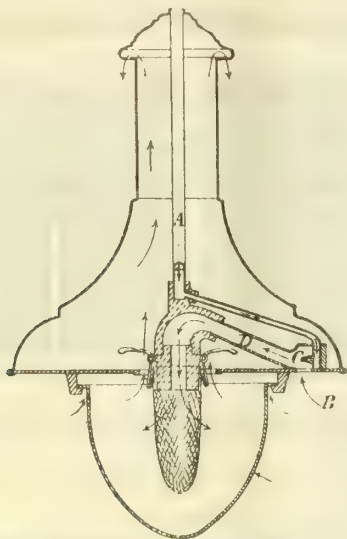
**The Disposal of Gas Liquor in Small Works.**—The report on the working in the past year of the gas undertaking at Rixdorf, near Berlin, contains an interesting account of a profitable disposal of gas liquor. The works have an annual make of about 70 million cubic feet of gas; and the manufacture of sulphate appeared to be too elaborate a process to be undertaken on the spot for the comparatively small quantity of liquor which such a works produces. In place of sulphate, which contains about 25 per cent. of ammonia, a concentrated liquor containing on an average 22.52 per cent. of ammonia has been produced. This liquor has been obtained by passing the richly ammoniacal vapours direct to a so-called carbonic acid washer, in which carbonic acid is absorbed by lime. The removal of the carbonic acid in this apparatus permits the concentration of the liquor to proceed until it contains even as much as 25 per cent. of ammonia. The customary separation of crystals does not occur when the carbonic acid has been previously removed. The concentrated liquor at Rixdorf met with a ready sale, as the freight charges were relatively low in comparison with its strength. Its manufacture was a source of considerable profit to the works.



## REGISTER OF PATENTS.

**Inverted Regenerative Incandescent Gas-Light.**—Kent, H. A., of Bowes Park, N. No. 20,823; Sept. 10, 1897.

This arrangement (as shown) is a combination of a Wenham and incandescent mantle light, and is an improvement on patent No. 3667 of 1897. The patentee describes the burner as consisting of one or more tubes of metal, fitted on to a smaller tube or jet for the admission of gas, with slots, holes, or the like in the larger tube, for the admission of air. The



tubes are arranged on the top of a plate of metal having a hole in its centre, through which projects the end of the burner. This is made of steatite or any fire-resisting material; and on to it is fastened, by clips actuated by gravity or spring, the light-giving medium. The tubes are covered by a chimney or cone of metal, to the underside of which is attached a semi-circular shaped glass.

In the engraving, A represents the gas-inlet; B, the air-inlet; C, the gas-jet; and D, the mixing-tube for the gas and air.

**Bunsen Burners.**—Bishop, H. S., and Salmon, C., of Erith. No. 21,790; Sept. 23, 1897.

This burner is formed with a number of small gas-nipples N, arranged in a ring, and drawing their supply of gas from a common reservoir A of cup-shaped form, with a flat top. Standing immediately over each nipple is a small draught-tube T, shaped at the lower end to facilitate the air admission, and of "size and length relative to the opening in the gas-nipple to admit just the right quantity of air necessary for combustion." The draught-tubes all terminate at their upper end in a common mixing chamber C, which is insulated from the heat of the draught-tubes at J, so that the heat generated at the upper part of the burners, and necessarily communicated to the walls of the mixing chamber, is not communicated to the draught-tubes.

Referring to this feature of their invention, the patentees say: "By keeping the draught-tubes cool, the draught is not restricted or destroyed in a manner such as would take place with hot tubes, owing to the rapid expansion of the gases therein." They are thus "enabled to reduce the length and diameter of the draught-tubes to a minimum, which makes the burner much neater in appearance and more convenient for use."

To guard against the destruction of the mantles in situations subject to vibration, the burner is constructed so that the upper part, carrying the mantle, rests on a delicately adjusted spring.

**Gas-Governor.**—Milne, J., of Edinburgh. No. 23,264; Oct. 11, 1897.

Two forms of governor are described in the specification and illustrated by the drawings reproduced.

In the first (see fig. 1) the interior of the body of the governor A is divided by two cross walls into three chambers, the middle one of which is sub-divided into two by a longitudinal wall. Each of the two end chambers B is sub-divided into two by a horizontal wall, having an opening which forms a valve-seat C. The gas enters one of the sub-divisions of the centre chamber; and thence passes into the upper sub-division of one end chamber, and simultaneously into the lower sub-division of the other through openings in the cross walls. The gas then flows through the valves into the lower end chamber and upper end chamber respectively, and thence into the other sub-division of the central chamber, and is conveyed away by the ordinary main pipes. The valves (of any convenient type) are arranged to close on being lowered, and to open on being raised. They are supported by chains passing over pulleys to the top of a bell G placed in a tank above the body of the governor. The bell (being connected with the gas at the outlet of the governor by a small pipe with stopcock) is subjected to the various changes of outlet pressure, and so rises or falls—sealed by water placed in the tank shown. The ascent of the bell lowers the valves, and its descent raises them; thus decreasing or increasing the apertures through which the gas passes.

The effect of this arrangement of the valves, in conjunction with the manner of admitting the gas simultaneously to the lower sub-division of one end chamber and the upper sub-division of the other, is that, "what-

ever may be the suddenness or extent of any fluctuations in the inlet pressure, the valves are maintained in equilibrium—the gas tending equally to open the one and close the other."

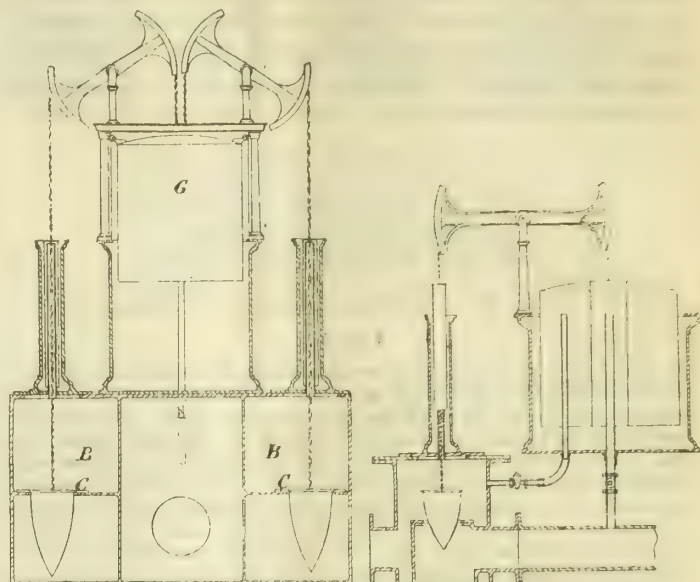
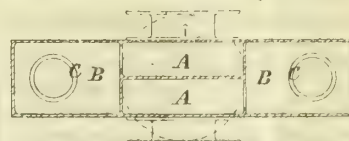


Fig. 1.

Fig. 2.



In fig. 2, the governor is made with the usual cone seat and cone, with its apex pendant from the lever or pulley, and connected therewith (from the ordinary water-slide chamber) by a rod or chain. The tank and bell, instead of being immediately over the cone, are placed to one side; and the bell is connected by means of a chain or band to the opposite end of the lever or wheel to which the cone is attached. Inside the bell, and fastened to the crown of it, is a compensating chamber open at the bottom, having its sides parallel to those of the bell, and its area equal to that of the opening in the valve-seat. The gas is admitted from the inlet side of the governor to the inside of this chamber by a tube rising above the water-line; and a pipe is carried between the outer side of the bell and the outlet side of the governor by which the outlet pressure is brought to bear upon the under side of the bell. Each of these pipes is fitted with a conveniently accessible stopcock.

The effect of this arrangement of cone-valve—in conjunction with the arrangement for admitting the gas simultaneously to the small chamber of the bell and the under side of the cone—is such, that, whatever may be the suddenness or extent of any fluctuation in the inlet pressure (as in the first instance), the valve is maintained in equilibrium; the gas tending equally to raise the bell on one side and thus depress the cone, and to raise it by its direct action.

**Gas-Engines.**—Hamilton, J. H., of Sandiacre, Derbyshire. No. 25,987; Nov. 9, 1897.

The patentee claims for his invention: (1) In a gas-engine of the four-stroke type, a special arrangement of admission, exhaust, and timing valves; the last named being normally held against its seat by a spring, but opened at the right time for ignition by a small lever pivoted to its outer guide. To the other end of the lever is pivoted a light rod, with a catch formed upon it, which engages with the top of the lever that operates the admission and gas valves. (2) A shaft governor consisting of a weight (or weights) pivoted to the fly-wheel, or other part fixed to the crank-shaft, and arranged so that, when the speed of the engine is too high, the weights cause a bevelled surface to be interposed in the path of the push-plate that operates the gas-valve. (3) A special water-circulating arrangement for the engine piston. (4) A self-starting arrangement for gas-engines, in which he proposes to utilize the steam from the boiler of the gas-plant by fitting in a vertical cylinder a loose piston, and to the bottom end of the cylinder connecting steam and exhaust pipes; while to the top end are connected air and gas pipes. The gas-pipe is led from the engine to the starter, and on past the latter to some convenient point for blowing off bad or surplus gas; while at the engine end the gas-pipe is connected through a cock to the main gas supply, and also through a lift-valve to the engine cylinder.

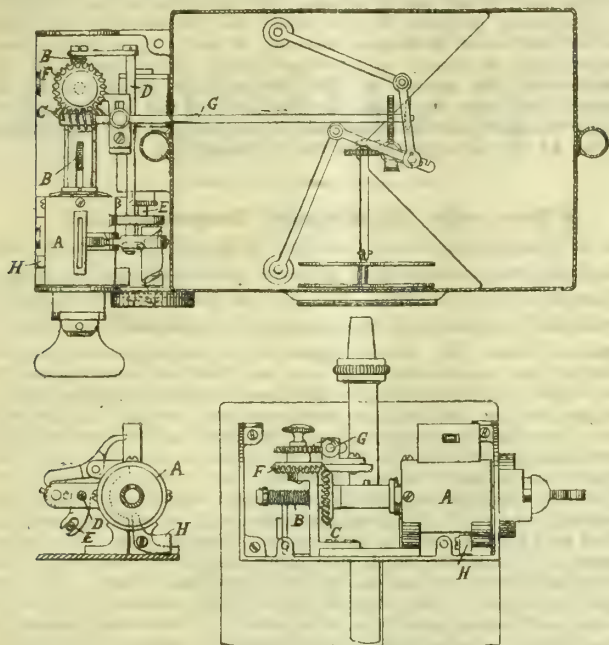
**Prepayment Gas-Meters.**—Anderson, J., of Edinburgh. No. 26,369; Nov. 12, 1897.

The essence of this invention in coin-freed gas-meters is "the arrangement, in combination, of parallel moving spindles and screw-and-bevel gear for operating the gas-controlling valve."

A hollow spindle extends from the coin-turning barrel A, and through it works a screw-threaded spindle B with cross-head end and a pin projecting through a longitudinal slot in the hollow spindle. The spindle B works through the internal screw-threaded boss of a bevel wheel C mounted on it; and in the forward motion of B, the wheel C is prevented from turning by connected wheel gearing. A spindle D is mounted parallel to the screw spindle; and the forked end of a radial arm from it embraces the disc end of the spindle B, so that, when the latter is turned and made to traverse forward, the parallel spindle D is given a corresponding extent of longitudinal movement. The forked-end of an arm at its opposite end embraces the spindle E of the gas-controlling



valve, so that the valve receives corresponding motions. A projecting pin from this arm or from the spindle, works in a spiral slot or groove formed on the barrel of a parallel spindle, on which is mounted a pointer that works over a dial in front of the meter-case, to indicate the number of coins for which prepaid gas has to be vended; and a projecting pin on the barrel is made to tilt a lever, so as to close the coin-depositing slot when the maximum number of coins have been deposited at a time for prepaid gas. A bevel wheel F, mounted on a vertical spindle, gears with the wheel C; and an adjustable spur-wheel on the spindle gears into a screw worm on a horizontal spindle G, from which ordinary gear connec-



tions are taken to the counting mechanism of the meter. A bell crank or tilting lever H is fitted from below the coin-operated barrel to keep coin in position, and permit of varying thicknesses of coin operating the barrel.

As prepaid gas is consumed, the ordinary mechanism operates the bevel wheel C; and the parallel spindle D is traversed in the opposite direction to that given by the insertion of a coin. Thus when all the prepaid gas has been consumed, the gas-controlling valve is automatically closed—the spindle E being always moved in one direction while coins are being inserted, and in the opposite direction through the worm and bevel gear while gas is being consumed.

**Incandescent Gas Mantle Support.**—Brogden, G., of South Shields. No. 26,745; Nov. 16, 1897.

Instead of suspending the mantle by a small loop as usual, the patentee proposes to provide the mantle-supporting rod or post at its upper end with a perforated disc of convex or other suitable form, upon which the mantle rests, and is evenly and steadily supported—"it does not swing about; thus causing it to give a better light, and to be more lasting."

**Acetylene Generators.**—British Acetylene Gas Generator Company, Ltd., and Spence, H. K., of Kirkcaldy. No. 14,432; June 30, 1898.

This invention is a modification of, or addition to, the apparatus described in patent No. 29,554 of 1896; and it has for its primary object to provide more simple and efficient means for bringing the carbide chambers into action one after the other upon the exhaustion of the material therein, "whereby the generation of the gas can be performed automatically after the generator has been once started." It has also for its object to improve the construction of the water-valves and pipes supplying the carbide chambers.

#### APPLICATIONS FOR LETTERS PATENT.

- 20,766.—FORRESTER, W., "Acetylene gas generator." Oct. 3.
- 20,837.—SMITH, A. G., "Acetylene gas generators." Oct. 4.
- 20,842.—STREUBEL, A., "Gas-cocks for street-lamps." Oct. 4.
- 20,851.—GINDER, W. J., "Acetylene lamps or generators." Oct. 4.
- 20,936.—WILTSHIRE, G., "Producing acetylene gas." Oct. 5.
- 20,965.—LISLE, H., "Gas or other stoves." Oct. 5.
- 20,984.—SPOONER, A. F., "Gas-burners." A communication from La Société J. Lacroix et Cie. Oct. 5.
- 20,995.—COLBERG, H., THOMPSON, A., and LION, J., "Generating acetylene gas." Oct. 5.
- 20,996.—LAKE, H. H., "Production of acetylene gas." A communication from R. Turr. Oct. 5.
- 21,034.—MARTIN, P. A., "Acetylene lamps or generators." Oct. 6.
- 21,038.—MCNECHY, J., "Production of acetylene gas." Oct. 6.
- 21,054.—WERN, C., "Lighting or extinguishing street and other gas-lights." A communication from O. Ljungstrom. Oct. 6.
- 21,067.—BROWN, F., "Production of oxygen gas." Oct. 6.
- 21,069.—SCHAD, E., "Acetylene-lamps." Oct. 6.
- 21,112.—KITCHEN, J. G. A., "Oil or gas generating burners." Oct. 7.
- 21,187.—FLETCHER, T., RUSSELL, W., and FLETCHER, RUSSELL, and Co., Ltd., "Gas cooking-apparatus." Oct. 8.
- 21,197.—BRAY, G., "Gas-burners." Oct. 8.
- 21,242.—TROUBEL, S., "Acetylene gas generators." Oct. 8.

**The Carlisle Corporation Water Act**, passed last session, involved an outlay of no less than £415 5s. 6d.

## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### Extension of Workmen's Breakfast Time.

SIR,—Allow me to draw the attention of your readers to an amelioration of the lot of working men that costs the employer but little compared with the benefit conferred.

During the discussion that accompanied the strike of the engineers last year for an eight-hour day, it was said that it was a hardship to require a man to go to work at six o'clock and wait two hours for his breakfast at eight o'clock; and that it would be better to have breakfast before going to work. This, of course, was all nonsense; for experience shows that two hours' work or exercise before breakfast gives a wholesome appetite for the meal. It, however, occurred to me—and I blame myself for never thinking of it before—that when breakfast-time comes, with the healthy appetite produced by labour or exercise, it is essential that time should be given to make a comfortable meal. For this, half an hour is certainly not enough in the majority of cases. Of course, I said nothing while the strike of the engineers lasted; but at its close the question was discussed, and the resolution was adopted to increase the breakfast-time for all yard labourers and mechanics, and all other men except those engaged in the retort-houses, from half to three-quarters of an hour, of course without reduction of pay. This was done about four months ago; and I have never known any concession to workmen give so much satisfaction. Moreover, the Company do not lose the whole fifteen minutes, because there is now no necessity for the men to begin preparing for breakfast some minutes before the bell rings. The result has been so good all round, that last Saturday the Crystal Palace District Gas Company followed the example of their neighbours, with equal satisfaction to their men. For a workman to be able to get a comfortable breakfast at eight o'clock with his wife and family, is far better than to require him to breakfast before going to work, as is necessary under the eight-hour system.

South Metropolitan Gas Company, Oct. 17, 1898.

GEORGE LIVESLEY.

### The Suggested Reserve Force of Gas Stokers.

SIR,—I thank you for your article in the last issue of the "JOURNAL" on "A Suggested Reserve Force of Gas Stokers."

First let me say I made the suggestion, believing that "prevention is better than cure," and that if gas-workers knew their employers had a strong federation at their back, there would be few strikes, and managers would go through the winter season much more comfortably.

If the gas-works federating would agree to subscribe each year (say) half-a-crown per million cubic feet of gas made, this would, in my opinion, more than cover the expenses.

A Secretary should be appointed, who would keep in touch with labour questions, and be able in the event of trouble at any of the federated works to advise the manager as to finding men, and the better means of providing huts, beds, food, &c.

The men could be obtained several ways—say by each subscriber agreeing to find and send, as and when called upon, one man for every fifty millions of gas he makes annually. There would be no difficulty in having a private agreement with several men—say, by giving them an extra shilling a week—to be ready for this duty. Of course, they would be allowed to return if they wish when the trouble is over. Or if the manager preferred not to interfere with his own men, surely it would be easy enough to find free labourers out of work to this small number in each town; or, alternatively, by the Federation paying a lump sum each year to the Free Labour Association, of London, or to Mr. Græme Hunter, of Manchester, or any other Free Labour leader, who would enter into a contract to provide a certain number of competent men at a day's notice.

The Council of the Federation should be empowered to make a grant to any company having fought a strike, of (say) one-half of the cost of such strike—this from existing funds or by making a levy.

The Federation should keep a gang of old soldiers or policemen, to act as pickets at each works when a dispute is on, so as to protect any free men when applying for, or going to or from, work. I attach particular importance to this suggestion, because I am sure if proper protection were afforded, no unjust strike would succeed.

One does not desire to take any unfair advantage of one's workmen; but the unreasonable demands of the respective Unions among the men caused the successful formation of the Shipping Federation, the Masters' Combinations of Engineers and of Coal Owners, and the Gas Makers' Union must eventually cause "The Gas-Works Federation," or the joining of the larger Federation of Capital mentioned in your article.

Oct. 13, 1898. MIDLANDS.

SIR,—In one of the "Editorial Notes" in last week's issue of the "JOURNAL," reference is made to a suggestion for the formation of a "reserve force" of skilled gas-works stokers, ready to be called upon at a moment's notice in case of a strike. No doubt this refers to horizontal retorts, charged by hand. I take the liberty of mentioning the fact that there would be no necessity for the "reserve" wherever inclined retorts are adopted, as the labour required is entirely of an unskilled nature; and it is found advisable not to engage skilled stokers who have become used to shovel charging—the best man for the job being the smart, handy labourer.

Leeds, Oct. 14, 1898.

MAURICE GRAHAM.

### Amalgamation of the London Water Companies.

SIR,—Recent events indicate unmistakably the wisdom of the unity among the London Water Companies which is strength. Amalgamation in the case of gas has been fruitful in good results; and, analogously, similar benefits would accrue to water. Uniformity in administration, coupling up all the distributory apparatus, utilizing surplus water storage, assessments, ratings, and many other matters, could be more easily dealt with under one directorate than many. To delay the matter is to court defeat and favour the chronic agitator whose "little knowledge is a dangerous thing" in the way of mischief-making.

It is an historical fact that when a great work has to be done, this



country has usually produced the necessary power at the right moment, and done it. In this case, the means are existent; but where is the man to ensure this consummation? Will he not step to the front in the hour of need? It is time to "limber up, the enemy is upon us."

A propos of the unprecedented rain-famine which has afflicted Central England and the Eastern Counties for many years, and the assertion of the before-mentioned "chronics" that "there has been no drought" within the meaning of section 3 of the Water-Works Clauses Act, 1863, or section 15 of the Metropolis Water Act, 1871, I beg to enclose a copy of my rainfall register kept at Leyton, by which it will be observed that the rainfall has been less than 9 inches in nine months. This is an instructive and interesting fact to make a note of, whether viewed in connection with river and canal navigation or water supply, whether by gravitation works, surface springs, subterranean reservoirs, or other sources, inasmuch as the record is some 50 per cent. below the average, and therefore phenomenal, even for this dry district.

Lea Bridge Road, Leyton, Oct. 12, 1898.

C. E. JONES.

[ENCLOSURE.]

Rainfall at Leyton, Essex, in 1898.

[RAIN GAUGE.—Diameter of Funnel, 5 inches; Height of Top above Ground, 1 foot.]

| Month.          | Total Depth. | Greatest Fall in 24 Hours. | Number of Days on which 0'01 inch or More Fell. |
|-----------------|--------------|----------------------------|-------------------------------------------------|
|                 | Inches.      | Depth.                     | Date.                                           |
| Jan. . . . .    | 0'53         | 0'21                       | 5                                               |
| Feb. . . . .    | 0'86         | 0'16                       | 5 & 26                                          |
| March. . . . .  | 1'04         | 0'42                       | 26                                              |
| April. . . . .  | 1'06         | 0'31                       | 27                                              |
| May. . . . .    | 1'93         | 0'37                       | 19                                              |
| June. . . . .   | 1'10         | 0'30                       | 27                                              |
| July. . . . .   | 0'75         | 0'24                       | 22                                              |
| Aug. . . . .    | 1'01         | 0'68                       | 7                                               |
| Sept. . . . .   | 0'40         | 0'31                       | 29                                              |
| Total . . . . . | 8'68         | ..                         | 86                                              |

### An Unsuspected Cause of Waste of Water.

SIR,—The scarcity of water, not only in East London, but also in various parts of the country, owing to the extraordinary drought which has prevailed, makes the question of waste at the present time of unusual importance to all water authorities. I venture to point out what, in my opinion, is the greatest existing cause of useless expenditure of water.

Of recent years, it has been the custom, in all moderate-sized or even small houses, to construct bath-rooms and lavatories with hot and cold supply. These are, in most cases, fed from a hot-water cistern in the scullery. When the fire is made up for cooking the dinner, this cistern begins to roar and shake; and the vibration is felt more or less all over the house. The cook, if inexperienced in life on a screw steamer, where similar noises are often heard, is much alarmed, and informs the neighbouring servants of the danger which she thinks exists. They laugh at her ignorance, and seem surprised to find that she does not know it is necessary to turn on the hot-water tap at the sink, and allow the water to run to waste whenever there is a large fire in the kitchen. She adopts the idea and "lives happy ever after." This is no exaggeration; and I feel sure if any water authorities finding an excessive consumption of water in their districts will take the trouble to make private inquiries, they will learn that the practice I have alluded to very generally prevails.

The questions discussed of recent years with regard to two, three, or five gallon flushes are mere idle talk, as regards the quantity of water affected by them, when compared with the construction of the hot-water supply in modern villas.

Oct. 15, 1898.

A. K. B.

## LEGAL INTELLIGENCE.

### Unlawful Use of Water at Kingsgate.

At the Cinque Ports Petty Sessions, held at Margate, on the 3rd inst., before Mr. E. S. Wootton (Chairman) and Captain C. T. Hatfield, Mr. A. Kay, of Little Holland House, Kingsgate, was summoned on the information of Mr. W. J. Latchford, Manager of the Broadstairs Gas and Water Company, for having, between the 27th of July and the 25th of August, unlawfully used a portion of the water supply of the Company for the purpose of watering his lawn and garden. Mr. J. Emery appeared in support of the charge; Mr. Shea represented the defendant, who pleaded "Not guilty." Mr. Emery said the proceedings were taken under the 18th section of the Water-Works Clauses Act, 1863 (incorporated with the Broadstairs Water-Works Act), which prohibited a person having a supply of water for domestic purposes from using it in other ways. In the present case, the defendant had water for his house, and also for a horse and carriage; but he had not contracted for a supply for his garden, and he was summoned for using water for it. It was alleged that some five years ago he received permission from Mr. Skinner, who was then collector to the Company, to use the water for the garden without paying for it. Since the summons was issued, he had called upon Mr. Skinner and asked him if he remembered giving him such permission; and he informed defendant that he had never done so, either to him or to anyone else. Defendant then said he must have been mistaken. Mr. Latchford put in a minute passed by the Directors authorizing him to take the present proceedings. In answer to the Chairman, he said the charge for a horse was 6s. and for a carriage 8s.; but there was no fixed charge for a garden hose. Application had to be made to the Company; whereupon the garden was inspected, and the charge fixed according to its size—it might be £2, £5, £10, or even more. In this case the charge would have been at least £2. Even these charges did not pay for the water used. Mr. Skinner was called, and denied having given the permission stated. Mr. Shea remarked that the defendant was

partner in a large firm of South African merchants, and was not the kind of gentleman who, for the sake of £2, or even £200, would attempt to use the water supplied by the Company without paying for it, did he not believe that he had a perfect right to do so. He was apparently under a wrong impression as to his interview with Mr. Skinner some four or five years ago; but he certainly thought permission had been given to him to use the water for his garden. The defendant had for five or six years paid for water for a horse and carriage; but for the past three years, if not more, they had not been down. Yet he had paid just the same; nothing being said about any rebate. Therefore he was simply using the water on his garden instead. His client never had any intention of avoiding payment for the water; and therefore he (Mr. Shea) asked the Magistrates to dismiss the case. It was suggested that a compromise might be effected on defendant paying for the water used; but no settlement was arrived at. Mr. Shea said he would not call any witnesses, but leave the matter in the hands of the Bench. After a short consultation, the Chairman said it was decided to fine defendant 1s., with £1 16s. 6d. expenses and 16s. 6d. Court fees.

### A Point under the Workmen's Compensation Act.

At the Birmingham County Court last Wednesday, his Honour Judge Whitehorse was called upon to arbitrate between Richard T. Jones, a blacksmith, of Cranmore Street, Nechells, and Messrs. C. & W. Walker, of Donnington, Newport, as to the amount of compensation for injury to be paid to Jones. Mr. Parker appeared for the applicant; and Dr. Rogers for the respondents. The case was the first under the new Act heard in the Birmingham Court; and though there was no dispute as to the injury and the liability to pay compensation, a rather singular point arose. Jones had been employed as a blacksmith at the Standard Cycle Works, and earned from 32s. to 38s. per week; but he fell out of employment, and in search of other work called two or three times at Saltley Gas-Works, where the respondents are engaged erecting a new gasholder. Ultimately, on July 11, the foreman in charge of the work engaged him. He had only been at work an hour or two, however, when the accident happened. A hammer, which was being used by a workman, broke, and the head fell a distance of 50 feet on to Jones's back. The blow caused concussion of the nervous system and contusion of the dorsal muscles, and incapacitated him from work. He therefore claimed that he was entitled, as a blacksmith earning the wages mentioned, to an allowance of 16s. 9d. per week during his incapacity. He did not admit that he was merely engaged as a labourer, urging in support of his contention that he was not engaged on labourers' work at the time, and that after his injury 2s. 6d. was sent to him as wages. The defendants, on the other hand, contended that, though a blacksmith, Jones was engaged as a labourer to assist a mechanic who was fitting the guide-rails to the holder. The foreman, Monk, asserted that, when he engaged Jones, he told him that there were no blacksmiths' forges on the premises. The rate of wages was not mentioned, because there was a standard rate of 24s. for labourers. The half-crown which was sent to Jones did not represent the wages he had earned during the short period of his employment. His Honour said two questions were raised. Could they, in deciding the amount of wages which the applicant was entitled to receive, look back to some former employment, and could they infer the rate of wages from the terms of employment even though practically no wages had been earned. On the first point, he held that an applicant was not entitled to look back; for, if he were, a workman would always select a previous employment when he was earning higher wages. As to the second point, he did not think the Act intended a man to be excluded from benefit when he was injured while working under such circumstances as were disclosed in this case. He held that Jones was employed as a labourer; and the wages for that occupation being 24s. per week, the compensation would be 12s. per week. Dr. Rogers did not ask for costs; but he expressed the hope that, in not doing so, he would neither be establishing a precedent nor holding out an encouragement to workmen to "have a run for their money" in the belief that it would cost them nothing.

### Use of Water by Fishmongers.

At the Ipswich Police Court last Thursday, Mr. W. H. Southgate, a fishmonger, was summoned for infringing the regulations of the Water Committee of the Ipswich Corporation. The Town Clerk (Mr. W. Bantoft) said Mr. Southgate was served with a notice on the 23rd of June, to the effect that the Council had determined that from and after Sept. 29, 1898, the supply of water to fishmongers would be by special agreement only in each case; and the fixed charge of 3s. per quarter, in addition to the domestic rate, was from that date abolished. Defendant was informed that, if he proposed to use any water in connection with his business after the 29th of September, it would be necessary to communicate with the Manager before the 1st of August. As the defendant did not take any notice of this communication, he was reminded of it; and on the 8th of October one of the inspectors found two men and a boy washing fish in his yard with the tap turned full on. Under these circumstances, the Corporation were bound to take proceedings. Mr. Hamlet Roberts, the Manager, said defendant told him he would not have a meter fixed at any cost. The defence was that a good price was being paid for the water. Defendant paid the rate for his own house and for the one adjoining, which was not occupied, and also an extra water-rate of 13s. a year which was put on him about fourteen years ago. A penalty of 20s. and 12s. costs was imposed.

The Supply of Gas in the Out-Districts of Bradford.—At last Tuesday's meeting of the Bradford City Council, on the recommendation of the Gas Committee, it was resolved to include in their next Bill in Parliament clauses for the purpose of authorizing the Corporation—(1) To purchase gas in bulk for the supply of districts in the existing or extended city lighted by private Companies, with a view to the equalization of the gas charges throughout the limits of the existing or extended city; (2) if deemed desirable, to purchase the distributing mains of private Gas Companies within the limits of the existing or extended city.

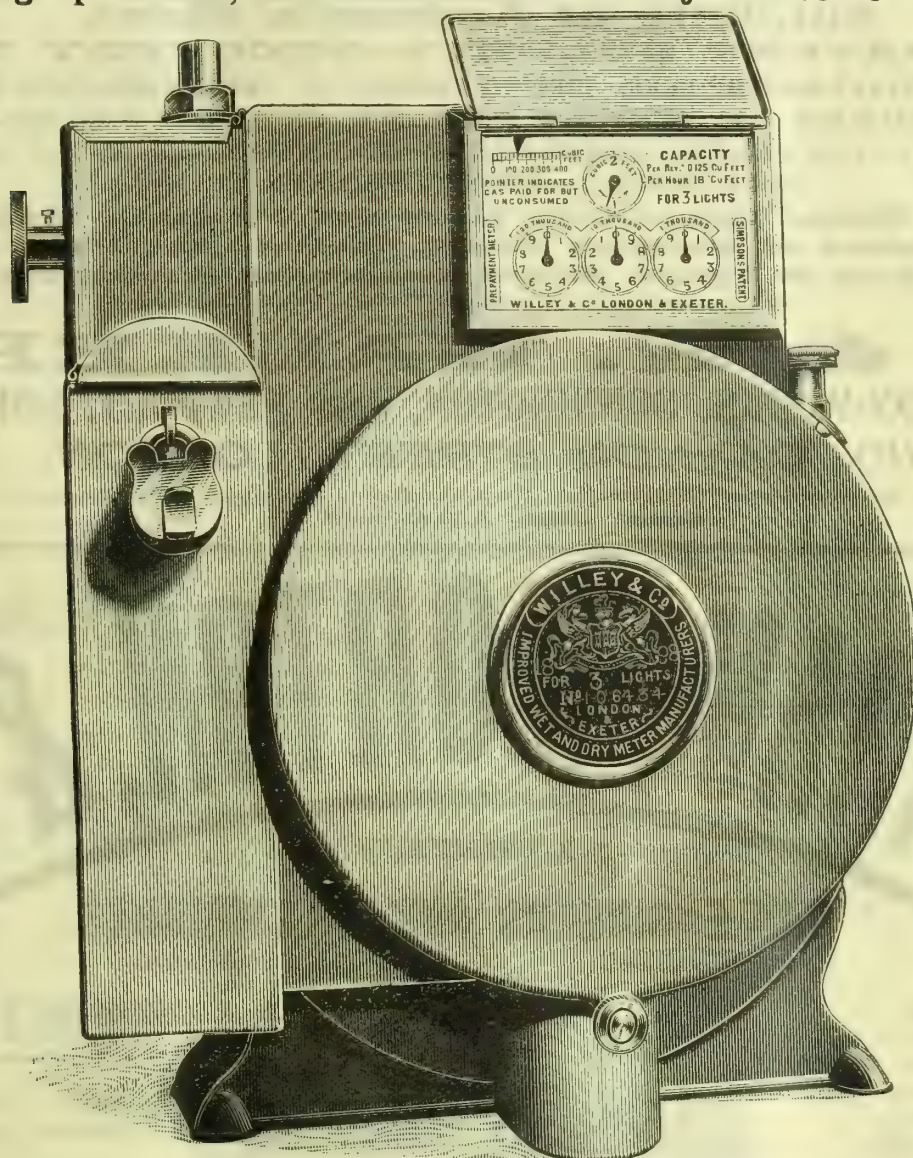


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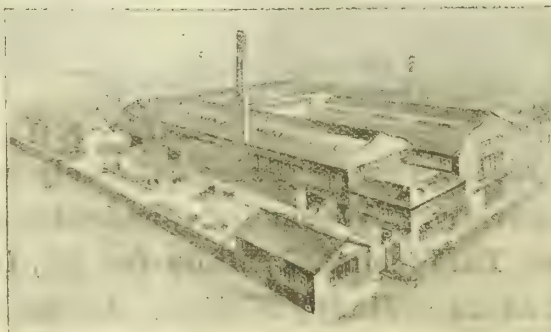
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## MISCELLANEOUS NEWS.

## THE GAS QUESTION IN VIENNA.

Recent events in connection with the above question were recorded in the last number of the "JOURNAL." At the sitting of the Communal Council on Monday, the 11th inst., Dr. Lueger stated that he would lay before the Governor of Lower Austria the protest of the minority against the decision come to in the matter of the suburban contract of the Imperial Continental Gas Association. He would not, however, oppose the decision in question, as he held it to be perfectly valid. The following are the principal heads of the contract: The Association obtain a unified contract extending to Dec. 31, 1911, for the lighting of all the suburbs, with one exception, which is in the immediate vicinity of the new municipal gas-works; this being exchanged for parts for which they had no contract. At the expiration of the new contract, the Municipality will be compelled to take over the mains, meters, public lamps, &c., belonging to the Association at a valuation. There is also a stipulation that the prices charged for gas are not to be changed without the consent of both parties. Commenting on the question, the Vienna Correspondent of "The Times" says: "The result of this sample of anti-Semitic administration, so far as the city of Vienna is concerned, is this: Whereas the Corporation might have obtained the whole of the business and works of the English Company, without trouble or inconvenience, for £1,350,000, the town has been kept in a state of confusion, and serious loss has been inflicted upon the trading classes, by the putting down of new pipes, necessitating extensive excavations, interrupting traffic in the main thoroughfares, and disfiguring the city. It has been well-nigh fatal to tradespeople. It has kept strangers away from the place, and has caused a general outcry among the entire population. If all appearances are not deceptive, the anti-Semitic administration has been digging its own grave in the streets of the capital. A sum of £3,000,000, if not more, will be expended, and they are as yet only in possession of a portion of the lighting of the town. The agreement is treated by the entire Press, with the exception of the anti-Semitic organs, as a crushing defeat for Dr. Lueger and his party, and a complete victory for the English Company." Simultaneously with this victory comes the announcement by the Directors of the Association of a dividend of 5 per cent. for the half year ending the 30th of June.

## BIRMINGHAM CORPORATION GAS SUPPLY.

## Disqualification of the Chairman of the Gas Committee as a Burgess of Birmingham.

By a singular mischance, following closely upon the general feeling of satisfaction experienced by the members of the Corporation of Birmingham and the other gentlemen forming the party who visited the Saltley Gas-Works last Wednesday, as recorded in another part of the "JOURNAL," at the excellent position of the gas undertaking, a circumstance came to light which has deprived the City Council, at all events for a year, of the man to whose ability a good deal of the prosperity of the undertaking is due. It has been discovered that Alderman Pollack, the Chairman of the Gas Committee, has become ineligible for re-election as an Alderman next month, owing to his disqualification as a burgess. It appears that, upon the publication of the new burgess roll, it was found that Alderman Pollack's name did not appear thereon. Inquiry as to how such an omission could have occurred resulted in the discovery that some person in the Overseers' office had put the word "alien" against the Alderman's name in the rate-book, with the result that it was not included in the new list of voters submitted to the Revising Barrister. The omission was not observed by Alderman Pollack, nor by any of the agents of the political associations, or a claim would have been sent in on his behalf.

Referring to this unfortunate matter last Saturday, the "Birmingham Daily Gazette" said: "On Thursday the fact was not known outside a very small circle of officials, and hopes were still entertained that a *modus vivendi* might be discovered whereby the error could be rectified and Alderman Pollack's great services on behalf of the city of his adoption continued without interruption. Several consultations took place between the Town Clerk and representatives of the Overseers; but an examination of the authorities bearing upon the question made it perfectly clear that for twelve months Alderman Pollack will be unable to take any active part in municipal affairs within the City Council. The more the subject was discussed, the greater became the surprise that Alderman Pollack should be classed among the 'aliens,' and thereby disqualified from voting or associating himself with the active government of the city. He has been a naturalized Englishman for the last 45 years; and, in addition to being a ratepayer and an Alderman of the City Council, he has served as Mayor and is a Magistrate for the city. Although his omission from the register is recognized as an official error, it is absolutely impossible for it to be rectified until the voting lists for 1899 are compiled, for there is no Act of Parliament under which Alderman Pollack could appeal to the Higher Courts for the restitution of the rights of citizenship so unjustly taken from him. It was suggested that his invaluable services on the Gas Committee might be retained in the same way that the assistance of several gentlemen who are not members of the Council is secured on the Free Libraries and Museum and School of Art Committees; but this also is impossible under the provisions of the Municipal Corporations Acts. It is only in the cases of the Free Libraries, Museum, School of Art, and Technical Instruction Committees—which have Special Acts of Parliament—that gentlemen not members of the City Council can act. No one has rendered more loyal and self-sacrificing service to the city than Alderman Pollack; and we share with every inhabitant of Birmingham the regret that will be felt over his compulsory—though it is hoped only temporary—retirement from civic life."

We learn from the above-named source that Alderman Pollack has received numerous letters and personal expressions of sympathy in his unfortunate dilemma. It was only natural that he felt the position

acutely—indeed, he was dumbfounded when the fact was first made known to him. He, however, fully recognized the hopelessness of the situation; and while regretting his enforced severance from the work in which he has for seventeen years taken so warm an interest, he has determined to make the best of it. If he was called upon at the end of another twelve months to resume office, and his health was continued, he would, he said, be prepared to place his services at the disposal of the city. Happily, all the work—and he spoke especially with regard to the Gas Committee—was well in hand; so that his successor in office would have no insuperable difficulties to face.

## METROPOLIS GAS SUPPLY.

## Dr. A. W. Williamson's Quarterly Report.

The following is an extract from the report of Dr. A. W. Williamson, F.R.S., the Chief Gas Examiner for the Metropolis, on the quality of the gas supplied to London during the quarter ended the 30th ult. :—

I. *Illuminating Power*.—The maximum, minimum, and average illuminating power, in standard sperm candles, of the gas at each of the testing-places was as follows:—

|                                       | Max. | Min. | Aver. |
|---------------------------------------|------|------|-------|
| <i>The Gaslight and Coke Company—</i> |      |      |       |
| Fenchurch Street, E.C.                | 17.4 | 15.9 | 16.6  |
| Kinghorn Street, Cloth Fair           | 17.1 | 16.0 | 16.5  |
| Dorset Buildings, E.C.                | 17.2 | 16.2 | 16.6  |
| Millbank Street, S.W.                 | 17.8 | 16.4 | 16.7  |
| Ladbroke Grove, W.                    | 17.5 | 15.8 | 16.5  |
| Vincent Terrace, N.                   | 17.2 | 16.0 | 16.4  |
| Carlyle Square, Chelsea               | 16.5 | 16.0 | 16.1  |
| Camden Street, N.W.                   | 16.9 | 16.1 | 16.4  |
| Graham Road, Dalston                  | 17.3 | 16.0 | 16.6  |
| Kingsland Road, E.                    | 17.6 | 16.1 | 16.7  |
| Spring Gardens, Charing Cross         | 16.9 | 16.0 | 16.4  |
| Vinery Villas, St. John's Wood        | 16.9 | 15.8 | 16.2  |
| Lambeth Road, S.E.                    | 16.8 | 14.5 | 16.3  |
| Hornsey Road, N.                      | 17.3 | 15.8 | 16.4  |
| George Street, Hampstead              | 17.1 | 16.0 | 16.5  |

*Commercial Gas Company—*

|                        |      |      |      |
|------------------------|------|------|------|
| Wellclose Square, E.   | 17.2 | 16.0 | 16.2 |
| Parnell Road, Old Ford | 18.1 | 16.0 | 16.6 |

*South Metropolitan Gas Company—*

|                            |      |      |      |
|----------------------------|------|------|------|
| Hill Street, Peckham       | 18.0 | 15.9 | 16.8 |
| Bedford Road, Clapham      | 17.8 | 16.0 | 16.7 |
| Stoney Lane, Tooley Street | 17.5 | 16.1 | 16.6 |
| Lewisham Road, S.E.        | 17.5 | 16.0 | 16.4 |
| Blackfriars Road, S.E.     | 17.5 | 16.0 | 16.6 |
| Burrage Road, S.E.         | 16.9 | 15.6 | 16.3 |

It will be seen from these results that the average illuminating power of the gas at all the testing-stations has been higher than the parliamentary standard of 16 candles.

II. *Purity*.—Sulphuretted hydrogen has not been present in the gas at any of the testing-stations. The proportions of sulphur in other forms than this were as follows:—

|                                       | Max.  | Min. | Aver. |
|---------------------------------------|-------|------|-------|
| <i>The Gaslight and Coke Company—</i> |       |      |       |
| Fenchurch Street                      | 13.9  | 7.6  | 10.5  |
| Kinghorn Street                       | 16.2  | 9.2  | 11.7  |
| Dorset Buildings                      | 12.6  | 7.6  | 9.8   |
| Millbank Street                       | 13.4  | 6.0  | 8.2   |
| Ladbroke Grove                        | 13.5  | 9.4  | 11.3  |
| Vincent Terrace                       | 19.4  | 9.9  | 13.5  |
| Carlyle Square                        | 16.4  | 9.4  | 11.7  |
| Camden Street                         | 13.7  | 8.5  | 11.4  |
| Graham Road                           | 11.4  | 9.2  | 10.1  |
| Kingsland Road                        | 13.3  | 7.8  | 10.7  |
| Spring Gardens                        | 13.6  | 6.3  | 10.2  |
| Vinery Villas                         | 14.6  | 8.9  | 11.6  |
| Lambeth Road                          | 16.2  | 7.3  | 9.3   |
| Hornsey Road                          | 17.02 | 7.3  | 10.9  |
| George Street                         | 17.0  | 8.6  | 12.3  |

*Commercial Gas Company—*

|                  |      |     |     |
|------------------|------|-----|-----|
| Wellclose Square | 10.1 | 6.4 | 8.3 |
| Parnell Road     | 15.2 | 3.0 | 8.2 |

*South Metropolitan Gas Company—*

|                  |      |     |      |
|------------------|------|-----|------|
| Hill Street      | 12.2 | 6.9 | 9.0  |
| Bedford Road     | 12.8 | 7.9 | 10.1 |
| Stoney Lane      | 15.2 | 6.9 | 10.3 |
| Lewisham Road    | 14.8 | 7.0 | 10.3 |
| Blackfriars Road | 13.6 | 5.7 | 9.2  |
| Burrage Road     | 12.4 | 5.1 | 10.6 |

The average amount of sulphur present in the gas at all the testing-stations has been considerably less than the quantity permitted—viz., 17 grains.

## EXPERIENCE OF MUNICIPALIZATION AT KENDAL.

The Falmouth Gas and Water Purchase Committee intend placing in the hands of the ratepayers a communication from Alderman John Monkhouse, the ex-Mayor of Kendal, giving that borough's experience of the municipalization of the gas and water works. The writer's argument is that what has been done at Kendal and elsewhere might be accomplished at Falmouth. The figures which he gives relating to Kendal are certainly interesting; and there is no doubt that much of the credit for the good results quoted must be ascribed to the management of the Engineer and Secretary (Mr. T. N. Ritson). Alderman Monkhouse states that £80,350 was paid for the joint undertaking, and the mortgage debt of £4500 was taken over. The purchase was ratified by Parliament in 1894; and during the three and a half years ending March last, there has been a surplus profit of £1000 a year—that is after paying £1668 interest and £638 to the sinking fund, together with all charges for maintenance of works, &c. In addition to this, the meter-rents have been abolished,



which is equal to a loss of £350 to the revenue. The price of gas has been reduced 3d. per 1000 cubic feet—a loss of £700 a year to the revenue—together a remission of £1050 a year to the consumers. The surplus profits earned are equal to 5d. in the pound on the rateable value; and as soon as the reserve fund is considered ample (it is now about £3000), Alderman Monkhouse believes the profits will be applied to a reduction of the rates. He is confident they will be able to gradually reduce the price of gas, both for lighting, cooking, and motive power, and still make large surplus profits. The demand is so great that the Committee are now considering the question of erecting a new gasholder at a cost of £6000. At the same time, the Corporation are discussing the question of the introduction of the electric light. They believe there is room for both illuminants. There is a wide field for gas among the smaller houses for lighting and cooking, to which the Gas Committee deal liberally by giving ring burners and stoves for cooking, and by putting in slot meters and fittings free. The output of gas at the date of the transfer was about 40 millions; and last year it was 57 millions—a fact which, Alderman Monkhouse says, “ought to appeal strongly to those who are always croaking that gas has seen its best day.”

### ELECTRIC LIGHTING NOTES.

At last Wednesday's meeting of the Kidderminster Town Council, the corporate seal was affixed to the agreement for the sale to the British Electric Traction Company of the Kidderminster Electric Lighting Order, 1871.

The Electric Lighting Committee of the Walsall Town Council, at their meeting last week, recommended that the salary of the Electrical Engineer be increased from £200 to £300 a year, and that electric lamps be substituted for the incandescent gas-lamps in certain parts of the borough, at a cost of £188. They also recommended, and it was agreed, that a sum of £400 be included in the next borough rate estimate to cover the loss on the Electric Lighting Department.

The Tunbridge Wells Town Council some time ago decided to extend their electric lighting works, for which purpose they are now seeking power to raise a further loan of £25,000. The capital already sunk in the venture is of modest proportions; the total being £15,000. This, according to information recently laid before a Local Government Board Inspector (Mr. Dandford Fawcett), has enabled the authorities to secure a net profit on the past year's working of £1348. In 1896-97 the surplus was £890; while in the preceding seven months £757 was derived from the enterprise.

At the meeting of the Bradford City Council last Tuesday, an attempt was made to saddle the Tramways Committee with the cost of lighting—estimated at about £500 per annum—the new electric tramway routes out of the town, mainly, it would appear, on the ground that the Electricity Department has £11,000 in hand and the Gas Department £47,000. It was objected that the Corporation already supply light for about 8000 street-lamps free of specific charge to the public; and yet it was proposed that the first person or body to be charged should be the Tramways Committee. It was manifestly unjust to saddle the Tramways Committee with the expenditure, as they had nothing to do with the lighting of the streets. An amendment, to this effect, to the Finance and General Purposes Committee's report was thereupon put and carried.

The intimation of the Local Government Board to the Bury St. Edmund's Town Council that a modification of the scheme of electric lighting might find favour in their eyes has been under the consideration of the Electric Lighting Committee; and they curtailed their proposals to such an extent that a loan of £16,000 would suffice to carry it out. In the meantime, offers were received from electric lighting companies to take over the Provisional Order; but such a course was not acceptable to the Committee. Before introducing the modified scheme in open Council, it was brought before a meeting of the General Purposes Committee, who, seeing that the new proposal showed only a small saving in capital cost, decided to recommend the Council to appoint a deputation to wait on the Local Government Board, and urge them to consent to the original scheme, the cost of which is now estimated at £21,500—a further £1200 having been tacked on to the cost of the buildings. The Council last Tuesday adopted the recommendation of the General Purposes Committee; but it is doubtful whether the deputation will be more successful in softening the hearts of the Board than previous deputations from other towns have been.

A Local Government Board inquiry, conducted by Mr. W. A. Ducat, was held in the Shire Hall, Shrewsbury, last Friday, in reference to an application by the Corporation for sanction to a loan of £35,800 for the purchase of the undertaking of the Shropshire Electric Light and Power Company, and the subsequent extension of the works. Mr. H. C. Clarke, the Town Clerk, appeared for the Corporation; and Mr. Spearman, of the Oxford Circuit, for the Shrewsbury Gas Company. Mr. Clarke stated that the Electric Light Company obtained their powers in 1894, and in 1897 they were approached by the Corporation with a view to the purchase of the works. Messrs. Kinkaid, Waller, and Manville were accordingly called in; and it was agreed provisionally to pay £21,500 for the undertaking. If the works were purchased by the Corporation, it would be necessary to enlarge them; and for this purpose a provisional agreement had been entered into for the purchase of additional land at a cost of £800. Mr. Manville presented his report, and said the price was reasonable. Mr. Spearman cross-examined him to show that the speculation was a bad one for the ratepayers. He said that the price was excessive, and that the works were not paying at present. Mr. T. P. Deakin (Chairman of the Lighting Committee) said the lighting of the streets had been complained of for some years and at last negotiations were entered into for purchasing the works of the Electric Light Company, by which means they thought they would bring down the price of gas. The inquiry closed without any other opposition than that of the Gas Company.

There are a few points in a letter which has appeared in the Manchester Press on the subject of the electric lighting of Stretford which will bear a wider publication. The writer is Mr. Wilfrid L. Spence, M.Inst.C.E.; and the object of his letter was to dispel some of the misapprehensions which he thinks existed at the recent meeting of Stretford ratepayers (noticed last week), and which, in his opinion, were responsible for the

passing of a resolution protesting against the action of the District Council in deciding to establish a system of electric supply, rather than receive current from the Manchester Corporation. He says that the Manchester charges for current are by no means the lowest in the kingdom. It might appear at first sight that a maximum charge of 5d. and a minimum of 1½d. is lower than Edinburgh's flat rate of 3½d., with discounts up to 25 per cent.; but this is not the case, for the average prices obtained are: Edinburgh, 3-50d.; Brighton, 3-77d.; Manchester, 3-81d.; the next lowest being Whitehaven, 3-94d. Therefore, although the Manchester charge is certainly low, it is only fractionally more favourable than that of Whitehaven, with but one-twentieth the output; and it is higher than at Brighton, where fuel costs £1 per ton. The second misapprehension is that it would be impossible for Stretford to afford a self-supporting supply at an average price of 4d. per unit. The costs of generation at Manchester, as in several other towns, are rising instead of falling. The 0-94d. of 1896-7 became 1-11d. in 1897-8—a rise of 18 per cent.; and thus, although it is extremely unlikely, there is still a possibility that the charges in subsequent years will have to be raised in Stretford, unless, of course, the citizens are willing to increase their municipal burdens to relieve the lighting charges on suburban consumers. If the supposed supply scheme at Stretford were to be dependent solely on a lighting demand, it might be admitted that not for several years—say, three or four—could the system be made self-supporting at 4d. per unit. But with the immediate prospect of a large and constant demand for current to work the trams, there can, in Mr. Spence's judgment, be no reasonable doubt that, with a well-arranged plant, current sold at 4d. to lighting consumers would pay costs with interest and sinking fund from the very outset. Mr. Spence, who disclaims holding a brief for Stretford, concludes by asserting that the terms proffered by Manchester are such as no self-respecting local authority should accept.

The proceedings at a Local Government Board inquiry at Bangor last Wednesday possess more than ordinary interest for our readers. It had reference to an application for sanction to borrow £13,500 for an electric lighting installation; and one of the blessings which it is expected it will confer is “the relief of the strain upon the gas-works.” Whether any evidence was adduced to show that the electric lighting scheme will be the cheapest way of relieving that strain does not appear in the report before us. The case for the Council was stated by Mr. J. A. Rodway, the Deputy Town Clerk. He first briefly outlined the course which the Council had pursued since 1890 to the present time to cope with the deficient storage capacity at the gas-works. Reports had been obtained from Mr. Thomas Newbigging, Mr. W. Poster (Nelson), and the late Mr. Robert Hunter (Chester); and the recommendations contained in the joint report of the two latter had been adopted. The electric lighting scheme which it was proposed to carry out was recommended by Mr. Medhurst; and the plant at the generating station would be equal to 4000 8-candle power lamps. The effect of the installation upon the gas-works would not be to decrease the consumption of gas, but it would stop the increase; and thus relieve the strain upon the gas-works. The proposed charge for the electricity was 6d. per unit. Mr. J. Smith, the Gas Manager, stated that the present storage capacity at the gas-works was 100,000 cubic feet; but the maximum consumption had in one day reached 223,000 cubic feet. With the new gasholder about to be erected, the storage would be increased to 180,000 cubic feet. Mr. Grey Edwards, the Chairman of the Lighting Committee, said that more than 100 of the principal ratepayers had promised to take the electric light; and these he estimated would require 3000 lights. To meet any possible deficiency on the works, a bond had been signed by about 60 persons, including tradespeople, professional gentlemen, and others, guaranteeing the sums set respectively opposite their names for five years. The total of the guarantee amounted to upwards of £650 per annum. The obtaining of this bond was the reason why the Council ultimately became unanimous upon the electric lighting question. In reply to the Inspector (Mr. W. O. E. Meade-King), Mr. Medhurst stated that electricity at 6d. per unit was equivalent to gas at 3s. per 1000 cubic feet. The opposition was represented by Mr. David Owen, who maintained that the electric light would be certain to affect the gas-works, which were the property of the town, and were very heavily encumbered. It was admitted that £3500 must be spent upon the gas-works to increase the storage capacity; and the opponents contended that this should be done first so that the town could have a little time to recover from its present financial position. Further evidence was also given.

**Heywood Gas Supply.**—The Gas Committee reported at the meeting of the Heywood Town Council last Thursday that the Local Government Board had sanctioned the borrowing of £8000 for the purposes of the gas undertaking.

**Threatened Strike of Gas Stokers at Yeadon.**—The stokers in the employ of the Yeadon and Guiseley Gas Company recently asked for an advance of 3s. per week and the engagement of a “wheeler on,” and they gave notice that, if their request is not complied with, they would cease work yesterday. The Directors offered to pay the same rate of wages paid by similar gas companies using the same kind of retorts; but this proposal was declined by the men.

**Advance in Stokers' Wages in the London District.**—Last week the South Metropolitan and Crystal Palace Gas Companies resolved, on the ground that general labourers' wages, from which class stokers are drawn, have increased so considerably in the last ten years, to increase the wages of stokers 5d. a day, making 6s. the wages for the eight-hour shift. It is made up thus: Wages were 5s. 4d., with 1s. 6d. a week as “good time” money. This has been commuted into 3d. a day; making 5s. 7d. The idea was to give an increase of 4d.; but this would have made the odd figure of 5s. 11d. The round sum of 6s. a day was therefore adopted. At the Crystal Palace Company, however, the Sunday pay has been reduced from double time for 16 hours, from 6 a.m. to 10 p.m., to the South Metropolitan level of time-and-a-half for twelve hours, from 6 a.m. to 6 p.m. Other retort-house men and those working on the two-shift system have had proportionate increases; the latter not in proportion to the time but to the work. The men not being under the influence of the Union, work well and fairly; and this consideration has largely influenced the Directors of both Companies in making the advance of wages. Both Companies announced the increases last Saturday.



## METROPOLIS WATER SUPPLY.

## Proposed Amendment of the Metropolis Water Act, 1871.

The agitation which has been going on in the East-end ever since the East London Water Company were compelled, owing to the continued dry weather, to restrict the supply of water in their district, has given rise to pretty freely expressed opinions that some kind of legislation should take place with the view, if possible, of preventing a recurrence of the trouble now experienced. It was intimated that if the Government were not disposed to move in the matter, some one else would do so; and we find that the initial step has been taken by Mr. Harry S. Samuel, the member for the Limehouse Division of the Tower Hamlets, who has prepared a Bill which he proposes to introduce next session to amend the Metropolis Water Act, 1871, and to "make further provision for the due supply of water to the Metropolis." Mr. Samuel has courteously furnished us with a print of the Bill; and we give below an abstract of its provisions.

The Act is to be cited as the Metropolis Water Act, 1899. The Metropolitan Water Companies are, within three months of the passing of the Act (unless the Local Government Board shall, by Provisional Order, extend the time), to make such junction or junctions of their mains or main pipes as may seem to the Board necessary for the effective supply of water as between the several Companies. The cost of making the junctions and effecting any repairs and renewals incidental thereto is to be divided between the Companies. They are to have power to enter into agreements with reference to the supply of water to each other; but such supply is only to be given or taken in cases of emergency with the consent of the Local Government Board, and during such periods as the Board may from time to time prescribe. Nothing contained in the Act is to prejudice or derogate from the rights and privileges which at the commencement of its operation might be lawfully exercised by the Conservators of the Thames; nor is anything to be construed to alter or vary any provision contained in Part V. of the Thames Conservancy Act of 1894, or in any other Act or agreement limiting the quantity of water to be taken from the Thames or any of its tributaries.

The foregoing epitome covers clauses 1 to 4 of the Bill. By clause 5, section 35 of the Metropolis Water Act, 1871—which gives power to the Local Government Board at any time to "appoint a competent person to inquire into and report on the quality of the water furnished by any Company," notwithstanding the absence of any complaint made and signed by twenty inhabitant householders, as prescribed by the Act of 1852—is repealed; and provision is made by the next clause that the Board may at any time appoint a competent person to inquire into and report, not only on the quality of the water supplied by any Company, but also as to the quantity of water in the Company's reservoirs, and the pressure of water in the mains. Under clause 7, the Board are to have power to require, in cases of emergency, any one or more of the Water Companies to supply water to any other of such Companies; the terms and conditions to be a matter of agreement between them, or, in default, to be as prescribed by the Board. By clause 8, any local authority may petition the Board to exercise the powers thus conferred upon them.

The next clause deals with penalties. It is provided that "any Company who violates, refuses, or neglects to comply with any of the provisions of this Act shall be liable to a penalty not exceeding £200, and to a further penalty not exceeding £100, for every week during which such violation, neglect, or refusal to comply continues." Every penalty so incurred may be sued for and recovered in a Court of Summary Jurisdiction by the local authority within the jurisdiction of which the same has been incurred; and the penalty is to be paid out of the divisible profits of the Company concerned, and is to be in reduction of dividend.

The last clause defines the expression "Metropolitan Water Companies" as meaning the eight Companies specified in section 5 of the Metropolis Water Act, 1897; and "local authority" means the Council of any county, borough, or district, the Corporation of the City, and any Vestry, District Board, or Local Board of Health in the County of London.

## THE LONDON COUNTY COUNCIL AND THE WATER QUESTION.

At the Meeting of the London County Council last Tuesday—Mr. T. McKINNON WOOD in the chair—the debate was resumed on the following resolution, moved at the previous meeting by Mr. Crooks, and seconded by Mr. Stuart, M.P.: "That, in view of the existing difficulty in obtaining an adequate supply of water in a large portion of the County of London, it be an instruction to the Water Committee to forthwith submit its proposals with regard to legislation affecting the water supply in the ensuing session of Parliament." To this Mr. Beachcroft had moved, and Mr. H. P. Harris seconded, an amendment to add to the resolution the words, "and also to obtain the opinion of the Engineer as to what works are required to provide for connecting the mains and works of the several Companies for use in cases of emergency."

Mr. Dickinson, the Chairman of the Water Committee, in resuming the debate, said the real importance of the resolution rested in the word "forthwith." They were asked to take a very important, but in his opinion a very wise, step under existing conditions. In ordinary circumstances, they might hesitate to adopt the course suggested, because a Royal Commission was now sitting to whom was delegated the consideration of the whole question of the London Water Supply. It was a strong action on the part of the Council to ask Parliament for legislation of any kind until the report of that Commission was issued. But in the present circumstances of the East London Water Company, he thought the Legislature ought to be put in possession, during next session, of some scheme which should enable it, in one way or another, to deal with this question. It could not be in defiance of the Commission, but rather in the way of helping it, if the Council now put forward a scheme. There could be no doubt that the findings of the Balfour Commission were come to upon fallacious evidence. The figures as to the quantity of water flowing in the Thames for the month of August clearly showed that no amount of storage would meet the difficulty; and he believed that, if the Council laid the evidence now in their possession before the present Commission, they would see that the solution of the water problem upon the lines

proposed by the Water Companies was fallacious, and that an additional supply must be secured from Wales or elsewhere if the needs of London were to be properly met. To secure unanimity, he was prepared to support the proposed addition to the resolution.

Dr. WHITE thought it was high time that some definite parliamentary action was taken, in order to solve the water problem, which was in reality an engineering question, and should never have been made a party one.

Mr. SHAW LEFEVRE supported the resolution, and pointed out that the events of the past few weeks had abundantly vindicated the water policy pursued by the Council. Had the proposals of the Council been carried, there would have been no scarcity in the East-end of London. There was no real famine in the whole of London; the difficulty having arisen purely from a drought in the Lea Valley. The Council had always said that the water drawn from the Thames would not provide for the wants of London in a few years to come; and that recourse would have to be had to a supply from elsewhere. This, he thought, was now generally admitted. In regard to the policy which the Council should pursue, he considered the only course open to them was to apply to Parliament for powers to purchase, quite irrespective of the Royal Commission—and whether it reported in time or not, the Council would probably not be very much influenced by it—and he felt certain that after the experience of the past few weeks Parliament would pass a Bill on these lines.

Mr. WESTACOTT said he had long felt that the whole of the London Water Companies ought to be under one authority, but what authority this should be was a debatable point. They should now consider not so much the past as what could be done to prevent the recurrence of such a catastrophe as that which had occurred in the East of London. He hoped that, whatever the County Council might do, Parliament would do something next session to settle the water question in the interest of the health of London. He hoped, with a view to unanimity, that the amendment would be withdrawn.

Mr. A. SMITH supported the resolution. As representing an East London constituency, and having watched the recent course of events in that district, he had been driven to the conclusion that there was no remedy for the present state of affairs other than the municipalization of the London Water Supply.

Mr. CROOKS appealed to Mr. Beachcroft to withdraw his amendment, on the ground that it was dangerous and dilatory.

The amendment not being withdrawn, the debate was continued.

Ultimately, however, on a division, the amendment was carried by 88 votes to 15.

Colonel FORD moved a further amendment to add the words, "and that the Committee be instructed to include in any proposed legislation power to enable this Council, with the consent of the Local Government Board, to compel general, immediate, and effective interchange of water supply by the Water Companies, upon such terms and conditions as shall be sanctioned by Parliament."

The amendment was rejected by a large majority; and the resolution, as previously amended, was adopted.

## THE RECENT DROUGHT AND THE WATER SUPPLY.

## The Position at the East-End and in the Provinces.

The recent rains and cooler weather have to a considerable extent mitigated the immediate effects of the severe drought at the East-end; but they have made little difference in the storage of water. The average rainfall in the Lea Valley for the week ending the 13th inst. was 0.03 inch, but even this small quantity made an impression on the volume of the flow of the river. For the first time for seven weeks, the water in the reservoirs began to rise; and each day brings in something more than what is required for the day's consumption. The Directors of the East London Water Company, however, at their weekly meeting on Thursday, did not feel justified in making any change in the arrangements. As the result of the heavy fall of rain on Sunday, the next official returns of the gaugings of the river will probably show something not far off 0.5 inch—a quantity which has not been registered for many months in the same number of days. The Company's advisers, however, recommend that the water shall not be again turned on for a full supply till the head is reached in the Walthamstow reservoirs; and it was last week calculated that about 2 inches of rainfall would be required to produce this rise in the storage—the reservoirs being about 4 feet below the head level. The new connections are working with advantage; and the result is a general increase in the pressure. The Company are negotiating for further supplies; and five wells are being sunk in the chalk—one at Lea Bridge being nearly completed. There is, therefore, a good prospect that the constant service, which has been temporarily suspended owing to extraordinary meteorological conditions, will shortly be restored; while in regard to the future, the Company consider that, should an exceptional drought occur such as has happened during the present year, their connections with other Companies' systems and their new wells will enable them to cope with all reasonable demands.

With regard to the Provinces, the Water Committee of the Birmingham Corporation, at their meeting last Friday, had submitted to them by the Works Sub-Committee a report concerning the measures taken to economize water during the recent drought. The consumption during the weeks of drought rose at times to over 20 million gallons per day; and for the eleven weeks to the end of September it averaged nearly 19 million gallons daily. Urgent appeals were made to the public not to waste water, and street watering was restricted. The draught upon the storage had, of course, been very great; no less than 114 million gallons being drawn from the great reservoir at Shustoke between July 28 and Oct. 10. Although rain has fallen, the replenishment of the reservoir has not yet commenced; indeed, the tendency is still further downwards, and on Friday the water stood at a lower level than at any previous period. Notwithstanding all the difficulties the Committee have had to contend with, there has been no curtailment of supply; the storage and service reservoirs on the Birmingham side of Whitacre have been kept full by constantly drawing upon Shustoke. By the present restriction of the Bradford water supply to eight hours out of the 24, Mr. J. Watson, the Water Engineer, estimates that about 3 million gallons of water are saved daily. This is principally effected upon the high level, as though the low







estimate of the total cost of the works to deliver 200 million gallons a day into a reservoir at Elstree for distribution in London nearly to the same figure as that proposed by the Chief Engineer.

As regards the second sum of nearly 3½ millions sterling, we think the estimate will prove to be in excess of the real requirements. We have considered how far this estimate would be common to the Welsh scheme and to any scheme for pumping an equal quantity of water from the Thames. The sum included by the Chief Engineer for filters might be necessary for filters of the area required for Thames water; but experience of the filtration of mountain water shows that it is greatly in excess of the expenditure required in connection with the Welsh scheme. Having regard to all the circumstances, we think that this estimate of 3½ millions somewhat reduced in amount may be fairly assumed to be common to the Welsh scheme and to any scheme for the supply of Thames water; and we shall therefore omit it from any comparison we may make between the two.

Assuming the first part of the scheme to be modified by carrying out works for the supply of 200 million gallons a day from the Wye sources instead of from the Usk and Llangorse sources, without varying the line of aqueduct or the Elstree reservoir, the cost of the several instalments would be as follows:—

|                                          |             |
|------------------------------------------|-------------|
| First instalment of 66½ million gallons. | £10,215,292 |
| Second " 66½ " "                         | 1,759,968   |
| Third " 66½ " "                          | 1,924,969   |

Total . . . £13,900,229

The ultimate cost of the alternative schemes treated in this manner is thus practically the same, but that of the first instalment of the Wye project is materially less, and there is a probable advantage in the latter arrangement, as the Usk and Llangorse sources now appear to yield about 1½ per cent. less than the 200 million gallons a day, while the yield of the Wye scheme, even after the omission of the Ithon and Clywedog, as in the above estimate, is in excess by about 5½ per cent. We also think that the latter estimate allows a margin for the purchase of land and easements considerably in excess of that provided in the case of the Usk and Llangorse sources.

We have checked the Chief Engineer's estimates of the cost of obtaining a further supply of 200 million gallons from the Wye sources with a reservoir at Banstead Downs. On the assumption that the first supply is taken from the Usk and Llangorse, we do not appreciably differ in our results, though, for reasons already stated, we think the estimate may be reduced by the omission of the Ithon and Clywedog reservoirs.

(To be continued.)

**The Rossendale Union Gas Company's Assessment Appeal.**—The appeal of the Rossendale Union Gas Company against the assessment of their property will be heard by Mr. Worsley Taylor, Q.C., the Recorder, at the Preston Quarter Sessions next Thursday. The proceedings will be watched with much interest by several local gas companies who have similar appeals in contemplation.

## THE FYLDE WATER-WORKS TRANSFER.

### Terms of the Proposed Agreement.

The stockholders of the Fylde Water-Works Company have received the draft agreement which has been entered into by the Directors and the Water Board for the transfer of the undertaking. The Local Authorities of Blackpool, Fleetwood, Lytham, and St. Anne's together constitute the Board.

If the agreement is accepted by the stockholders at the next half-yearly meeting, each holder of stock "A" will receive certificates of the new Board for £363 12s. 9d. of 2½ per cent. stock for every £100 of old stock, and so on in proportion for any greater or less amount, repayable at par (£363 12s. 9d.) fifty years from the date of transfer. In like manner, each holder of £100 of stock "B" will receive certificates for £254 10s. 11d. of 2½ per cent. stock. In like manner, each holder of £100 preference stock will receive certificates for £145 9s. 1d. of 2½ per cent. stock. The interest payable half-yearly to each shareholder will be exactly the same as received at present—viz., the maximum rate of dividend it is possible for the Company to pay. In addition to the above, the new Board pay the Company £37,000 in cash and one year's interest thereon—a portion of this amount to form a compensation fund, as the stockholders may determine. The new Board pay costs, and assume the whole of the liabilities of the Company. They also agree to take up £100,000 of stock certificates if required, as named in the draft agreement. The management of the works is to remain in the hands of the Directors of the Company until Aug. 31, 1899. Clause 2 of the agreement states: "The consideration for the sale of the said undertaking shall be the sum of £802,455 12s., of which the sum of £37,000 shall be paid by the Water Board to the Company in cash; and the sum of £765,455 12s. shall be satisfied by the allotment or payment to stockholders of the Company of stock of the Board or cash in lieu of stock." The Board are to create stock to the amount of £765,455 12s. 6d., to carry interest at the rate of 2½ per cent. per annum. Of this sum, £218,182 10s. is to be distributed and allotted *pro rata* among the registered holders of the £60,000 of consolidated "A" stock of the Company; £445,455 4s. 2d. among the holders of the £175,000 of consolidated "B" stock; and £101,817 18s. 4d. among the holders of the £70,000 of 4 per cent. preference stock. On the completion of the purchase on Aug. 31, 1899, the £37,000, together with interest at the rate of 3 per cent. from Aug. 31 last, is to be paid by the Board to the Company; and all stocks of the Board and cash is to be allotted and paid respectively by the Board to the stockholders. The proceedings in the arbitration are to be stayed as soon as the Bill for confirming this agreement shall have received the Royal Assent. The Company are to be at liberty until completion to declare and pay dividends in accordance with their respective Acts, on the existing stocks, out of the net profits of the year or part of a year. The Board are not at any time to create or issue any stocks which shall rank in priority to the said Fylde Water Board "A" stock; but they may issue similar stock.

The half-yearly report of the Directors of the Company is noticed in to-day's issue on p. 880.

## GAS AND WATER COMPANIES STOCK AND SHARE LIST.

Referred to on p. 861.

| Issue.                | Share. | When ex-<br>Dividend. | Dividend<br>or Dividend<br>& Bonus. | NAME.                       | Closing<br>Prices. | Rise<br>or<br>Fall<br>in<br>Wk. | Yield<br>upon<br>Invest-<br>ment. | Issue.    | Share. | When ex-<br>Dividend. | Dividend<br>or Dividend<br>& Bonus. | NAME.                                 | Closing<br>Prices. | Rise<br>or<br>Fall<br>in<br>Wk. | Yield<br>upon<br>Invest-<br>ment. |
|-----------------------|--------|-----------------------|-------------------------------------|-----------------------------|--------------------|---------------------------------|-----------------------------------|-----------|--------|-----------------------|-------------------------------------|---------------------------------------|--------------------|---------------------------------|-----------------------------------|
| £                     |        |                       | p. c.                               |                             |                    |                                 | £ s. d.                           | £         |        |                       | p. c.                               |                                       |                    |                                 | £ s. d.                           |
| <b>GAS COMPANIES.</b> |        |                       |                                     |                             |                    |                                 |                                   |           |        |                       |                                     |                                       |                    |                                 |                                   |
| 590,000               | 10     | Oct. 13               | 10½                                 | Alliance & Dublin 10 p. c.  | 21½-22½            | ..                              | 4 19 4                            | 75,000    | 5      | June 29               | 6                                   | Malta & Meadn., Ltd.                  | 4½-5½              | ..                              | 5 14 3                            |
| 100,000               | 10     | "                     | 7½                                  | Do. 7 p. c.                 | 16-17              | ..                              | 4 8 3                             | 541,920   | 20     | June 10               | 5                                   | Monte Video, Ltd.                     | 13½-14½            | ..                              | 6 18 0                            |
| 800,000               | 100    | July 1                | 5                                   | Australian 5 p. c. Db.      | 105-107            | ..                              | 4 13 6                            | 617,946   | Stk.   | Aug. 31               | 9½                                  | Newcastle & Gateshead Con.            | 230-240            | ..                              | 4 1 3                             |
| 200,000               | 5      | May 26                | 6                                   | Bombay, Ltd.                | 6½-7               | ..                              | 4 5 9                             | 252,355   | Stk.   | Jan. 8                | 3½                                  | Do. 3 p. c. Db. Stk.                  | 113-117            | ..                              | 2 19 10                           |
| 40,000                | 5      | "                     | 6                                   | Do. New, £4 paid            | 4½-5               | ..                              | 4 16 0                            | 150,000   | 5      | May 26                | 8                                   | Oriental, Ltd.                        | 7½-8               | ..                              | 5 0 0                             |
| 880,000               | Stk.   | Aug. 12               | 12                                  | Brentford Consolidated      | 275-280            | ..                              | 4 5 9                             | 135,000   | 5      | "                     | 8                                   | Do. New, £4 10s. pd.                  | 6½-7               | ..                              | 5 2 11                            |
| 240,000               | "      | "                     | 9                                   | Do. New                     | 210-215            | ..                              | 4 3 9                             | 15,000    | 5      | "                     | 8                                   | Do. do. 1879, £1 pd.                  | 1½-1½              | ..                              | 4 11 5                            |
| 50,000                | "      | "                     | 5                                   | Do. 5 p. c. Prf.            | 140-145            | ..                              | 3 9 0                             | 60,000    | 5      | Sept. 29              | 7                                   | Ottoman, Ltd.                         | 6-6½               | ..                              | 6 6 2                             |
| 159,375               | "      | June 10               | 4                                   | Do. 4 p. c. Db. Stk.        | 130-135            | ..                              | 2 19 3                            | 500,000   | 100    | June 1                | 6                                   | People's Gas 2nd M.<br>of Chicago Bd. | 103-108            | ..                              | 5 11 1                            |
| 226,320               | Stk.   | Sept. 15              | 11½                                 | Brighton & Hove, Orig.      | 263-268            | +1                              | 4 5 10                            | 848,070   | 10     | Oct. 13               | 6                                   | River Plate Ord.                      | 9-9½               | ..                              | 6 6 4                             |
| 983,500               | Stk.   | Aug. 31               | 5                                   | Do. A. Ord. Stk.            | 190-195            | ..                              | 4 7 2                             | 250,000   | Stk.   | June 29               | 4                                   | Do. 4 p. c. Db. Stk.                  | 99-101             | ..                              | 3 19 3                            |
| 420,000               | 20     | Sept. 29              | 10                                  | Bristol 5 p. c. max.        | 125-130            | ..                              | 3 16 11                           | 250,000   | 10     | Sept. 29              | 10                                  | San Paulo, Ltd.                       | 14½-15½            | ..                              | 6 9 0                             |
| 50,000                | 10     | Aug. 12               | 11½                                 | British                     | 50-52              | ..                              | 3 16 11                           | 135,000   | Stk.   | Sept. 15              | 10                                  | Sheffield A.                          | 242-245            | ..                              | 4 1 8                             |
| 75,000                | 10     | "                     | 8½                                  | Bromley Ord. 10 p. c.       | 25-27              | ..                              | 4 5 2                             | 209,053   | Stk.   | "                     | 10                                  | Do. B.                                | 242-245            | ..                              | 4 1 8                             |
| 600,000               | 10     | Oct. 13               | 6                                   | Do. 7 p. c.                 | 20-22              | ..                              | 3 17 5                            | 447,427   | "      | "                     | 10                                  | Do. C.                                | 242-245            | ..                              | 4 1 8                             |
| 98,122                | Stk.   | June 29               | 4                                   | Buenos Ayres (New) Ltd.     | 9-9¼               | +½                              | 6 6 4                             | 5,600,000 | Stk.   | Aug. 12               | 5½                                  | South Metrop. 4 p. c. Ord.            | 140-143            | ..                              | 3 14 7                            |
| 150,000               | 20     | July 14               | 8½                                  | Do. 4 p. c. Db. Stk.        | 98-100             | ..                              | 4 0 0                             | 1,460,000 | Stk.   | July 14               | 3                                   | Do. 3 p. c. Db. Stk.                  | 102-105            | ..                              | 2 17 2                            |
| 100,000               | 10     | Sept. 29              | 7                                   | Cagliari, Ltd.              | 29-30              | ..                              | 5 10 0                            | 60,000    | Stk.   | Aug. 31               | 12                                  | Tottenham and A.                      | 280-290            | ..                              | 4 2 9                             |
| 50,000                | 50     | May 3                 | 6                                   | Cape Town & Dis., Ltd.      | 15-16              | ..                              | 4 7 6                             | 60,000    | "      | "                     | 9                                   | Edmonton B.                           | 200-210            | ..                              | 4 5 9                             |
| 550,000               | Stk.   | Oct. 13               | 13½                                 | Do. 6 p. c. 1st Mort.       | 58-60              | ..                              | 5 0 0                             | 182,380   | 10     | June 10               | 7                                   | Tuscan, Ltd.                          | 10½-11½            | ..                              | 6 1 9                             |
| 200,750               | "      | "                     | 10½                                 | Commercial Old Stock        | 310-320            | +1½                             | 4 4 5                             | 149,900   | 10     | July 1                | 5                                   | Do. 5 p. c. Dbs. Red.                 | 100-103            | ..                              | 4 17 1                            |
| 200,750               | "      | June 10               | 4½                                  | Do. New do.                 | 247-252            | +½                              | 4 3 4                             |           |        |                       |                                     |                                       |                    |                                 |                                   |
| 200,000               | Stk.   | June 10               | 12                                  | Do. 4½ p. c. Db. dc.        | 148-153            | ..                              | 2 18 10                           |           |        |                       |                                     |                                       |                    |                                 |                                   |
| 200,000               | "      | "                     | 9                                   | Continental Union, Ltd.     | 207-212            | ..                              | 5 13 2                            |           |        |                       |                                     |                                       |                    |                                 |                                   |
| 51,600                | Stk.   | Aug. 31               | 14                                  | Do. 7 p. c. Prf.            | 193-198            | ..                              | 4 10 11                           |           |        |                       |                                     |                                       |                    |                                 |                                   |
| 168,400               | "      | "                     | 11                                  | Croydon A 10 p. c.          | 305-310            | ..                              | 4 10 4                            | 746,164   | Stk.   | June 29               | 10½                                 | WATER COMPANIES.                      |                    |                                 |                                   |
| 555,000               | Stk.   | Aug. 12               | 5½                                  | Do. B 7 p. c.               | 255-265            | ..                              | 4 3 0                             | 150,000   | "      | "                     | 5                                   | Chelsea, Ord.                         | 313-318            | ..                              | 3 6 0                             |
| 60,000                | "      | "                     | 5                                   | Crystal Palace Ord. 5 p. c. | 125-130            | ..                              | 4 0 9                             | 160,000   | "      | "                     | 4½                                  | Do. 6 p. c. Prf.                      | 170-175            | ..                              | 2 17 2                            |
| 486,090               | 10     | July 28               | 11                                  | Do. 5 p. c. Prf.            | 140-145            | ..                              | 3 9 0                             | 175,785   | "      | Sept. 29              | 4½                                  | Do. 4½ p. c. Prf. 1875                | 148-152            | ..                              | 2 19 3                            |
| 354,060               | 10     | "                     | 11                                  | European, Ltd.              | 23-24              | ..                              | 4 11 8                            | 1,720,560 | Stk.   | Oct. 18               | 7                                   | Do. 4½ p. c. Db. Stk.                 | 155-160            | ..                              | 2 16 3                            |
| 5,922,230             | Stk.   | Aug. 12               | 12½                                 | Do. 27 10s. paid            | 17-18              | ..                              | 4 11 9                            | 654,740   | "      | June 29               | 4½                                  | East London, Ord.                     | 212-217            | +½                              | 3 4 6                             |
| 100,000               | "      | "                     | 4                                   | Gaslight & Coke, A. Ord     | 290-295            | -2                              | 4 8 0                             | 890,000   | "      | "                     | 3                                   | Do. 4½ p. c. Db. Stk.                 | 157-160            | ..                              | 2 16 3                            |
| 665,000               | "      | "                     | 10                                  | Do. B 4 p. c. max.          | 120-125            | ..                              | 5 4 0                             | 700,000   | "      | June 29               | 7½                                  | Do. 3 p. c. Db. Stk.                  | 103-105            | ..                              | 2 17 2                            |
| 30,000                | "      | "                     | 5                                   | Do. C, D, E, 10 p. c. Prf.  | 308-313            | +1                              | 3 8 11                            | 910,000   | Stk.   | Sept. 29              | 4                                   | G'd Junction, 10 p. c. max.           | 115-118            | ..                              | 3 3 7                             |
| 60,000                | "      | "                     | 7½                                  | Do. F, 5 p. c. Prf.         | 152-157            | ..                              | 3 3 8                             | 708,000   | Stk.   | Aug. 12               | 14                                  | Do. 4 p. c. Db. Stk.                  | 140-145            | ..                              | 2 15 2                            |
| 1,300,000             | "      | "                     | 10                                  | Do. G, 7½ p. c. do.         | 230-240            | ..                              | 3 2 6                             | 160,000   | "      | "                     | 7                                   | Kent                                  | 365-370            | ..                              | 3 15 8                            |
| 463,000               | "      | "                     | 10                                  | Do. H, 7½ p. c. max.        | 195-200            | ..                              | 3 10 0                            | 1,043,800 | 100    | June 29               | 10                                  | Do. New, 7 p. c. max.                 | 212-217            | ..                              | 3 4 6                             |
| 476,000               | "      | "                     | 6                                   | Do. J, 10 p. c. Prf.        | 308-313            | +1                              | 3 3 11                            | 300,000   | Stk.   | Sept. 29              | 7½                                  | Lambeth, 10 p. c. max.                | 300-305            | ..                              | 3 5 7                             |
| 101,150               | "      | June 10               | 4                                   | Do. K, 6 p. c. Prf.         | 185-190            | ..                              | 3 3 2                             | 350,000   | Stk.   | Sept. 29              | 4                                   | Do. 7½ p. c. max.                     | 227-232            | ..                              | 3 4 8                             |
| 294,850               | "      | "                     | 4½                                  | Do. 4 p. c. Db. Stk.        | 131-133            | ..                              | 3 0 2                             | 500,000   | 100    | Aug. 12               | 13½                                 | Do. 4 p. c. Db. Stk.                  | 140-145            | ..                              | 2 15 2                            |
| 958,000               | "      | "                     | 6                                   | Do. 4½ p. c. do.            | 148-153            | ..                              | 2 18 10                           | 1,000,000 | Stk.   | July 28               | 4                                   | New River, New Shares                 | 435-440            | ..                              | 3 0 2                             |
| 70,000                | 10     | May 12                | 8                                   | Do. 6 p. c. do.             | 198-203            | ..                              | 2 19 1                            | 902,300   | Stk.   | June 29               | 6                                   | Do. 4 p. c. Db. Stk.                  | 140-145            | ..                              | 2 15 2                            |
| 8,800,000             | Stk.   | "                     | 10                                  | Hongkong & China, Ltd.      | 14-15              | ..                              | 5 6 8                             | 126,500   | 100    | "                     | 6                                   | Southwark & Vxhall, Ord.              | 166-171            | ..                              | 3 10 2                            |
| 376,400               | 100    | Aug. 2                | 4                                   | Imperial Continental        | 228-233            | ..                              | 4 5 10                            | 489,200   | Stk.   | "                     | 5                                   | Do. do. 7½ p. c. Prf.                 | 160-165            | ..                              | 3 12 0                            |
| 473,600               | Stk.   | Aug. 12               | 3½                                  | Do. 4 p. c. Dbs. Red.       | 98-101             | ..                              | 3 19 3                            | 1,019,585 | "      | Oct. 13               | 4                                   | Do. 4 p. c. A Db. Stk.                | 139-142            | ..                              | 2 16 4                            |
| 560,000               | 100    | Oct. 1                | 5                                   | Do. 3½ p. c. Db. Stk.       | 101-104            | ..                              | 3 7 4                             | 1,155,066 | Stk.   | June 10               | 10                                  | West Middlesex                        | 300-305            | ..                              | 3 5 7                             |
| 250,000               | 100    | "                     | 4½                                  | Met. of Mel. 5 p. c. Db.    | 110-112            | ..                              | 4 9 3                             | 200,000   | "      | Sept. 15              | 4½                                  | Do. 4½ p. c. Db. Stk.                 | 162-165            | ..                              | 2 14 7                            |
|                       |        |                       |                                     | bourne 4½ p. c. Db.         | 105-107            | ..                              | 4 4 1                             | 200,000   | "      | "                     | 3                                   | Do. 3 p. c. Db. Stk.                  | 102-105            | ..                              | 2 17 2                            |

\* Ex div.



## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

It is known that wiser counsels prevailed in Peebles upon the subject of the gas transfer, over those which the Town Council were at first disposed to follow; and it now falls to be recorded that a formal agreement has been entered into between the parties. This week it was adopted at a meeting of the shareholders of the Gas Company, and is now final so far as they are concerned. Adoption by the Town Council is to take place whenever the Burghs Gas Supply Act comes into force, which, of course, cannot be until after the November elections. There is a provision that, unless the agreement be adopted by both parties prior to Jan. 15 next, the transaction shall be at an end. This provision is, however, not now likely to come into operation. The date of transfer is to be held as at Whitsunday, 1898. Meantime, the Company are carrying on the gas-works for the behoof of the Corporation, under conditions set forth in the formal agreement, one of which is that the Commissioners are to pay the Directors an allowance at the rate of £35 per annum, as remuneration for the period from May 15 last till the dissolution of the Company. The Commissioners are to pay all the debts of the Company, including law charges, and also the expenses of the transfer. The shareholders of the Company are to receive annuities at the rate of 10 per cent. for 35 years, at the end of which time they are either to be paid £157 10s. for every £100 of the nominal amount of stock held by them, or, in the event of non-payment, they are to be entitled to 5 per cent. interest upon the amount till payment be made. There is a provision of rather a peculiar nature at first sight, but which, on second thought, is seen to be necessary in order to provide capital for the Commissioners. It is to the effect that the shareholders of the Company shall lend the capital sum they will be entitled to in 1933 to the Commissioners upon mortgage, without interest. Till then the annuities are the interest upon the capital. In 1933, when the annuities cease to be payable, the Commissioners, if they are not in a position to refund the capital sums, shall pay the 5 per cent. rate of interest. On these terms, the Commissioners are to receive, as at May 15 last, "the whole undertaking of the Company, including all the property and assets thereof . . . and the whole business, lands, premises, works, and other property, heritable and moveable, thereof." The accumulated funds of the Company thus pass over to the Commissioners, as well as all stocks on hand at May 15 last, without payment.

The Corporation of Dumbarton have reduced the price of gas from 2s. 9d. to 2s. 6d. per 1000 cubic feet for private lighting; and for public lighting the rates are to be 21s. per lamp per year, or 1s. 8d. per 1000 cubic feet. There are no meter-rents. The gas supplied is of 25-candle power. The mere mention of these facts is a tribute to the excellence of the management of Mr. M'Gilchrist who, it is evident, has control of the gas undertaking well in hand. One evidence of this is the extent to which gas is used by the people in Dumbarton. I have been comparing the figures for several places; and I find that Dumbarton stands among the first four or five towns of some size in the matter of the

highest percentage of gas consumers. This argues confidence on the part of the community in the management of the undertaking; and this opinion is not shaken by the fact that I find that Forfar, where a section of the members of the Corporation do as much as they can to create dissatisfaction with the gas management, possesses the highest percentage of all the towns whose results I have looked at, because Forfar is only the exception—the other towns being all places where the gas managers do their work in peace. The outcome of the high percentage of consumers in Dumbarton is to be found in the circumstance that the engineers' strike reduced the consumption of gas considerably. Indeed, it was this information which led me to look into the matter. I learn that this is the first year since the Corporation have owned the works—the transfer having been in 1873—in which they have had to look behind; and also that the gas consumption is greatly on the increase at the present time. Down till now, the Corporation have been in the habit of taking large sums from the gas profits, and placing them to the Common Good of the burgh. The pernicious practice is not likely to be repeated, as there is a feeling among the consumers that they ought to get gas at cost price. Should this be effected, further reductions in price may be looked for.

The town of Johnstone, in Renfrewshire, is celebrated for the manufacture of the highest quality of wood and iron tools. It is a flourishing place, increasing by leaps and bounds. In this increase the Corporation Gas Department is also a participant. It has been found necessary to double the capacity of one of the holders, by telescoping it. The work has been done by the Barrowfield Iron-Works, Limited, of Glasgow, to plans prepared by Mr. J. M'Gilchrist, of Dumbarton. It is now completed; and on Thursday the gas was turned into the new holder by Mr. Thomson, the Provost of the burgh. He stated that the gas undertaking was acquired by them in 1879. In 1880, the price was 5s. 1d. per 1000 cubic feet; and it is now 3s. 4d. They had also reduced by £11,000 the debt incurred to pay the purchase price. The work of doubling the holder has been carried out to the satisfaction of all. After the ceremony of turning on the gas, the assembled company sat down to dinner in the Council Chambers. Among other toasts which were drunk were those of the Engineer (Mr. M'Gilchrist) and of the Contractors. Mr. M'Gilchrist presented Provost Thomson with a silver-mounted walking stick; and Mr. Ewen, of the Barrowfield works, presented Bailie Lang, the Convener of the Gas Commission, with a pair of bronze figures with gas-globes.

It is stated that tenders have been received by the Corporation of Glasgow for supplies of cast-iron water-pipes, and that it is not likely any more orders will go to America. There is considerable chagrin in Glasgow at the report which has been circulated within the past few days, that the Americans have taken advantage of the fact that they have got two small orders for pipes from Glasgow to advertise largely in different parts of the world that they supply the Corporation of Glasgow with pipes. This is a circumstance which is calculated to do great harm to the pipetrade of Glasgow; and it is certainly to be regretted that neither the Corporation nor the pipefounders were astute enough to foresee it. On this subject, I see the statement was made at a public meeting that in the Town Council the labour representatives supported the motion to send the orders to America. It is characteristic of the commercial blindness

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## WINTER SEASON 1898-9.

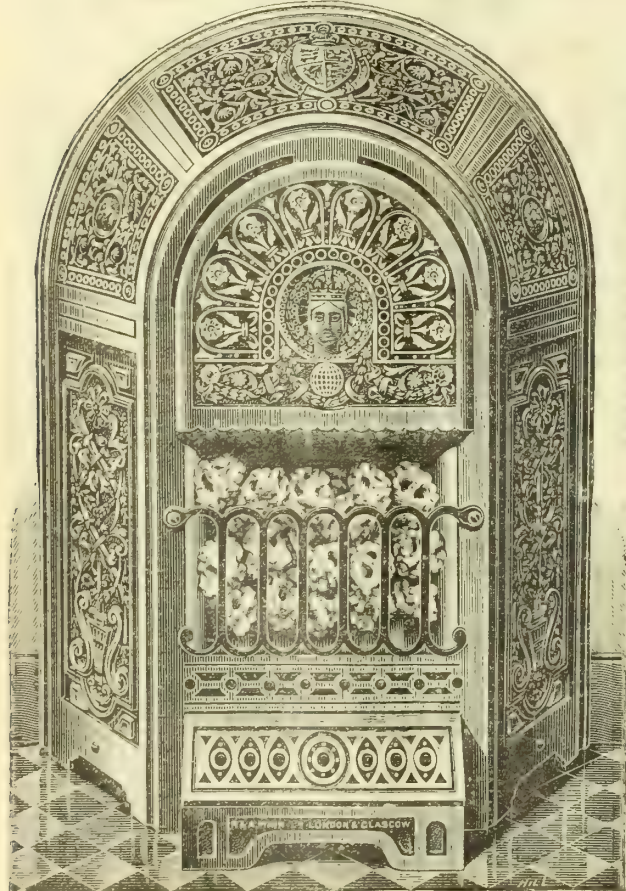
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of their class that they, in their eagerness to administer a blow at their supposed enemy capital, did not hesitate to take a step in the direction of depriving their fellow-workers of the means of making their daily bread. If it were possible for shame to arise in the faces of such people, they ought never to meet a working man without blushing to the roots of their hair.

The Gas Committee of the Glasgow Corporation had a long meeting on Tuesday, upon the subject of the proposed new gas-works at Blochairn. No resolution was arrived at; but it is reported that the Committee still adhere to the idea of erecting the new works on the site selected, and that they should purchase an additional piece of land on the adjoining estate of Blackhill. This estate is already the property of the Corporation. It was purchased many years ago as a proposed site for a prison; but the Government of the day did not adopt it. Blackhill has remained on the hands of the Corporation ever since, and has been an unprofitable investment. Its altitude makes the greater part of it unsuitable as the site of a gas-works. The opposition to the proposal to go to Blochairn is still being pushed by east-end residents; but I cannot say it is growing.

The report of the two Accountants who were appointed to examine the system of financing practised by the Forfar Gas Corporation was submitted to the Corporation last night. It is a long document, and has been ordered to be printed for circulation. No further information regarding it has transpired, except that it recommends several changes in the method of book-keeping employed. So much might have been expected, as a matter of course.

The Arbroath Gas Corporation met on Thursday night to consider the proposal to promote a Bill in Parliament giving them increased borrowing powers. The Clerk reported that the Committee of Management recommended that borrowing powers to the amount of £15,000 be applied for. Provost Grant moved the recommendation, and in doing so pointed out the advantages which the Corporation would have in possessing power to borrow, even though they did not require to use the money. Ex-Bailie Strachan wished to know what the money was wanted for, and moved disapproval of the Committee's recommendation; but he was told that he was out of order. He thereupon gave notice of motion on the subject; and the Corporation agreed to meet on an early date to consider it.

At a meeting of the Perth Gas Commission on Monday, the Commissioners approved of the plans for the new gas-works which have been prepared by Mr. Foulis, of Glasgow, with the exception that they enlarged one or two parts of the plant. Mr. Cuthbert, the Convener of the Works Committee, said that the retort-house would contain 240 retorts, which would be capable of producing 2 million cubic feet of gas per day. At present, with 122 retorts, they were able to make 1,100,000 cubic feet per 24 hours. Mr. Foulis estimated the cost at £21,000, which would exhaust the borrowing powers of the Commission.

The Town Council of Edinburgh on Tuesday considered a recommendation by the Treasurer's Committee to lend £150,000 to the Edinburgh and Leith Gas Commissioners, at the rate of 3 per cent. interest per annum. Mr. Cranston moved disapproval of the recommendation, chiefly on the ground that the Corporation of Edinburgh were already involved, in the matter of temporary loans, to the amount of £600,000, and could

not afford to lend any more; and, besides, he did not consider it business to borrow money and to re-lend it at the same rate of interest. The feeling was expressed that the Gas Commission was an arrangement which must some day cease, and the undertaking come into the management of the Corporation directly; and that this consolidation of the indebtedness of the community was a step in that direction. At a meeting in which there were 44 members present, Mr. Cranston had only one supporter; and thus the recommendation of the Committee was adopted by 42 votes to 2.

It was reported to the Paisley Gas Commissioners, on Tuesday, that the Gas Committee had had under consideration the propriety of insuring their workmen, to meet claims for compensation for accident; and the Committee recommended that an offer by the Vulcan Boiler and General Insurance Company, at a premium of 10s. per cent. of the wages paid, should be accepted. This was agreed to.

#### CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Oct. 15.

**Sulphate of Ammonia.**—On the East Coast the market has been very slow; and prices have drooped. On the West Coast, however, there has been a better demand for immediate delivery, and the moderate quantity offered has been readily absorbed. The closing quotations are £9 10s. per ton f.o.b. Hull and Leith, and £9 13s. 9d. per ton f.o.b. Liverpool. The difficulties with the shale miners in Scotland, which have for some time been brewing, have come to a head; and the dispute has been settled, in the case of one of the largest oil works, by an advance in wages of 6d. per day. It seems likely that a settlement on a similar basis may be arrived at by the other oil concerns; and it is to be hoped that by this means further trouble may be avoided. In the forward position, the Scotch makers are practically off the market. London make may, however, be had for some months ahead at £9 10s. per ton, Beckton terms; and there is speculative offering abroad at something under the equivalent of the price.

**Nitrate of Soda** is steady at 7s. 7½d. per cwt. for good, up to 7s. 9d. per cwt. for refined quality, on spot.

LONDON, Oct. 15.

**Tar Products.**—Carbolic acid is selling freely; and makers seem disposed to contract for a considerable period ahead at current rates, which is singular having regard to the extent of business being done. There is still a fair demand for creosote; and heavy oils and pitch continue in moderate request at former rates. There is no life in anthracene, and it continues to drag along neglected. The production is undoubtedly being restricted, which should by and bye tell its tale on the value. The low price of benzols seems to be recognized both by sellers and buyers; and a large business is reported at prices marked below.

To-day's values may be taken as: Tar, 14s. to 19s. Pitch, east coast, 25s.; west coast, 23s. Benzols, 90's, 8½d.; 50's, 9d. Toluol, 1s. 1½d. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 1d. Crude, 30 per cent.

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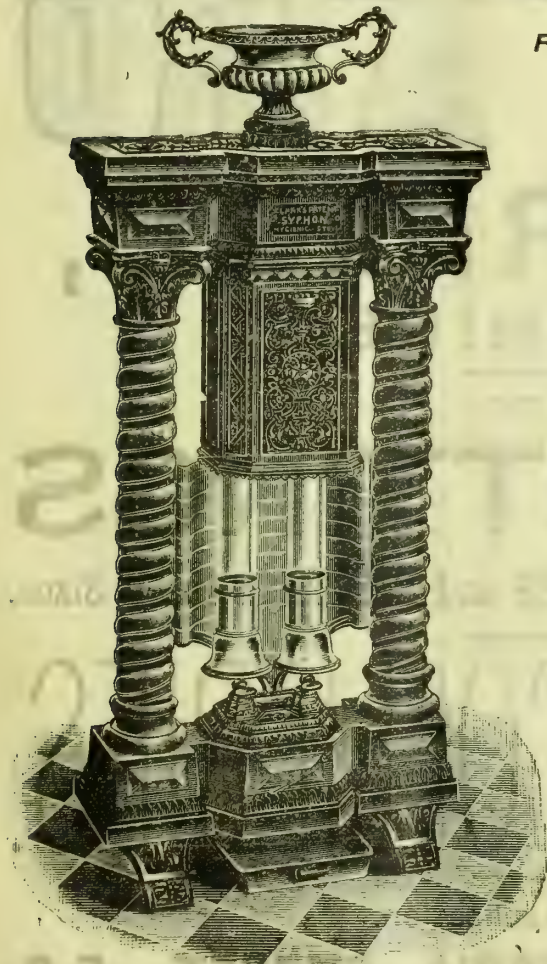
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**Sulphate of Ammonia.**—The price of sulphate has gradually fallen apparently without any substantial reason, excepting that buyers are holding off. Important quantities have changed hands at prices ranging between £9 8s. 9d. to £9 11s. 3d. per ton, less 3½ per cent.

### COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—Though, with regard to the better qualities of round coal, there is still an absence of that briskness of demand for house-fire purposes which is usually looked for at this time of the year, generally the position throughout the coal trade of this district is satisfactory. Prices are being fully maintained, with collieries as a rule working full time, and only in exceptional cases not disposing of all their present output. Supplies of common round coals here and there are rather more plentiful; but this is due chiefly to lessened requirements for shipment—the inland demand for steam and forge purposes continuing brisk. Good qualities are fetching from 7s. 6d. to 8s. 6d. per ton at the pit. Slack maintains the hardening tendency reported last week; and though in the open market there is no actual scarcity of supplies, many of the leading collieries are experiencing a difficulty in meeting the requirements of their customers, and generally there is a disinclination to book forward contracts except at an advance. Current rates average 3s. 6d. to 3s. 9d. per ton at the pit for the common sorts; 4s. 3d. to 4s. 6d., for good medium descriptions; and 4s. 9d. to 5s. 3d., for the best qualities. The shipping trade, taking it all through, is only quiet; and rather low prices, as compared with those that have previously been obtained without difficulty, have been quoted. Common sorts of steam coal have been purchasable at as low as 8s. 9d. to 9s. per ton, with 9s. 6d. representing about an average figure for good qualities, delivered at the Mersey ports.

**Northern Coal Trade.**—The coal trade is quieter, but not equally so in the great branches. The shipments to the upper ports of the Baltic are now beginning to fall off; and this has its effect most on the fuel from Northumberland. Best steam coals are quiet at 9s. 9d. per ton f.o.b.; steam smalls are 5s. 9d.; and second-class steam are about 9s. Manufacturing coals continue steady, and the prices are well maintained. In gas coals, there is an increasing demand. Sales of single cargoes of gas coals continue at prices that vary from 9s. 9d. to 11s. per ton f.o.b.; but some contracts have been entered into for best Durham gas coals for export next year at a little over 9s. For gas coke, the demand is well sustained; but with the larger production now, the market finds a better supply. The price of gas coke for export is firm; while that for home use is unaltered.

**Scotch Coal Trade.**—The demand continues good, but chiefly for home supplies; foreign trade being weaker. In consequence, prices have suffered a slight decline. The quotations are: Main, 8s. per ton f.o.b. Glasgow; ell, 9s.; and splint, 9s. 3d. The shipments for the week were 196,499 tons—a decrease of 9916 tons upon the previous week, but an

increase of 28,802 tons upon the corresponding week of last year. For the year to date, the total shipments have been 7,648,863 tons—an increase upon the same period of last year of 1,424,365 tons.

**The Reigate Corporation and the Local Gas-Works.**—The ratepayers of Reigate have been invited by the Mayor to attend a public meeting to-morrow to sanction the promotion of a Bill to enable the Corporation to acquire the local gas-works. In view of this fact, the Directors of the Red-hill Gas Company have, through their Secretary (Mr. Read), pointed out to the burgesses what may be the result of the success of the Corporation's scheme. In the first place, they must borrow a very large sum of money. Then it is practically certain that the consumers will not be benefited by having the price of gas reduced for many years to come. If there should be a surplus profit on the working, it will be applied towards reducing the rates, so that everything will come out of the consumers' pockets to benefit owners of land and others who are not consumers; whereas, should the Company be left alone, they will have the benefit of all reductions in price of gas. A very significant point in Mr. Read's circular is that the present price of gas will be reduced 2d. per 1000 cubic feet on the 1st of January next. This reduction would, it is pointed out, have been made many months earlier had not the Corporation opposed the Company's Bill in Parliament, and thereby put the Company to serious expense, besides inflicting an extra rate on the townspeople in order to defray the Corporation expenses.

**Fylde Water Company.**—The report of the Directors of this Company states that the expenditure on capital account during the past half year has been £12,632, and the account stands at £446,939. This amount includes the sum of £76,665 paid towards the new works authorized by the Fylde Water Act, 1896. Interest upon the outlay has been charged to revenue; but no income has yet been derived from it. The water-rates and other receipts during the half year ending Aug. 31, after an allowance of £382 for empty houses, &c., and bad debts, amount to £19,858; the interest on loans and bank commission amount to £1519; and working expenses, rents, rates, and taxes to £4191. This leaves a balance of £14,147, to which an amount brought forward from the last account is added—making a total balance of £29,939. Dividends on the subscribed stock at the rate of 4 per cent. per annum on the preference stock, 1891; at the rate of 10 per cent. per annum on the "A" stock; and at the rate of 7 per cent. per annum on the "B" stock, are recommended—leaving a balance of £19,765 to be carried to the next account. The Directors report that the net profit of the Company still continues to show a considerable increase; the increase for the past year being about £2500, after providing for the payment of interest upon £76,665 expended on works in process of construction. The Directors announce that, after considerable negotiation with the authorities constituting the new Fylde Water Board, they have, subject to the sanction of the stockholders, entered into an agreement with the Board for the purchase of the undertaking, which agreement the Directors recommend for consideration. If the terms of the agreement be refused by the stockholders, the value of the works will have to be determined by arbitration, as fixed by the Fylde Water-Works Transfer Act, 1897.

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## TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

## EDITORIAL NOTES.

## The Pay and Prospects of London Gas Stokers.

It was announced in last week's "JOURNAL" that an advance of wages had been given to the stokers of the South Metropolitan and Crystal Palace Gas Companies, in recognition of the fact that the wages of general labourers, from which class retort-house hands are drawn, have risen considerably of late years. The Directors of these two Companies experienced the less reluctance in making this concession, inasmuch as their men, not being under the influence of any Trade Union, have worked well and fairly. The advance of wages is therefore an encouragement as well as an adjustment of rate to the conditions of the labour market of the London district. It is worthy of being put upon record as a further proof of the truth that Trade Unions are not necessary to this process of adjustment. In the case of London gas workers, the rates of wages paid are bound to be uniform throughout the district; and accordingly it was inevitable that The Gaslight and Coke Company should follow the South Metropolitan lead, as they did last week. Unfortunately, the carbonizing expenses of the different London Gas Companies do not bear the construction that a true friend of Trade Unionism would desire, by proving that there is equality of performance as well as of pay. All the London Gas Companies are good paymasters; but unhappily they do not all get the same return. The Gas Workers' Union is fast enough in prompting its members to ask for more money, whenever and wherever there seems to be the smallest prospect of getting it. The Union hands have not forgotten the disappointments of 1889; but in London at least the Union Executive has kept quiet for some years. We have lately recorded movements on the part of the Union in different places in the country; and London was certain to feel much the same impulse sooner or later. During the past week, the London newspapers published references to the existence of discontent among the Beckton stokers; and the ominous heading, "Gas Workers' Agitation," once more appeared in these prints. It is always difficult to trace the origin of movements of this kind. A News Agency puts it that, "in face of the demands of the gas workers employed at the various stations in connection with The Gaslight and Coke Company, the Commercial Company, and the West Ham Company, who have decided to ask their employers "for an increase of 15 per cent. in their wages," the Secretary of the Executive Council of the Gas Workers' Union issued the "manifesto," the terms of which we reproduce in another column. It is to be noted that this circular is not dated, so that it is impossible to say whether it is to be regarded as cause or effect of whatever "demand" may have been preferred to the Companies named, by or on behalf of the stokers. The circular tells the carbonizing workmen that they "have not had any direct "increase of wages for the past 22 years, whilst at the "same time the wages of all classes of workmen have "been increased at least 25 per cent." The men are implored to join the Union, with the object of wringing from the Companies the advance of pay which this organization was formed and endeavoured to obtain in 1889. This is as much as to say that, in the judgment of the Union Executive, the opportunity has come at last for taking up the cause which had to be dropped in 1889. It was the extra shilling a day that the men who joined the Union really wanted then; and, of course, they would like it now. At first, the Union concentrated their energies to secure the eight-hour shift; and, possibly to the agitators' surprise, they discovered that they had undertaken "to force "an open door." On Sunday, July 28, 1889, a mass meeting of gas workers was held in Hyde Park, to celebrate their "victory" in getting the eight-hour day, when not a word was said in acknowledgment of the fact that the victory had been gained without fighting, or in confession of the equally important truth that the other shilling a day would have been better appreciated.

It was not long after this that the Union took the next step, by formally notifying that none but members would be allowed to take service under the London Gas Companies; and thenceforward the struggle as to who should be master went on to the settlement which is matter of history. It is needless to recount the story of how the brunt of the Union attack fell upon the South Metropolitan



Gas Company; but it should be borne in mind that in this conflict the whole strength of the Union was spent, leaving nothing for furthering the desire of the members employed at other London gas-works for higher pay. So the matter was allowed to drop for awhile. In the usual way of such pronouncements, the new circular makes an attempt to persuade the gas workers that they are injured men. It sings the old song about the men having to carbonize more coal, "in consequence of the "scoops being made deeper, wider, and heavier;" and asserts that the "nigger-driving" that "prevailed before "the Union started is becoming the practice again." It has ever been a trick of the labour agitator to tell the men that they are being "put upon" in some way or another. This time, however, the pretence is too thin. If the carbonizing expenses of the London Companies mean anything at all, it is something wholly different from Mr. Thorne's fond imaginings. The gas workers of London have only to do a fair day's work, and their employers will pay them a fair day's wages for it. If the Union gives further trouble, the immediate effects, whatever they may be, will be of little importance compared with the ulterior results. We have ere now published an article describing the making of gas without the help of stokers at all. If this is what it must come to in London, so be it. The old men in the workhouses a few years hence will know whom to thank for loss of employment, pension, and freedom.

#### Some Features of the Gas Legislation of the Year.

THE abstracts of the Gas Acts for the year, which it is our custom to publish at this season, permit the student to ascertain the drift of contemporary parliamentary practice in this department of legislation. There has been a somewhat heavy crop of these Acts; and several of them will repay very attentive consideration. The interest of those who are not particularly affected by such Acts is divided between those of the clauses that are old, and those that have some pretension to novelty. It is not for us to emulate the performances in criticism of the Liberty and Property Defence League, which, proceeding on the assumption that all legislation is of the nature of a restriction of man's natural rights, pokes ponderous fun at the statutory privileges conferred by Private Acts. We are pleased to record the fact that gas supply continues to give Parliament a good deal of work every year. Last session was remarkable for the number of Gas-Works Transfer Bills passed into law. A highly gratifying feature of most of these measures was the solicitude shown for the interest of old employees of the Companies; and we have already taken occasion to commend the Yeovil case for remembrance on this account. It was high time that the subject should be properly dealt with, and fair treatment of Company's officers and servants erected into a precedent. The natural desire in many instances for trying the effect of "new brooms" should not be indulged at the sole expense of the old hands; but it is for the outgoing proprietors to insist upon this condition of the transfer of gas property. The fashion for consolidating and unifying Gas Companies' capital is well exemplified. The sanctity of the initial price under the sliding-scale has been maintained.

The subject of the consolidation of Gas Companies' capital, and the bearings of the operation upon the undertaking and the proprietors' and consumers' interests, ought to be exhaustively treated by a paper and a discussion at a technical gathering. It might be taken into consideration in connection with the comparatively new rule making Local Authorities' gas-works extension loans repayable within forty years. Under these conditions, how much remains of the familiar argument in favour of the municipalization of gas-works, that Local Authorities can borrow money for capital purposes at a cheaper rate than Gas Companies can raise additional capital? The Public Works Loan Board will now lend money for forty years at 3 per cent. Gas Companies can dispose of permanent debentures for less. The paper might raise the independent question of whether gas capital standing at more than current values should be extinguished, and how.

Some of the Standing Order clauses of Gas Acts might be overhauled in the light of facts. What of that curious prohibition of the compulsory removal from their dwellings of members of the labouring classes? In how many instances is such a prohibition needed? The occasional clauses of some of the Acts are suggestive. There is an echo of litigation in the permission accorded to the Enfield

Company to use their gas-mains for ancillary purposes. It seems strange that gas undertakings should require parliamentary sanction for such an ordinary trade precaution as the demanding of payment in advance—that is to say, "cash with order"—where this is deemed desirable. The limitation of the period during which a consumer's defective meter is to be presumed to have registered erroneously, is still subject to a little confusion. When the matter was first dealt with in Bills, it was sought to limit the period for correction to the current quarter of the year. As we pointed out, this is an absurdity; for in the usual way the meter would show itself defective at the registration for the previous quarter. It is now customary to limit the period of correction to the "last preceding quarter," although there is no unanimity in this regard. The power to inspect new interior fittings in houses is given in several instances, with the right of refusal of the supply unless the result of the inspection is satisfactory. In some cases, the consumer has a right of appeal to two Justices against an adverse decision in this regard; but not everywhere. The subletting of dwellings for a limited period is recognized in a few Acts. Some Companies are not liable for penalties in the event of defective supply capable of being referred to an "unavoidable cause." Several Acts provide for the recovery of demands under £50 in the County Court. A few Gas Companies are permitted to employ their capital in applying for and working an Electric Lighting Order; but nothing more in this regard is ever granted to them.

#### An Aspect of Municipalism.

THE Association of Municipal Corporations have held their autumn general meeting, under the presidency of Sir A. K. Rollit, M.P.; and there was a numerous attendance. The subjects of discussion brought under the notice of the august assembly might be described as "various," seeing that they ranged all the way from the assessment of Government property to the question of the inclusion of fried-fish shops in the list of offensive trades under the Public Health Act. It would be difficult to say off-hand which is the more important topic of the two. The subject that seems to have stirred the meeting to its depths, however, was that of a resolution moved by the Mayor of Nottingham affirming the principle "that where Local Authorities have, with the sanction of Parliament, established or are in the course of establishing undertakings for public benefit, and have not failed in the performance of their duties, it is not right or expedient that powers should be granted to Companies to compete with such Local Authorities." This is good, sound, mouth-filling language; but it seems to lack pointed application. This was supplied in the explanatory speech of the worshipful mover of the resolution, who began by remarking that nothing had tended in a greater degree to the well-being of the inhabitants of English towns than the action of the Corporations, under the direct sanction and authority of Parliament, in acquiring gas and water undertakings. When electricity supply came to the fore as a town requisite, the Corporations understood that Parliament would treat them as in the cases of gas and water supply. This impression was strengthened by the action of the Board of Trade under the Electric Lighting Act.

In these latter days, however, the confidence of municipalities in their monopolistic privilege has been rudely shaken by the circumstance of the House of Lords having passed the Bill of the General Power Distributing Company—a measure containing "most revolutionary proposals." It actually contemplates the invasion of Nottingham, with other places, by a Company proposing to supply cheaper electricity than the Corporation, with an eye to profits in aid of rates, can distribute the same commodity! "In a short time the Nottingham Corporation will have spent close on half-a-million sterling on electrical undertakings. The Association could imagine their dismay when they learnt that by means of a Private Bill they were to be subjected to the competition of a *Company working for a profit.*" The italics are ours. The cry of alarm raised by the Mayor of Nottingham was echoed by the Lord Mayor of Sheffield, his Lordship of Manchester, and half-a-dozen other spokesmen of municipal trading interests. The Town Clerk of Liverpool appears to have been desirous of a hearing "on the other side;" but he did not venture to say much in opposition to the stormy abuse levelled at this "iniquitous Bill," as the measure was called by the Lord Mayor of Manchester,



who declared his disbelief that the House of Commons will ever pass it. We shall see. One thing at least is certain—if this or any other similar Bill does pass the Commons, it will be on account of the grasping after profits by the Corporations of Manchester and some other places, who have charged what they liked for gas, regardless of the broad interests of the community. Parliament is not an association of municipalities exercising, or hoping to acquire, any monopolies for the supply of the necessities of town life. There was not a municipal magnate at the meeting who had the boldness and fairness to ask what would have been the attitude of the Corporations to the Bill in question, supposing it to have threatened Electric Lighting Companies instead of Corporations. Would not the Mayors and Town Clerks have declared that the chief interest of their people was in getting the cheapest possible supply of electricity for lighting and tramway working? Would they not have said, as one man, that if the small local Companies could not do the work as cheaply as the big general concern, it might be so much the worse for them; but the interest of the public must be paramount? And now the Mayor of Nottingham is afraid of a Company proposing to work “for a profit”—why? Because the interest of Nottingham in cheap electricity is confused with that of the Corporation in the profits of the business. Who is to fix a standard of value for electricity in Nottingham, or any other town?

Unfortunately for themselves, the Corporations owning gas undertakings have shown that they are not to be trusted to sell gas at the lowest possible price. They make up their municipal minds as to what is a “reasonable” price for the article, such as it is, and take the “profits.” The Mayor of Nottingham talks at large about the benefit to town populations that has accrued from the municipalization of the gas supply; but it is the fact that few municipalities sell gas as cheaply as a Company in the same district would do it—with the Municipality keeping a sharp look-out upon the quality of the service. The truth of the present matter is that those English Municipalities supplying electricity that have turned the corner of solvent working, have already exhibited the desire to grasp after profits; and this has “shown the red light” to Parliament. The proof is to be read in the Telephone Committee’s report of last session. Is everything that can be municipalized, like gas, to be made subservient to the desire of Local Authorities to escape the obligation to charge all their expenditure upon the rates? Are popular Mayors everywhere to clear away slums and lay out squares, called by their own names, at the expense of the users of Corporation services? Of course, this is a very objectionable suggestion; but it is not wholly without justification, as many Mayors and Town Clerks will agree, if they will glance at some other towns than their own. Electricity supply is an infant. Nobody can foresee its growth and development. A few years ago everybody thought municipal central stations for generating the small amount of electricity required for lighting purposes would be safe from injurious competition. Now an outsider threatens, in some places, to do the same work at half the price. Why should the Municipality stand in his way? They had far better make a deal with him before he starts.

#### Cases under the Workmen’s Compensation Act.

It is greatly to be desired that readers of the “JOURNAL” who may be in a position to supply information concerning the operation of the Workmen’s Compensation Act in disputed cases, will not neglect to communicate with us, on the mistaken supposition that we are in a position to know what goes on in all the County Court circuits throughout the country. For some time to come, the County Courts will have the settling of the law under this Act; and there is no knowing how it will work out. At Liverpool recently, His Honour Judge Collier, sitting as Arbitrator under the Act, had to deal with three claims, all raising debatable points of interpretation or procedure. In the first case, the widow of a man who had been killed preferred the statutory claim upon the employers, which was met by the objection that the deceased had left a certain private estate, which negatived the idea of the wife being solely dependent upon his earnings. His Honour reserved his decision; observing that the matter was important. In the second case, action was taken for the recovery of an amount representing the man’s wages for every day after the accident until his return to work. The employers

offered an amount made up at the same rate of wages for every day after the first fortnight; but they raised the objection that the Court had no jurisdiction, inasmuch as the time allowed for the appointment of an arbitrator mutually had not expired. His Honour overruled the objection, upon the ground that, there being no mutual agreement to refer the claim, it was for the Court to deal with it. He gave judgment for the smaller amount tendered by the employer. In the last case, the man met with the accident while searching, after the dinner hour, for the fellow-workman with whom he was doing his appointed work of carrying planks. In the course of his search, he fell down a ship’s hatchway. It was held that the accident did not arise out of the employment, because it was not part of the man’s duty to seek for his mate off the scene of their joint labours. This decision strikes us as being both wise and strong.

### WATER AND SANITARY AFFAIRS.

THE scheme proposed by the Water Committee of the London County Council for dealing with the Water Question in the coming session is now before us. The Committee’s first recommendation is that a Bill should be brought into Parliament for the purchase, by the Council, of the undertakings of the eight Metropolitan Water Companies; the sale to be compulsory, failing agreement. It is also proposed that a Bill (or Bills) shall at the same time be brought forward, by which the Council shall be empowered to bring an additional supply of water to London from the watersheds of the Wye and the Towy. The Usk section is for the present abandoned, and the Council is asked to rescind its resolution of a former date, by which it was decided to take up the Usk portion of the Welsh scheme in the first instance. With this change in view, there is a slight reduction in the estimated cost, which is now put at £16,546,000 for a daily supply of 200 million gallons. What are called “two main facts” are brought forward as justifying the proposals thus framed. It is alleged that one-quarter of the population of London has recently been subjected to a series of water famines by reason of the default of the East London Water Company. A second allegation is that the drought of the present year has reduced the flow of the Thames and the Lea to so low a state as to make it certain that these rivers cannot, in a dry year, yield the supply which the Royal Commission presided over by Lord Balfour of Burleigh relied upon in making their report. Whatever were the calculations of the Commission as to the flow of the Thames, the supply from that source has been found ample to meet the wants of the districts dependent upon it. As for the diminished flow over Teddington Weir, it is not clear that the quantity previously abstracted by the Companies has been duly allowed for. The figures always appear vague; and we suspect that the truth is somewhat disguised—the natural flow being much larger than the statistics suggest. At all events, the supply to the consumer has not failed. There may have been a reduced volume in the stream, for this has been the case with all the rivers in the kingdom, and the canals have been run inconveniently low. Concerning the other “fact” referred to—namely, that of “the default of the East London Water Company”—such “default” as existed is being made good; and the Committee themselves admit that “it is possible, by temporary measures, to satisfy the needs of East London immediately.” The Committee prove the depth of their conviction on this point by proposing that the undertakings of the Water Companies shall be vested in the Council within six months after the Bill has passed (price, of course, being an after-consideration); and that the Council shall forthwith proceed to connect the mains so as to “protect any part of the Metropolis from the want of water.” It is boldly asserted that “if the Council’s Bills of 1895 had become law, there would have been no water famine in East London” in the “present year.” In other words, there was no want of water, but there was the want of an Act of Parliament—one which should unite all the undertakings, and place them in the hands of the County Council. But this union can be effected without the intervention of the Council; the sources of the supply remaining the same.

The terms on which the undertakings of the Water Companies are to be acquired, as set forth in the projected Bill,



are of the same inequitable nature which has characterized former attempts. The arbitration clause, though less openly unjust than it was in its pristine condition, is still a veiled menace. As for the outer areas, the question which they involve is declared to be "naturally one of difficulty," and its ultimate settlement seems altogether remote; everything to remain in the meantime in the hands of the Council, as the party in possession. Into further detail we need not at present enter, as the Bills await the consideration of the Council a week hence. Beyond that, it has yet to be seen what kind of reception Parliament will give to an old friend with a slightly new face. The past can scarcely be said to encourage attempts to enter the sphere appropriated to the Water Companies. In the course of the recent debate in the County Council on the water supply of the Metropolis, it was stated by Dr. White that there had been seven attempts by seven different Governments to deal with the London Water Question, and all had ended in failure. The speaker accounted for the result by the fact that the question had always been made a party one. Certainly it was so in 1880, when it was made to serve as a lever for upsetting the Government of the day; a Select Committee, presided over by Sir William Harcourt, being afterwards able to report against the terms of purchase which had been provisionally arranged by Mr. E. J. Smith, such terms having formed part of the ill-fated Bill then brought forward by Mr. (now Viscount) Cross. Under the present Government, the Metropolitan Water Question again becomes prominent, and a Royal Commission has been appointed to inquire into the subject. Mr. Price-Williams, who was associated with Mr. Smith in working out some of the calculations for the scheme of purchase in 1880, has lately written to "The Times," and looking back, like Dr. White, mentions that the present Royal Commission is really the third of a series. Dwelling on the scheme of 1880, Mr. Price-Williams says that if the Bill had received the sanction of Parliament, and had the undertakings of the Companies been obtained on the terms proposed, the Metropolis by the end of 1892 would have been in possession of the undertakings free from every incumbrance as to deferred payments, and would also have enjoyed the benefit of a credit balance to the extent of £400,000. In short, Mr. Price-Williams contends that the estimates put forth by Mr. Smith have been fully justified by the event. There can be no doubt that the rejection of Mr. Cross's scheme was ill-advised, and was dictated by party spirit rather than by a calm consideration of the facts.

The storm is again brewing in the same fashion, except that party spirit now promotes a measure. The County Council is not disposed to wait for the Royal Commission, but proposes a Water Bill or two of its own in the coming session. As previously intimated, the Council need have two schemes—one for bringing in its pet supply from Wales, and one for settling terms with the Companies. But where are the "negotiations"? As for the Welsh supply, can we really consider its merits to be fully established? Are the rains always abundant on the Welsh mountains? Reports have reached us which show that while the drought prevailed in the Valley of the Thames, there was a very perceptible shrinkage in the rivers and streams of the Principality. River banks which should have been covered were laid bare and dry to an extent unremembered by the present generation. The Welsh supply, if ever it comes, should assuredly be held as "supplementary," for there would be evident danger in relying upon it wholly, especially as other towns intrude on the same area. But the need of going to Wales is open to serious question, if not to absolute denial. At the last sitting of the present Royal Commission, evidence of a very striking character was given by Mr. Reginald Middleton as to the abundance of water obtainable in the neighbourhood of the Metropolis. When the Commission resumes its sittings in the course of the coming month, the case of the Companies will be proceeded with; Mr. Middleton being the first of their witnesses. At this stage of the inquiry, the County Council sees fit to push its own scheme to the front, regardless of what may yet come to light in the proceedings of the Commission. But the evidence to be adduced is not likely to be ignored by Parliament or by the Government. The situation is at the present moment affected in the Council itself by opposition to be apprehended from the Earl of Onslow and the Moderates, directed against the report of the Committee.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 933.)

THE Stock Markets were more depressed last week than they have been for a very long time. The dominating factor was, of course, that which is called "the Fashoda incident." Everybody clings to the hope that war may be averted; but the way out of the difficulty is not very clear if both sides are firmly resolved not to give way. Business has naturally been very limited. There were few buyers about; and sellers had to be content with low prices whenever they pushed realizations. The weakness affected every department right through the list. Another influence to send things down was the condition of the Money Market, which is decidedly stringent. The monetary advance in France and Germany has tightened the pinch here; and the rates, both for short loans and for discount, have hardened considerably. It seems questionable whether the 4 per cent. rate will last till Christmas; but there is no likelihood of its going lower. The Gas Market last week was in an almost inanimate condition, most probably the result of the generally prevailing depression. The business done was of the smallest proportions—only a few transactions day by day just to save the market from absolute stagnation. Only two changes in quotation were made; and though both of them were in the downward direction, yet the general tendency was moderately firm. Each of the changes may be accounted for by special circumstances. Gaslight "A," after being steadily but very moderately dealt in at middle figures, receded a couple of points at the end of the week, when sensational rumours regarding a strike were set in motion. The secured issues were firm. South Metropolitan were quiet, and made no sign. Commercialers were quite stagnant. The Suburban and Provincial group furnished their full proportion of what small business was done; all figures being steady and unchanged. The Continental contingent provided the other instance of a changed quotation, where further realizations of Imperial by those who fancied a safe hedge sent the quotation back five points. All the rest was destitute of any feature calling for remark. Business in Water was at a very low ebb all through the week; and the usually quiet day Saturday transacted pretty well as much as all the balance of the week. There were no changes in Water quotations.

The daily operations were not on a scale which calls for any detailed notice. Imperial Continental was rather freely offered at the opening, and dropped 3. From this point business just marked time, without any changes whatever being effected, until Saturday, when Imperial receded 2 more, and Gaslight "A" was put down 2.

### ELECTRIC LIGHTING MEMORANDA.

Failures of the Electric Light—Is Electric Lighting Suitable for Steamships?  
—The London County Council and Electric Traction—The Cost of Arc Lighting in Edinburgh: A Correction.

It was reported in Friday's newspapers that Brighton was "plunged into partial darkness" the previous night, owing to the failure of the electricity supply from the Corporation works. The incident furnishes another illustration of the continuing weakness of central station electric lighting, of which we cited some striking proofs last week. It is by no means our desire to make too much of this feature of the electric light; and we are quite aware that it will not prevent its extended use where people take to, and can afford it. At the same time, it is a feature that ought not to be overlooked, as will assuredly be the case if the electricians are left to report such occurrences. What we are mainly concerned to keep before the public, as users of artificial lights, is the simple fact that the elaborate and extensive electric light plants of the present day, notwithstanding their cost, are just as likely to fail at an awkward moment as their rough-and-ready prototypes. We remember quite well that when the first Edison incandescent electric lighting installation in this country, at the Crystal Palace, was being "inaugurated" in the usual festive manner, the toast of the evening, "Success to the Electric Light," had to be drunk by the primitive illumination afforded by a few candles procured in a hurry; the electric light itself having incontinently gone out. As it was then, it is still, and apparently ever will be. A peculiarly annoying element of these failures is due to the very favour which electric lighting receives from Local Authorities. When a municipality possess an electric lighting undertaking, they take good care to make the lighting as prominent as possible in the principal thoroughfares, the public buildings, and so on. There is no hiding of this light under a bushel—far from it. The consequence is that when the lamps go out accidentally, all the town knows it, and the maximum inconvenience is suffered.

When reverting to this subject last week, we could not know that another feature of electric lighting closely related to its unreliability would receive so terrible an illustration as was supplied when the "Mohegan" was lost on the Manacles reef. It is unnecessary to repeat here the awful tale of that ship-



wreck, when, for some unimaginable reason, a new liner, making her way down Channel on a dark but clear night, failed to pick up the Lizard lights, and ran ashore at a point twelve miles off her proper course. What is to be noted, however, is the circumstance that one of the first results of the vessel's striking was the going out of every electric light on board. This is a feature of ship lighting by electricity to which renewed attention will be called by the loss of life in the case of the "Mohegan," which was in all probability largely due to the fact of the ship being put in utter darkness at the supreme moment when the life and death of hundreds hung in the balance. For these many years past naval architects have treated the electric light as an indispensable necessary to a ship's equipment. Tier after tier of cabins and state-rooms, reached by means of corridors seemingly meant to reproduce the idea of a "maze," have only been made habitable by electric lighting. One's imagination fails to realize the situation created by such a catastrophe as the sudden extinction of every one of these lights, the instant after the sickening crash of collision or grounding has struck every soul on board with panic fright. How is anybody to find his way out of a great ocean steamship thus turned in a moment from an epitome of modern luxurious civilization into a darkened death-trap? The difficulty is to see how the evil is to be dealt with. Yet it seems impossible that ships can be permitted to go to sea with a lighting equipment which, however convenient so long as all goes well, is certain to fail in, and increase immeasurably the horror of, such a disaster as that which lately occurred to the ill-fated "Mohegan."

A week or so ago we discussed in this column the desire of the London United Tramways Company to obtain the consent of the County Council to an extension of the trolley-wire system of electric traction into the West Metropolitan district. It has now been decided by the Council to consent to application being made by the Company to the Board of Trade for power to introduce this system for the London terminal of one line of tramway, on condition that the Company do also, and on the same terms, introduce electric traction upon some underground system for the terminals of two other lines of tramway. The matter has naturally given the Highways Committee of the County Council a great deal of trouble; and one immediate result of the consideration of the subject by this Committee has been to strongly divide the members. It remains to be seen whether the Tramways Company will accept the conditional consent of the Council; but there is no other hope of the Council tolerating the trolley-wire system, even as an experiment. The Council are being urged from within and without to waive their objection to the overhead trolley-wire system. Examples of the successful use of the system are heaped upon them, so to speak; and over and above all they are conscious of the crying need for improving the tramway service in the suburbs. There is incessant clamour for "something to be done;" and against all this pressure the Council have only been able to raise the objection that the overhead trolley wire is a nuisance more than sufficiently serious to outweigh the possible advantages of electrical traction by this system. The opposition to the system is concentrated in the person of Mr. J. W. Benn, the Chairman of the Highways Committee, who cannot bring himself to see why London should put up with a system admitted to be imperfect, and at the very best only suitable for the outlying districts of the Metropolitan area. In the course of a few years, all the London tramways will come under the control of the Council, and the service will need to be largely extended, to relieve the congested central areas of the town. But it is from these central areas that the overhead trolley-wire system must be excluded; and Mr. Benn thinks that to permit it anywhere will operate as a bar to the introduction of a better system such as London could safely adopt. It is urged by some that electrical traction for tramways means the overhead trolley-wire system—there being no alternative. This is denied by Mr. J. Allen Barker, among others. Mr. Barker has made a report on the whole subject, which has been printed for the Council. We shall find another opportunity for doing justice to Mr. Barker's labours; but meanwhile it may be stated that he declares the choice between the overhead wire and underground conduit systems of distributing the electric power to be a question of relative expense only. If this is so, it is astonishing that our electrical contemporaries should recommend, as they do, the adoption of such a half-measure as the former system for London. We regard Mr. Benn's position as a strong one, and think the recent decision of the County Council eminently wise. The best of everything is not too good for London.

Referring to the statement in these "Memoranda" last week as to the cost of electric arc lighting in Edinburgh, a correspondent writes to point out that every alternate lamp is extinguished at 11:30 p.m., and consequently only burns half-time. If allowance were made for this ingenious way of economizing light by not using it, the cost of Edinburgh arc lighting would come out at £18 13s. 4d. per lamp per annum.

**Gas-Engines for Driving Dynamos.**—Gas-engines are to be used for driving the dynamos on the electric lighting plant at King's Lynn, for which Professor Henry Robinson is the Engineer. There will be five engines, each of 100-horse power, using producer gas as the working agent.

#### A FIFTY-TWO-AND-A-HALF HOURS WEEK.

AN announcement of the very highest importance was published in last week's "JOURNAL," in the letter of Mr. George Livesey headed "Extension of Workmen's Breakfast Time." It is not too much to say that the matter of this communication is of much greater interest for a large proportion of the working population of this country than the whole body of so-called "Labour" politics usually debated at Trade Union Congresses. Mr. Livesey states that four months ago the Directors of the South Metropolitan Gas Company decided, upon his suggestion, "to increase the breakfast time for all yard labourers and mechanics, and all other men except those engaged in the retort-houses, from half to three-quarters of an hour, of course, without reduction of pay." He is now able to report that he has "never known any concession to workmen give so much satisfaction." The assertion can easily be credited. Mr. Livesey remarked that he blames himself for never having thought before of the insufficiency of the traditional breakfast half hour to enable workmen to get a comfortable meal. In this expression of contrition, there is only the common human impulse of regret that a proved good thing has not been longer known. It is additional evidence of the strength of Mr. Livesey's conviction that an increased breakfast interval really meets a workman's need, and is one of those rarest of novelties—an unmixed good for all parties concerned. Like the "quality of mercy" described by the Poet of all Humanity, this boon is "twice blessed—it blesteth him that gives, and him that takes." We should be lacking in our duty to the gas industry and those who live by it, did we fail to give all possible prominence and publicity to this gracious act of the great Gas Engineer and true friend of labour who has already done so much for the working men of England. If Mr. Livesey had desired to make capital for himself out of the grant of this free gift to the South Metropolitan workmen, he would have brought the intimation before the general public as a communication to "The Times," or in an "inspired" paragraph transmitted through "the round of the newspapers." Nowadays, when so many people have brought the gentle art of self-advertisement to such perfection, it smacks of the manners of an older, more reticent Age to hear that an industrial reform of the first magnitude has been introduced without a flourish of trumpets in somebody's honour. Mr. Livesey, however, does not feel the temptation to pose on the pedestal of the popular press whenever he has done a wise and good deed. In the present instance, he communicates the fact through the channel by which he knows it will reach the special public for whose opinion he has a particular regard. We shall probably interpret his action in this respect most pointedly by suggesting that he would desire gas workers generally to be the first of British artisans to receive, by free gift from their employers and masters, this boon of a comfortable breakfast interval.

It is a great cause, and presents a fine opportunity which we hope gas managers throughout the United Kingdom will not be slow to make use of in the best interests both of capital and labour. If a National Party could win honour and power by virtue of adhesion to the cause of "A Free Breakfast-Table," surely employers of labour may attach a great deal of importance to the corollary of a reasonable allowance of time for the meal. It is one of those considerations which to the thoughtless appear to be trifles, but which the wise know to possess vast practical importance. A man of books and papers, an arm-chair philosopher, or a political economist of the college—a doctrinaire politician, or a journalist who never practised a handicraft, might fail to recognize the immense interest to workmen of the times allowed for meals. Nobody who has the very smallest personal acquaintance with the work-a-day world and the industrial population can underrate the importance of the subject. Not to labour the point, it is quite superfluous to seek proof for the conclusion that the extension of the breakfast interval from a half to three-quarters of an hour is to be esteemed as one of the most practical industrial reforms to be credited to the closing years of the century. It is obviously the first large concession that labour has received from the employer since the institution of the week of 54 hours. Henceforward the normal working week will be of 52½ hours.

The alteration will be noteworthy on several accounts. In the first place, it takes effect in the manner most closely touching the workman's personal and family rule of life. Thus it is clearly altogether different from a shortening of the working day at either end, by a later start or knocking off earlier. To shorten the working day by a quarter of an hour in either of these respects would be an unmitigated loss of so much productive time to the employer; while it may be doubted whether it would benefit the workmen in the smallest appreciable degree. By the actual way of it, as Mr. Livesey shows, the employer does not lose the whole time; while the workman gets it just when it does him and his family most good.

Secondly, the concession comes without asking (from the originators, at any rate), and is not influenced by Trade Union agitation, political clamour, or any other consideration besides that of the benefit derivable by both parties. For it would be folly to commend it as an act of philanthropy. If it were merely this, it would remain an isolated feature of a particular employment; whereas it is to be recommended for general



adoption as a paying thing to do. It assists the workman, and is directly by way of rendering him a more comfortable, healthy, and efficient man. What Mr. Livesey can afford to do for the South Metropolitan workmen, can be done everywhere. It is, moreover, on the one hand a clear-cut, plain, and simple point of industrial economy such as every works manager can reason out for himself; and it is, on the other, a boon which the most captious workman must appreciate, even though he appear to be thankless. At all events, if the most cantankerous "sea lawyer" of them all will not thank his employer for the addition to his ease, he will not be required to thank anybody else than Mr. Livesey for originating the idea. Unlike the much-discussed Eight-Hour Day, there is no *pseudo*-physiology or sheer fancifulness about this reform. Nobody has taken it up, or made a "cry" of it, so that the practice stands upon its own merits, which are obvious.

It may be objected that the Eight-Hour Day, or forty-eight hour week, is equally confessed to be a paying system by some employers, so that if the experience of one is to govern the rest, the A.S.E. ought not to have come to grief over their attempt to impose this as the rule for the London district. It should hardly be necessary to argue that the two things are wholly different. There is such a mass of contradictory and irrelevant contention surrounding the central idea of the Eight-Hour Day, that it is almost impossible for a man of business, who does not wish to have anything to do with politicians in business matters, to know what to believe about it. Such a person is confronted at the outset with the irreconcilability of the two grounds upon which the case for an eight-hour day is based by the labour agitators who clamoured for it, and the few employers who have adopted it. The former argued for an eight-hour legal day as a means of absorbing the unemployed; for the reason that it would necessitate the engagement of more men to do a certain amount of work. They made no fetish of this particular length of the working day, but declared that if it did not turn out to their satisfaction as an absorbent of disposable labour, they would proceed to agitate for a seven or a five hour legal day, until the *desideratum* was achieved. When it came to pressing the point upon employers, however, this argument was left out; and it was contended that men would be found to do as much in eight hours as in nine. Physiology was invoked to show that nobody ought to work longer hours; and the claims of the workman to more leisure, to be devoted to the means of self-improvement and the higher culture, were pushed for all they were worth—from the political point of view. Those employers who adopted the system, and have found it to answer, justify themselves on the second ground of the foregoing category—that their men actually do as much in the week under the system; or that it answers their purpose in some other way.

The question raised by the last observation, as to what system of working is most expedient in the interest of the workman, or the master, or of both, is a very wide and deep one, not to be answered by referring to a particular employment, or any single industry. It goes so deeply into the very foundations of industrial and general society, that different nations and communities may be expected to supply different answers to it. Practically, the choice in England between the eight-hour day and the day of nine or more hours, resolves itself into a question of working some time before breakfast, or of having breakfast before getting to work. On the continent of Europe, and in America, the case is different. Widely divergent as the Continental and American social divisions of the day are in some respects, they agree in starting work at 7 a.m., and going on without a break until noon. Re-starting at 1 o'clock, they would go on until 6 p.m.—thus making the ten-hour day, which is the minimum. Sometimes work is started earlier, and ends later. The British workman has been bred to a different order of the day. Starting at 6 a.m., he works a "quarter" before breakfast, for which meal he has invariably been allowed half an hour. Bricklayers and navvies begin their dinner hour at 12, mechanics at 1 o'clock. Working 9½ hours for five days of the week, they all get done by their respective dinner times on Saturday—thus making a 54-hour week. If the eight-hour day is substituted, this means the abolition of the breakfast interval. From the employers' point of view, this is not altogether a bad idea. They say that men coming in "cold, sleepy, and hungry" at 6 o'clock only work in a half-hearted way until breakfast time, in anticipation of which they begin to get ready to go out ten minutes or so before the bell rings. The influence shows itself patently in the case of piece-workers by hand, who are prone to lose the first "quarter," and make up afterwards for lost time. Attention has been recently drawn once more to this aspect of the question by the reported experience of Messrs. Short Brothers, of Pallion. This firm of shipbuilders and engineers adopted the eight-hour day seven years ago, chiefly owing to the difficulty of getting the men in for the first "quarter;" and they have found that under the new system the actual time worked per man per annum is more than with the old system—the output of the works being correspondingly improved. Here is an example which may be employed to illustrate the bearings of the whole question. It certainly does not completely answer it in any sense.

The hour of starting work is chiefly a matter of habit, when it is not a matter of climate or of race, and of social or industrial necessity. Where the man lives near his job, it is no hardship in the English climate for him to turn out and do a good spell of work before breakfast. No healthy, able-bodied man of sober

habits is either cold, sleepy, or hungry at 6 o'clock in the morning. Having done his "quarter"—as smartly as any other spell for the day—he is ready for his breakfast. Meanwhile, the wife has had time to prepare the meal; and the children are also ready for breakfast and school. The workman and his family can partake of the first meal of the day together. Supposing the workman to be so circumstanced as to have to travel to his work by rail or tramcar. A regular service is provided, landing him on his job betimes. Again, after working his "quarter," he has the breakfast interval for his first meal, to be partaken of in company with his mates; the family being left at home. Where is the benefit of requiring the man to take his breakfast before starting work (say) at 7 a.m., with the certainty of getting no interval before noon, or later? If the home is near the job, the hour is too early for the wife and children to have their breakfast. If the job has to be reached by rail or tram, in all probability the man has to start just, or very nearly, as early as if his work began at 6; and he must snatch a "bite" before leaving home—which is too soon—or after he arrives, when there is no convenience for it. The whole thing is out of joint.

Therefore, every consideration points to the advantage of the South Metropolitan reform. The strike in the engineering trade would have been stopped amid a chorus of self-gratulation on the part of the agitators if the employers had offered such a concession to the forces of revolt. Indeed, the members of the A.S.E. were actually balloted once, to ascertain whether they would return to work upon this system, although the Federated Employers had previously declined to countenance any disturbance of the working hours. Things are different now; and in the present state of most trades a concession of the character of that which forms the subject of this article could generally be spared, and would be an unmixed good to the recipients.

#### THE GAS ACTS OF 1898.

(Concluded from p. 864)

The following Acts obtained last session by Local Authorities already possessing gas undertakings contain clauses referring to gas supply:—

The Coventry Corporation Gas Act extends the limits of supply to include the parish of Exhall. Additional gas lands are to be acquired compulsorily within three years. Certain footpaths are to be stopped up, and others substituted for them. Power is taken to construct railway sidings and canal lay-byes. Gas of 15-candle power is to be supplied, tested on the works. The period of error in consumers' defective meters is limited to the last preceding quarter. The price of gas in the parish of Foleshill is to be the same as that charged within the city. Certain provisions for the protection of the London and North-Western Railway Company are inserted. A new gas loan of £250,000 is authorized, repayable in forty years. It is provided that the repayment may be either by equal yearly or half-yearly instalments of principal, or of principal and interest combined, or by means of a sinking fund. In the latter case, the sinking fund may be formed by equal annual payments throughout the prescribed period altogether amounting to the capital sum. This is called a non-accumulating sinking fund. Or there may be paid to the fund throughout the prescribed period such equal annual sums as, with the accumulation of interest at a rate not exceeding 3 per cent., will make up the required amount. This is called an accumulating sinking fund. All sinking fund payments, and the interest thereon, unless applied in repayment of the loan, are to be immediately invested in authorized trust securities, or in municipal securities (not being annuity certificates or securities payable to bearer) duly issued by any other Corporation in Great Britain. It is provided that a reserve fund equal to one-fifth of the aggregate capital expenditure upon the undertaking may be formed out of the gas profits.

The Edinburgh and Leith Corporations Gas Act authorizes the Gas Commissioners to acquire new gas lands and erect works at Granton, to be completed within twelve years. An additional gas loan of £400,000 is sanctioned. The Commissioners may borrow money temporarily from their own sinking funds. Gas-fittings in any new house or building are made subject to inspection on behalf of the Commissioners, who have an absolute power of discretion as to refusing a supply of gas where the fittings are not to their reasonable satisfaction. Tenants of houses are made responsible for the gas-rental of a sub-tenant for any period not exceeding two months.

The Halifax Corporation Act contains a part relating to gas. Additional gas lands are sanctioned. Power of inspecting new internal gas-fittings is given. A new gas loan of £150,000 is to be raised, repayable in forty years. The financial clauses are similar to those in the Coventry Act.

The Ilkeston Corporation Act sanctions the supply and fixing of gas-fittings by the Corporation, and enacts other miscellaneous provisions now commonly found in modern Gas Acts. The sum of £5000 may be borrowed for gas purposes, repayable in thirty years. The accounts relating to the Corporation gas and water undertakings are to be separated.

The Middlesbrough Corporation Gas Act enables the Corporation to acquire additional gas lands, stopping up a street at the same time. Power is given to exchange certain lands. A new gas loan of £150,000 is authorized. Gas of 15-candle power



is to be supplied. Proceedings for the recovery of any demand not exceeding £50 may be taken in the County Court.

The St. Helens Corporation Act contains a part relating to gas. Power is given for the establishment of a gas reserve fund amounting to £25,000. The Corporation may make bye-laws as to gas service-pipes and fittings. Provisions are made with respect to Corporation employees' superannuation.

#### THE WATER ACTS OF 1898.

The following Acts of Parliament relating to water supply were passed during the last session:—

The Clacton-on-Sea Gas and Water Act incorporates a Company for the purpose of supplying Water in the urban district of Clacton, Essex. Existing water-works, the property of a Limited Company, are to be utilized; and extensions are authorized, including a well and pumping-station to be situated in the parish of Great Bentley. Upon the construction of this work, the Tendring Rural District Council may demand a supply of water in bulk, to be paid for at the rate of 1s. per 1000 gallons. The powers of the Company for the compulsory purchase of land are to cease after the expiration of five years. Rates for domestic supplies are set out in detail, with  $5\frac{1}{2}$  per cent. as the minimum charge for premises of £100 a year gross estimated rental and upwards. Water may be supplied by measure for other than domestic purposes. A part of the Act provides for the transfer of the undertaking to the Urban District Council, in accordance with the terms of a scheduled agreement. The money to be borrowed for this purpose is repayable in sixty years.

The Crawley and District Water Act incorporates a Company for the purpose of supplying water to a district of Sussex at present inadequately served in this respect. The capital of the Company is £30,000, with the usual proportion of loan. The Act is to be carried into effect within four years. The authorized works comprise a well and pumping-station to be situated in Ifield parish, to be completed within five years. The rate for domestic supplies is to be  $7\frac{1}{2}$  per cent. on the rateable value. Half-rates are leviable upon empty houses. A high-level service is to be chargeable with 25 per cent. extra; and all inns are to be charged 9 per cent. Prices are stated for other than domestic supplies. The charges for public institutions may be settled by arbitration.

The Mid-Kent Water Act dissolves and re-incorporates with statutory powers a Company formed in 1888 for the purpose of supplying water in a certain part of Kent. The Company's powers are to expire in six years unless effectively exercised. The capital of the Company is £120,000, whereof £33,000 is the original capital, and upon this the Company may borrow £8000, and the usual proportion of the additional capital. The works authorized to be carried out comprise a well and pumping-station in the parish of Halling, and a reservoir in the parish of Birling. The Company are not to interfere with the Tottington spring, in Aylesford parish. Clauses are inserted for the protection of the Maidstone Rural District Council. The works are to be completed within five years. The Maidstone Water-Works Company are protected. Rates for domestic supplies range from  $7\frac{1}{2}$  to 6 per cent. upon the rateable value. Water may be supplied by meter, at a minimum charge of £4 per annum. Portions of the South Kent Water Act, 1889, are repealed.

The Newhaven and Seaford Water Act dissolves and re-incorporates a Limited Company, who have obtained several Provisional Orders. The capital of the statutory Company is £50,000, whereof £30,000 is original capital, to be converted into stock. The borrowing powers are as usual. New water-works are authorized. Consumers' meters and fittings that have been unused for 48 hours may be removed. In the event of the undertaking being purchased by the Urban District Councils of Newhaven and Seaford, the price is not to be enhanced by the fact of the passing of the Act.

The North Warwickshire Water Act incorporates a Company for the supply of water to the parish of Foleshill and the neighbourhood. The Act must be carried out within eighteen months for a portion of the district, and three years for the remainder. The Corporation of Coventry are protected by the grant of purchasing powers, to be exercised only in the event of the city boundaries being enlarged to include part of the Company's district. The capital of the Company is £36,000, with the usual borrowing powers. The water-works comprise a well and pumping-station in the parish of Corley, and another in the parish of Keresley. The works are to be completed within seven years. Domestic rates range from 8 to 7 per cent., with 9 per cent. for inns. Owners of three or more houses may compound at a discount of 10 per cent. Water-rates for property held on weekly or monthly tenancy are payable by the owner.

The Rhymney and Aber Valleys Gas and Water Act incorporates a Company with £200,000 of water capital and the usual borrowing powers. The undertaking of the Rhymney Valley Gas and Water Company is to be acquired; as is also the water undertaking of the Rhymney Iron Company. An agreement for the purchase of the Caerphilly Gaslight and Coke and Water-Works Company is confirmed. The Company have the option of purchasing the undertaking of the New Tredegar Gas and Water Company, Limited. Additional water-works are authorized, including a new reservoir in the parish of Gelligaer, to be formed by impounding the Nant Pittgwellt Brook.

The water of the Rhymney River may also be taken when the flow exceeds 25,000 gallons per day, subject to compensation. The works are to be completed within seven years. Rates for domestic supplies are to range from 10 to 7 per cent. on the rateable value. Water supplied for domestic purposes is not to be used as a source of power. Meter supplies are to be chargeable at the rate of 1s. 6d. per 1000 gallons. Agreements with several Local Authorities are scheduled and confirmed. The period limited by the Rhymney Valley Gas and Water Act, 1892, for the construction and completion of the water-works thereby authorized, as extended by an Act of 1897, is further extended for a period of two years.

The Sheringham Gas and Water Act incorporates a Company already established for the supply of water in the parishes of Sheringham and Beeston Regis, in Norfolk. The capital of the Company includes £6000 original water stock, and £12,000 additional water stock, with the usual borrowing powers.

The Wey Valley, Frimley, and Farnham Water Act incorporates a Company with a capital of £30,000 and the usual borrowing powers. The water-works include wells and pumping-stations in the parishes of Crondall and Frensham. The Company are not to take without the consent of the Conservators any water that might find its way into the River Thames. Various other interests are protected. The works are to be completed within five years. Rates for domestic supplies range from 9 to 6 per cent. upon the rateable value. Charges for public institutions are to be settled by a County Court Judge. Fittings may be removed from houses unoccupied for three months. The limits of supply by the Frimley Company are extended, and the capital of the Company is increased by £15,000. Certain proceedings of the Company are legalized. The limits of supply of the Farnham Company are enlarged; and the capital of the Company is increased by £5000. Certain agreements between different Companies in the district are authorized.

#### PERSONAL.

Mr. A. T. OSMAN, of Oxford, son of the Manager of the Wimborne Minster Gas-Works, has been appointed foreman of the Distributing Department of the Torquay Gas Company, applications for which position were invited in the "JOURNAL" for the 13th ult.

A short time ago the German Emperor sent, through the German Ambassador in Copenhagen, to Mr. F. D. MARSHALL, Engineer of the Danish Gas Company, a signed photograph of himself, accompanied by a letter asking Mr. Marshall to accept the photograph in memory of pleasant times spent at Kiel together.

The Committee of the Royal Scottish Society of Arts recommend that Keith complimentary silver medals should be presented to Professor W. IVISON MACADAM, of Edinburgh, for a communication on "Carburetted Water Gas," and also to Mr. D. BRUCE PEEBLES, of Tay Works, Edinburgh, for a communication entitled "Acetylene Gas, and a Simple Generator for its Production."

#### OBITUARY.

Mr. C. PALMER, who was for many years Chairman of the Swaffham Water Company, has just died at the advanced age of 92.

We regret to announce the death, last Wednesday, at Cromartie House, Ventnor, of Mr. JOHN GILLET LIVESAY, A.R.I.B.A. In 1858, Mr. Livesay's father acquired the Ventnor Gas and Water Works. It was then that he came prominently before the town; and after the present Company was formed, he was appointed Secretary. In 1866, he became Surveyor to the newly-formed Local Board; and the general system of sewerage was carried out under his superintendence. Early in the seventies, however, he relinquished the position. For upwards of twenty years he had been a Director of the Company; and he was on the Board of several other companies, local and otherwise. In former years he had a large practice as an architect and surveyor. Deceased was in his 59th year; and his death was the result of a long illness.

**Midland Association of Gas Managers.**—The autumn general meeting of this Association will be held next Thursday, at the Grand Hotel, Birmingham, under the presidency of Mr. J. T. Lewis, of Wellingborough. We learn from the programme issued by the Hon. Secretary (Mr. C. Meiklejohn, of Rugby) that Mr. W. S. McGregor will read a paper describing the reconstruction of the gas-works of the Longton Corporation, which, as recorded in another part of the "JOURNAL," has been carried out under his supervision. In the afternoon, brakes will be in waiting to convey the members to the Saltley Gas-Works, where, by the kind permission of the Gas Committee of the Corporation of Birmingham, they will have the opportunity of inspecting the important extensions completed and in course of construction, to the designs of Mr. Hack, the Engineer. He will receive the members at Saltley, and conduct them over the works, described in the "JOURNAL" last week. After the inspection, light refreshments will be provided by Mr. Hack.



## NOTES.

**Effect of Carbon Dioxide on the Flame of Acetylene Gas.**

At the recent meeting of the British Association, Professor Emerson Reynolds performed an interesting experiment illustrating the effect on an acetylene flame of varying proportions of carbon dioxide in the gas. It was the result of a chance observation by Mr. Goodwin, who conducted a series of tests in Philadelphia on the enrichment value of acetylene when added to ordinary coal gas. He stated that expired air when mixed with acetylene appeared to increase the luminosity of the flame, and also to decrease the tendency to deposit carbon in the burners. More careful study, however, had shown that from 5 to 8 per cent. of carbon dioxide in the gas decreased the smokiness of the flame, and especially prevented the clogging of the burners. The increase in illuminating power was certainly not marked; but the mixture containing 5 per cent. of carbon dioxide gave as much light as the acetylene itself, and therefore there was a gain to this extent per volume of acetylene burned. The action of the carbon dioxide was regarded as probably due to its exerting some oxidizing effect.

**Creosote still the Best Timber Preservative.**

In a paper read by Mr. Charles H. Snow before the American Society of Engineers, various methods of protecting wooden piles from marine boring animals were described and criticized. Paints, verdegis, paraffin, tar, asphalt, and other exterior coatings have been used with this object; but it is usually difficult to retain such coatings in position. The conclusion drawn by the author is that of all the substances and devices suggested as substitutes for creosote, none can really compare with it. Creosote still supplies the best means for repelling the attacks of the teredo, limnoria, and other sea animals, and also the termite and other land woodborers. It is observed that the word creosote has not an absolutely exact definition. The substance has no chemical symbol, and it designates a fluid the constituents of which constantly differ. It is essential that creosote should be heavier than water, as light creosotes have never been satisfactory, and most of the failures attributed to creosote have really been due to the use of such oils. Creosote is expected to act in two ways. It introduces antiseptics into the wood; and also fills the pores with thick, gummy insoluble oils and naphthalene. The United States cannot meet the demand for dead oil of coal tar, and a large quantity is imported from England. The so-called "London oil" is very thick and heavy, and is regarded as one of the best grades of creosote for marine work. After procuring the proper grade of creosote, the next condition of success is the thorough application of it in sufficient quantity, and the selection of a suitable kind of wood.

**Slag Fire-Bricks.**

According to a recently issued German report, slag bricks possess important advantages for high temperature work. At first bricks were made in Germany from solid slag; but these did not prove satisfactory, being of the physical nature of glass. It was recognized that a certain degree of permeability is desirable in a brick; and accordingly slag bricks are now manufactured from slag that has been granulated in water. The granulated material is made binding by the addition of lime, with which ground slag is mixed when a specially dense and strong brick is desired. Slag bricks are not burnt in the process of manufacture; being simply moulded and hardened by drying. They are about as strong as common bricks. The resistance of slag bricks to high temperatures is stated to be quite remarkable. Heated to a pale red, when the carbonate of lime begins to decompose, the strength of the brick is not impaired. Even if a part of the lime should be burnt to the caustic state at such a high temperature, carbonic acid is again absorbed at a lower temperature and the brick becomes as strong as before. In testing whether slag bricks have dried and hardened sufficiently for use, a small sample tied to a string is dipped into a cold, concentrated solution of sulphate of soda, and hung up in the dry. By the evaporation of the water of the solution and the crystallization of soda, which in its action resembles the formation of ice, those samples of brick which would not be weather-proof are destroyed. Not merely slag bricks, but any other can be tested for frost-resisting quality in the same way. The slag bricks should be very cheap.

**Railway Carriage Lighting by Acetylene Gas.**

Acetylene gas for railway carriage lighting has been in use for some time on the Pontiac Pacific Junction Railway in Canada. In answer to a request by Colonel J. H. Western, the Inspecting Engineer of the Egyptian Government Railways, for some information concerning the use of this gas, Mr. P. W. Resseman, the General Superintendent of the former railway, states that he has used it for nine months, and that there is really no comparison between the effectiveness of acetylene gas and coal oil for car lighting. With coal oil at 14c. per gallon, and carbide at 5c. per pound, the cost of acetylene gas for car lighting is somewhat less than the same lighting by coal oil. In Canada, however, owing to the severe frost in winter, they have to place the generators inside the cars to prevent them from freezing. The disadvantage of this lies in the fact that acetylene gas is most difficult to control, and the slightest leak in the generator causes a disagreeable smell in the car. It is

found that an ordinary passenger coach, previously lighted by fourteen coal oil burners, can be brilliantly lighted with five 25-candle power acetylene burners, consuming each  $\frac{1}{2}$  cubic foot per hour. The carbide supplies 5 cubic feet of gas per pound; making the total cost of the lights 2c. per hour, or for a run of four hours 20c. to 21c. per car. The gas is generated in small quantities, confined beneath a 7-inch column of water; and any that may escape is so speedily diffused in the surrounding atmosphere that its explosive nature is at once neutralized. In the event of a car turning over, the lights go out immediately; and the gas escapes so quickly that fire cannot affect it.

**A Large Steam Heating and Ventilating Plant.**

One of the largest steam heating and ventilating plants in existence is reported to be that recently installed for the new buildings of the Colombia University. The whole of these structures are provided with a sufficiency of direct steam radiators to overcome the loss of heat through walls, windows, and roofs; and the fresh air required for ventilation is blown over stacks of heating pipes. Everything is calculated upon the customary American standard of heating efficiency—the maintenance of an indoor temperature of 70° Fahr. when the thermometer is at zero outside. The University buildings have a total content of about 9,700,000 cubic feet; the heating surface of the direct steam radiators amounts to 56,000 square feet; and the ventilating system is designed to furnish about 50,000,000 cubic feet of warmed air per hour. When the outside air is at zero, the steam consumption of the whole plant is computed to be as follows: Condensation in the direct-heating radiators, 560-horse power; condensation in the air-heating stacks in connection with the blowers, 2205-horse power; power required for driving the electric motors for the fans, 635-horse power. Thus it appears that to warm and distribute the fresh air for ventilation takes about six times as much fuel as is required to simply maintain the inside temperature of the buildings. Mr. G. A. Suter designed the plant, and calculated the dimensions from the following data determined by experience. One-horse power of steam serves 100 square feet of direct radiating surface. One-horse power of steam in air-warming pipes heats 20,000 cubic feet of air from zero to 70° Fahr. One-horse power on the shaft of an electric motor driving a blower will move 75,000 cubic feet of air in and out of the rooms. All the exhaust steam of the engines is utilized in the service.

**TECHNICAL RECORD.****THE DEVELOPMENT AND EXTENSION OF THE LEEDS GAS UNDERTAKING.**

One of the most interesting studies in the development of a municipal gas undertaking is furnished by that at Leeds. Of all the boroughs in the country, there is not one, within our knowledge, in which municipal action has been governed so much by party feeling as in that city. In the counsels of the Gas Committee it was at one time the dominant factor; and it had a serious and detrimental influence on the gas undertaking. But about three years ago, there was a change in administration; the Conservative party becoming the ascendant power. Then a Gas Committee, constituted of both parties, was formed, the members of which showed their wisdom by determining at the outset to sink all party differences in working for the retrieval of the fortunes of the undertaking of which they were given charge. The result of their enlightened policy is shown by the present financial position and productive strength of the concern. At the head of this Committee is Mr. Joseph Lowden; his deputy is Alderman Matthew Walker; among the members is the Lord Mayor (Alderman C. F. Tetley); and the General Manager of the department is Mr. R. H. Townsley. Then the General Committee (consisting of twenty-one members) is divided into five Sub-Committees. There is the Audit, Meters, and Mains Committee, of which Alderman Walker is the Chairman; the Meadow Lane Works Committee, with Mr. Francis Ambler as Chairman; the New Wortley Works Committee, with Mr. Philip Heaton as Chairman; the York Street Works Committee, with Dr. B. G. Heald as Chairman; and the Workshops Committee, with Mr. Henry Scholefield as Chairman. On Monday of last week, we were afforded an opportunity of inspecting the work which these gentlemen and their colleagues have accomplished in developing the undertaking and business; and we feel assured that, from the Chairman down to the lowest official of the department, one and all are animated by a fervent desire to do all they can to promote the best interests of the ratepayers. They have had a difficult task before them; and they have faced it boldly.

**THE BENEFICIAL RESULTS OF THE COMMITTEE'S LABOURS.**

Before describing what has been done in the way of improving and extending the works, it may be interesting to call attention to the benefits which have ensued from the reformation of the department. We must not omit to state that in this reformation not by any means the least important change has been the adoption of a superior system of management to that which existed for several years after Mr. Henry Woodall severed his connection with the undertaking. Now there is a competent Manager



at each station, with a central authority, as already stated, in the person of Mr. Townsley. The Station Managers are: Mr. George Tooley, Meadow Lane; Mr. John Bond, New Wortley; and Mr. W. E. Pettigrew, York Street. To proceed, nothing more than the following figures can be required to prove the wisdom of the policy inaugurated by the present administration, and which policy, if not interrupted by a change in the supremacy of parties, should lead to even better results. We are informed that the surplus profits for the year ending March, 1895, were £33,718; 1896, £26,493; 1897, £71,333; and 1898, £12,232. The last two years show a considerable fall; but this is easily accounted for. In the first place, the price of gas since then has been reduced by 2d. per 1000 cubic feet; and as 1d. reduction represents a gift to the consumers of £10,500, the 2d. is equal to £21,000. Then meter-rents have been abolished; and this reduced the revenue of the department by about £12,000 per annum. In addition, £27,000 has been handed over to the borough fund in aid of the rates. Crowning all this is a particularly pleasing feature—that in March last the Committee possessed a reserve fund amounting to £31,258; while, when they took office, there was an accumulated deficit of something like £33,000. Another reduction of 2d. per 1000 cubic feet (representing a further £21,000 for the consumers) will come into force on Jan. 1 next; and the price will then be 2s., less 5 per cent. discount, if the account is paid within one month of delivery, or 2½ per cent. if paid within the second month after delivery. Taking into consideration that there is no charge for meter-rents, the discount, and the quality of the gas (above 18 candles), the consumers have certainly nothing to complain of in respect of this price; and when production is cheapened by the introduction of additional improved plant, the charge will in all probability be further lessened. In the out-districts the price is also to be reduced by 2d. to 2s. 6d.; but the difference of 6d. causes some little dissatisfaction to the outside consumers. When, however, it is pointed out that the amount of gas sold outside the city boundary is only ¼ per cent. of the total consumption, or in all about 6 millions a year, it will be seen that the difference is not an unfair one. The introduction of prepayment meters by the Committee has also been very successful; and their use has greatly extended since they were supplied in conjunction with penny-in-the-slot cookers, of which within the last few months 300 have been fixed. The Committee furnish and fit the cookers free, and give 30 cubic feet of gas for a penny; but for lighting purposes 33 cubic feet are supplied.

By way of further showing the progress of the department, it may be pointed out that the quantity of gas manufactured in the year ended June 30 last was 2,849,233,000 cubic feet, as compared with 2,411,931,000 cubic feet in 1891; while the quantity sold was 2,530,952,500 cubic feet, as against 2,102,319,500 cubic feet. Still the increase is continuing at a remarkable rate. In July last, there was an increase of 6 per cent. in the quantity of gas made compared with the corresponding month of last year; in August, 14½ per cent.; and in September, 10 per cent. This is extraordinary considering the warm, bright weather experienced during those months. The quantity of gas sold per ton during the six months ending July was greater by 500 feet than at any other time in the history of the undertaking. All these figures speak volumes for the efficiency of the present management. Other figures for the year are also interesting. The quantity of cannel and coal used was 281,200 tons; the total number of meters in use was 89,214, as compared with 58,700 in 1871; 67,400 in 1881, and 82,195 in 1891; the number of prepayment meters was 3200; gas-engines, 805; gas-stoves, 2889, as against 1105 in 1891; and the length of gas-mains was 772 miles, as against 700 in 1891. The lighting area of the city is about 13 square miles. The distribution system covers one of the most extensive areas, if not the most extensive, of any undertaking outside London; and the mains run into some very straggling districts. The leakage is about 9 per cent., which, considering the nature of the district, is not regarded as excessive. The present capacity of the whole of the Corporation Gas-Works (including the additions) is about 17½ million cubic feet per day, or 2¼ millions more than in 1891.

In addition to the uphill work which the Committee have had to face in connection with their work of reformation, they have had to keep a watchful eye on the illuminating power and quality of the gas—it being subjected to a most rigorous system of testing. The gas is tested both at the works and gasholder stations (situated 2 or 3 miles from the works) by the Magistrates' Inspector, without restriction as to hours. It is also tested by the City Analyst in the centre of the town; and by the Chemists of the Gas Department, who are entirely independent of the Station Managers. The standard illuminating power is 18 candles; and the average return for the year ended June 30 last was 18.25 candles. The sulphur impurity in the gas has been reduced from 16.36 grains per 100 cubic feet in 1891 to 14.85 grains per 100 cubic feet in the year 1897-8. The satisfaction which the Gas Committee are giving the Gas Justices in respect to the quality of the gas is shown by a letter which Mr. Lowden received from the Chairman of that body (Mr. Spark) on Monday of last week. He stated that the Justices were pleased with the manner in which the Committee were maintaining the quality of the gas, and that for a long time they had no reason for complaint on this ground.

In conjunction with the extension and improvement of the works, to which we are about to refer, the Committee have given

consideration to the claims of the men. In 1892 only the stokers, firemen, and coal wheelers had an eight hours' working day conceded; but now every man employed inside the works enjoys that privilege.

#### THE EXTENSION OF THE MEADOW LANE WORKS.

Turning now to the extension of the works, we may preface the description of the new plant by mentioning that, although £120,000 has been spent during the past three years, it is intended to continue the present policy of modernizing the works as opportunity offers. Taking the Meadow Lane Works first, these cover an area of rather more than 5 acres. Since they were purchased from the Leeds New Gas Company they have practically been reconstructed, and are now capable of producing about 7½ million feet of gas per day. One illustration of the effect of the improvements is afforded by the make per mouthpiece. Five or six years ago it was only a little more than 5000 cubic feet; and now, even with the old plant, the yield is 7000 cubic feet. In 1895, a Sub-Committee was appointed to inquire into new methods of carbonizing; and, after much investigation, they recommended the General Committee to adopt at these works the automatic inclined retort system. This recommendation met with the approval of the Committee and the Council; and, in October of 1896, the plans of the late firm of Messrs. Little and Graham, Limited (since reconstituted as the New Conveyor Company, Limited) were adopted for the installation of the system, at an approximate cost of £22,813. There has also been an expenditure of some £12,000 or £13,000 in connection with a new retort-house. As it was anticipated that, with this additional retort-house, the make of gas would be increased by nearly 2½ million cubic feet per day, it became necessary to extend the purifying plant, and to erect a new set of exhausters, a couple of purifying-machines, three sets of new condensers, and a station meter, with a capacity of 100,000 cubic feet per hour, as well as to enlarge the whole of the mains both above and below ground. The new purifying-house, which is being constructed on the stage-floor plan, will certainly be a very fine one. The ironwork is being supplied by Messrs. Clayton, Son, and Co. The purifiers, eight in number, measure 30 ft. by 20 ft.; and they are fitted with Weck's valves. An elevator is being erected for the raising of the purifying material. Altogether, above £12,000 has been spent on this house. Another important feature has been the erection of a shed in which to store coal for use in the event of an emergency. This shed is 406 feet long by 70 feet wide, with a storage capacity of 15,000 tons. The process of filling is now taking place. There is also on the works a small experimental gas plant, at which tests are made almost daily of the coals as they are delivered, with the object of ascertaining whether, during the whole period of contract, the delivery is equal to sample.

#### THE INCLINED RETORT HOUSE.

The inclined retort installation has, like many of the other improvements of the last few years, been carried out by Mr. Townsley's advice, and under his direct supervision. Throughout it is an admirable example of work of its kind; and all who have been concerned in its erection, from Mr. Townsley and the New Conveyor Company down to the workmen, may well be proud of the completed structure. It has a semi-circular roof of 100 feet span and 60 feet from the ground level to the underside of the principal. In the centre of the building and on one side a roofed superstructure is built out to cover the higher portion of the conveying plant. The plant consists of two double sets of benches arranged back to back, each bench containing 49 retorts (seven settings of sevens), or a total of 196 retorts. The dimensions of the retorts (which are  $\Delta$  shaped) are 24 in. by 15 in. at the bottom, tapering to 20 in. by 15 in. at the top, 20 feet long, and set at an angle of 32°. The retorts are in specially designed settings, with regenerative furnaces below; the furnace being charged by an improved design of shoot from one or other of the top retorts, and the clinkering operation being performed on the ground level. The heats obtained with these furnaces are certainly magnificent. There are two chimneys, one for each of the two benches of retorts; and the dampers are arranged in special flues, so that both benches can be worked together or separately as desired.

The charging-stage for all four sets of benches runs down the centre of the house, and is 24 feet wide. The drawing-stages are on either side of the building, and are 21 feet wide. These run the entire length of the house; and the plates on both of them are chequered to give a good foothold, and also ample ventilation. Overhead are four steel storage hoppers, each having a capacity of about 70 tons. A gangway is fitted on the side of each set of hoppers, so that the men can have easy access to the push-plate conveyors and the hoppers themselves. There are three steel measuring chambers to every bed of retorts, each one being 5 ft. 8 in. deep, 1 ft. 6 in. wide, and 3 ft. 6 in. long, and holding a charge of 7 cwt. Inside is fixed an adjustable baffle-door, allowing the measuring of a small or large charge as required. The charging-shoots, which run along a steel railway in front of the benches, are of the latest design, with checks and baffles to regulate the flow of the coal into the retort, and so secure an even charge.

The automatic machinery for filling the overhead hoppers is made entirely in duplicate, and is arranged so that either plant can feed the whole of the hoppers. It consists of two coal-crushers of a powerful description, and two elevators, with



buckets 20 inches wide, to raise the coal into the push-plate conveyor, which runs transversely across the centre of the house. There are two horizontal steam-engines and gearing, the whole of the latter being so arranged that both plants can be working at the same time, or each plant separately, as required. Each of the drawing-stages has a staircase from the ground level, and the charging-stage can either be reached from the drawing-stage or from outside the house. By means of a spiral staircase, there is easy access to all parts of the machinery. Compared with hand stoking, the adoption of these inclined retorts will no doubt result in considerable advantage to Leeds. Mr. Townsley believes that the wages paid to the stokers at Leeds are among the highest in England; and therefore savings effected by the inclined system and stoking machinery would be greater than in many other towns. In this new inclined retort-house (which has only been in use about a month) the cost of carbonizing works out to rs. 6d. per ton, including chargers, drawers, firemen, coke slakers, and engine men. Under the old system of hand stoking, the cost was 3s. 3d. per ton; so that a saving of rs. 9d. is shown. From this have to be deducted interest and depreciation, which will probably be covered by 3d. per ton. At any rate, there is a saving of nearly 50 per cent.

#### IMPROVEMENTS AT THE NEW WORTLEY WORKS.

The New Wortley Works, which occupy about 11½ acres of land, have also, under the present administration, undergone a complete overhauling, and have been brought nearer an up-to-date condition than they have been in for some years. To a large extent, hand stoking has been superseded by machinery. In the summer of 1896, the Council authorized for No. 3 house, which contains 420 retorts, an installation of West's compressed-air stoking machinery, and also sanctioned the laying down of Arrol-Foulis hydraulic stoking machinery in No. 4 house, which contains 486 retorts. The West machinery cost £5692, and the Arrol-Foulis £4950; making a total of £10,642. In addition to this, there has, of course, been necessary expenditure in altering the retort-houses, and in erecting new boiler and engine houses. There are two charging and two drawing-machines on West's system, which charge and draw 210 through retorts four times every 24 hours; and the pressure of air to work them is 60 lbs. to the square inch. The Arrol-Foulis installation consists of four charging and four drawing machines; and they deal with 243 through retorts four times in 24 hours. The air-compressor and the pumping-engine for operating the machinery are situated in a building quite apart from the retort-houses. The hydraulic power is supplied by a pair of high-pressure pumping-engines, driving four single-acting plunger-pumps, 3 inches diameter, with 18-inch stroke, connected to an accumulator, having a ram of 11 inches diameter by 6-feet stroke, weighted to give a pressure of 400 lbs. per square inch. There was, at first, a great deal of wear and tear on the wire ropes of the Arrol-Foulis machines; but, since they have been replaced by chains, the wear and tear has been reduced to a remarkable extent. However, both systems have answered admirably, although the two houses in which the machinery is situated are not exactly what can be called ideal ones for the purpose. They were built many years ago, before machinery of the kind adopted was even thought of. Neither of the houses has a stage-floor; so that all the coke has to be removed from the ground level by barrows. The future, however, may see a system of conveyors in use. But even under present conditions, Mr. Townsley's experience is that, after allowing for interest and depreciation, the machinery effects a clear saving of 9d. per ton of coal carbonized. Out of a total output of 17½ million cubic feet of gas per day, about 8½ millions are now produced by machine stoking. Other improvements at these works in recent years include the construction of a new set of six purifiers and condensers; while at the present time a coal-store, 300 feet long and 70 feet wide, is being built. A tender has also been accepted for the erection of a new station meter, with a capacity of 100,000 cubic feet per hour. The maximum daily make of gas at New Wortley is about 7½ millions.

#### THE YORK STREET WORKS.

The changes at the above works during the past six years have only been of a moderate character. They comprise the erection of an exhaustor-house to hold two sets of exhaustors, each capable of passing 100,000 cubic feet per hour; and the extension of the purifying plant. A coal-store, with a capacity of 7000 tons, has also been built. At the present time, the works are closed for the purpose of adding to the purifying plant and fitting in two new steam-boilers.

#### INSPECTION OF THE EXTENSIONS BY THE CITY COUNCIL.

With the view of giving the members of the Council a clearer conception of the extent of the improvement which has been achieved at the works than any amount of oral or written description would convey, Mr. Lowden and the Gas Committee invited them to visit the two principal works on Monday of last week. At the time of assembly at the Town Hall, rain was falling heavily; but, notwithstanding, the opportunity of inspecting the plant for which they have voted so much money was not allowed to slip by many of the councillors. The visitors were accompanied by the several gentlemen whose names are mentioned at the beginning of the above article, and who busied

themselves in explaining and giving information on all points and objects of interest. It is nearly seven years since the Council paid an official visit to the works; and since then, as already indicated, the stations have undergone quite a transformation. By a happy thought, Mr. Townsley had arranged for the inspection to commence at the New Wortley Works, where the councillors were first shown the men laboriously engaged in charging retorts by means of shovels. Then they were taken into the houses in which the West and Arrol-Foulis charging and drawing machines were being operated; and the contrast between the old and new systems must have commended the latter to even the most obstinate opponent of the progressive policy of the present Committee. Other parts of the works were also inspected, after which the councillors were conveyed to the Meadow Lane station, at which they were to see some of the latest developments in gas manufacturing processes. By the wish of Mr. Lowden, they were first shown what has been done in the reorganization of the workshops connected with the department. The Committee have had these, the stove show-rooms, and the meter-testing work brought under one roof. The workshops are spacious, and have been brought to a high state of efficiency; but from their crowded state, owing to the large amount of work which the Committee find it profitable to undertake themselves, it looks as though further accommodation will soon have to be provided. The repair of meters bulks largely in the work carried on; and it is proposed to shortly equip the shops with machinery for stamping out meter cases, which operation is now performed by hand. From here the councillors were conducted to what was the principal feature of the visit—that was, the inspection and formal opening by the Lord Mayor of the new inclined retort-house already described. On reaching the charging-stage, Mr. Lowden, in inviting his Lordship to declare the house open, showed the necessity for this increase in the productive strength of the works by stating that in foggy weather the consumption of gas had risen to as much as 17 million cubic feet in one day; while the works had only been capable of manufacturing 14½ millions, and the storage accommodation was only equal to 15 millions. Before addressing the company, the Lord Mayor demonstrated the simplicity of the inclined system by depositing a charge of 7 cwt. of coal in one of the retorts. In declaring the building open, he referred to the inclined system as a triumph of mechanical principles over brute force. He was only sorry that it was left to a Frenchman to discover such a simple way of making gas; but he could not help thinking that this was not the ultimate triumph of the art of gas making. He believed that eventually some means of continuous stoking would be discovered, which would do away with the necessity of opening retorts, and so prevent the waste of heat occasioned thereby. The little ceremony ended, the party descended to the lower stages of the house to witness the discharging of a few of the retorts. By an unfortunate, and at the time inexplicable, circumstance, three of the retorts did not eject their contents so freely as on former occasions;\* but others illustrated what could be done by swiftly discharging themselves. The sluggish retorts were a disappointment; but the Committee's faith in the success of the system is shown by the fact that, later in the day, the Chairman invited the members of the Council to pay surprise visits to witness the operation of charging and discharging under ordinary conditions. Leaving the building, the company paid a hasty visit to the nearly completed purifier-house and other parts of the works, all of which showed that the extensions and renewals have been carefully planned and supervised. To celebrate the opening of the new retort-house, the Council were subsequently entertained at luncheon at the Town Hall. The repast over, the Lord Mayor, in a pithy speech, proposed the toast of "The Chairman and Members of the Gas Committee;" and it was responded to by Mr. Lowden. He mentioned the interesting fact that, at the time the Council purchased the works, in 1870, the capital cost per ton of coal was £7 16s. 8d.; while at the present time, in spite of the large outlay on new plant, it is only £4 16s. 3d. Referring to the staff, he spoke of the full confidence which the Committee have in Mr. Townsley, and also of the ability of the Station Managers. Several of the figures given in the foregoing article were quoted by him to show the improvement in results that has ensued from the work of the Committee; but still, added Mr. Lowden, much remains to be done. The current year's working has commenced well. In addition to the substantial increases in the consumption of gas already alluded to, the Committee have, by a stroke of good fortune, secured contracts for the supply of 336,000 tons of coal at the same prices as ruled last year, while many other companies and corporations have had to pay advances of from 3d. to rs. per ton. On this, as on many other points, the Committee are to be congratulated.

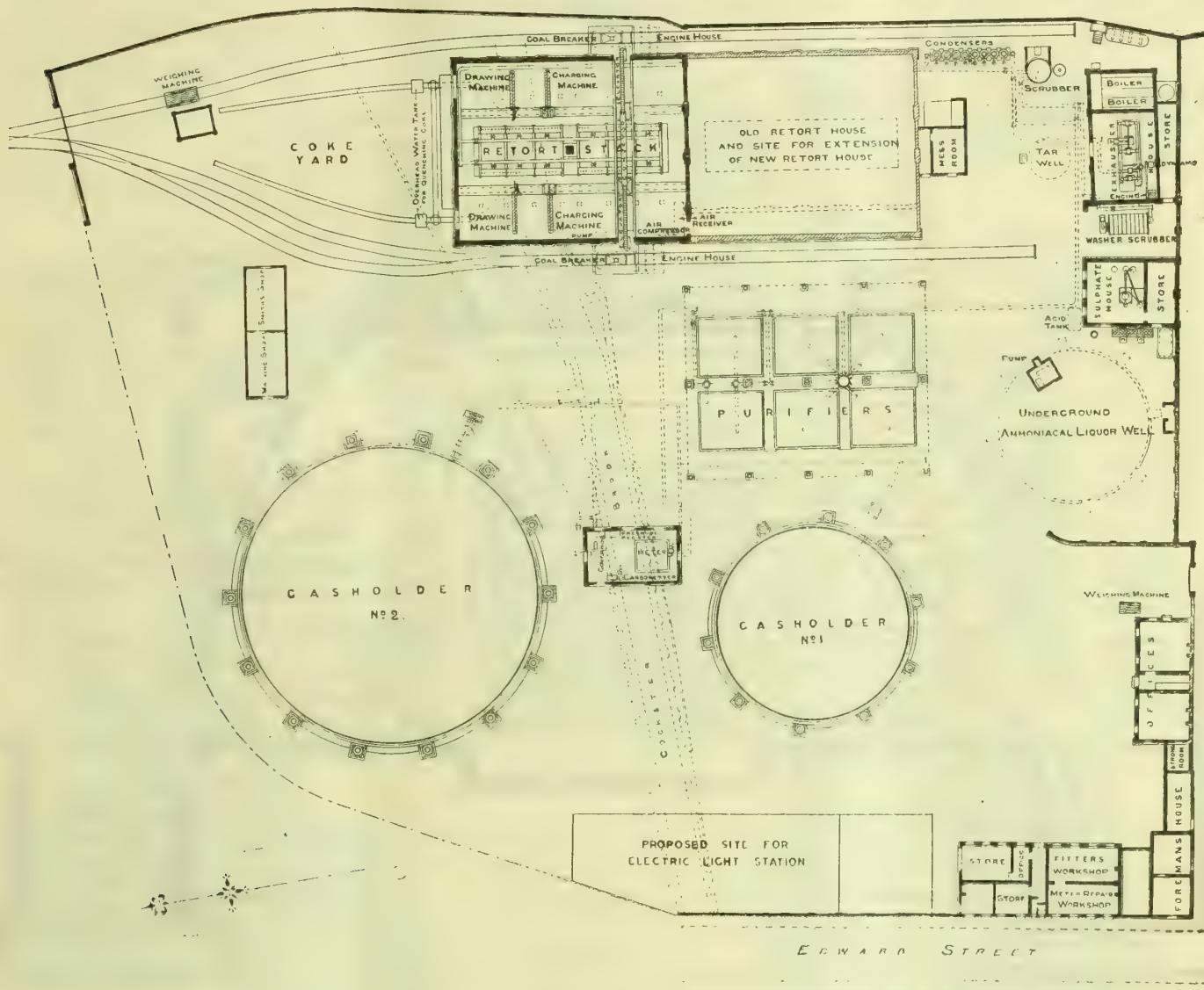
\* An explanation as to the cause of the trouble has since been received. It appears that the coal which was being used at the time of the visit had been kept in waggons standing in the siding over Sunday, and so was exposed to the heavy rain which fell that day. In addition there is no doubt that the space between the waggons and the top of the breaker pit admitted so much rain, that the elevator boot and breaker pit contained a large quantity of water, which would be lifted by the elevator like a bucket pump, and conducted into the overhead storage-tank. This is confirmed by the fact that some of the workmen saw water run down the charging-shoots into the refractory retorts. Nothing but trouble could be expected with retorts charged with coal and water.



## NEW GAS-PRODUCING PLANT AT LONGTON.

The old order of things has given place to the new at the Longton Corporation Gas-Works since Mr. W. S. M'Gregor entered upon the management. As is well known by readers in the Potteries district, and perhaps farther afield, the purchase of the undertaking was a costly transaction for the Corporation; and no doubt they were loth for some time to expend more money than was absolutely necessary in maintaining the works. However that may be, soon after his appointment Mr. M'Gregor exercised his persuasive powers, and convinced the Gas Committee that, for the well-being of the undertaking, money must be spent on a new retort-house and in other directions. Certainly, so far as the old retort-house is concerned, its decrepit appearance suggests that its days are numbered, and that if there had been much more delay in providing further power of production, Longton might have found itself one day without the first means of obtaining gas. But all this has been changed; and the borough now possesses a manufacturing plant which will do

them good service for many years to come. Besides the condition of the works, there was another reason why additional and enlarged plant was required. Mr. M'Gregor, with the support of his Committee, has taken active steps to increase the consumption of gas, and with admirable success. It is about two-and-a-half years since he took over the management; and in the two preceding years, the consumption stood at 101 million cubic feet. His first year of office saw a jump to 116½ millions; this was succeeded in the next twelve months by a rise to 125 millions, or about 15 per cent. increase; and if the coming season is a good one from the gas supplier's point of view, the consumption will, in all probability, reach, and perhaps pass, 135 millions. Fortunately, the storage accommodation is good—900,000 cubic feet, or equal to 1½ days' maximum demand—as, had it been otherwise, we are afraid that Mr. M'Gregor would on some days have found himself stranded. How has the increased consumption been obtained? Partly by the reduction of the price of gas by 2d., and largely by persistent efforts to develop the cooking-stove and prepayment meter branches of the business. Mr. M'Gregor lets out cooking-stoves at a penny



GROUND PLAN OF THE LONGTON CORPORATION GAS-WORKS.

a week. "A penny a week for a cooker" sounds well; and it has had the desired effect. It has secured many new users of such stoves; and the return to the department has been a profitable one. A good feature of slot meters is the tendency of the revenue per meter to increase; and it is found at Longton that from meters which at first yielded (say) £1 1s. per annum, in many cases about £1 10s. is now collected.

Having shown the necessity which existed for extensions and renewals at the works, we will now describe them; complimenting first the Engineer and the Contractors on the creditable and solid appearance of the whole of the new buildings and apparatus. We give a plan of the works, which shows the lay of the plant; and also [next page] a cross section of the retort-house, both of which may be useful to managers of works of similar size. As will be seen, the house is constructed and equipped on modern and approved lines. It is a plain and substantial building, measuring 90 ft. 6 in. long by 70 ft. wide between the walls, and 35 ft. 6 in. from the ground-level to the shoes of the roof principals. It is constructed with a stage-floor; the basement being on the level with the coke-yard.

The roof principals are of steel; and efficient ventilation is provided for by a louvre extending the whole length of the house, and suitable openings in the sides. The retort-stack is 21 feet through above the stage-floor, and contains six beds of nine retorts of 22 in. by 16 in. □ section; making a total of 108 mouthpieces. The retorts are heated on Winstanley's regenerator system; each through bed having one producer.

Space was not available on either side of the retort-house for coal-stores. But on each side there is a railway siding; and the coal is unloaded from the railway waggons direct to the coal-hoppers fixed above coal-breakers in connection with the West charging and drawing machinery with which the house is fitted. From the coal-breakers the coal is raised by elevators to overhead coal-hoppers, for supplying the charging-machines. A coal-conveyor is fixed between the heads of the elevators; the gearing being so arranged that the direction of the conveyor can be reversed, and coal conveyed from either elevator to the other side of the house should it be necessary to obtain the supply of coal from one railway siding only. The driving-engines for the coal machinery are of substantial construction,

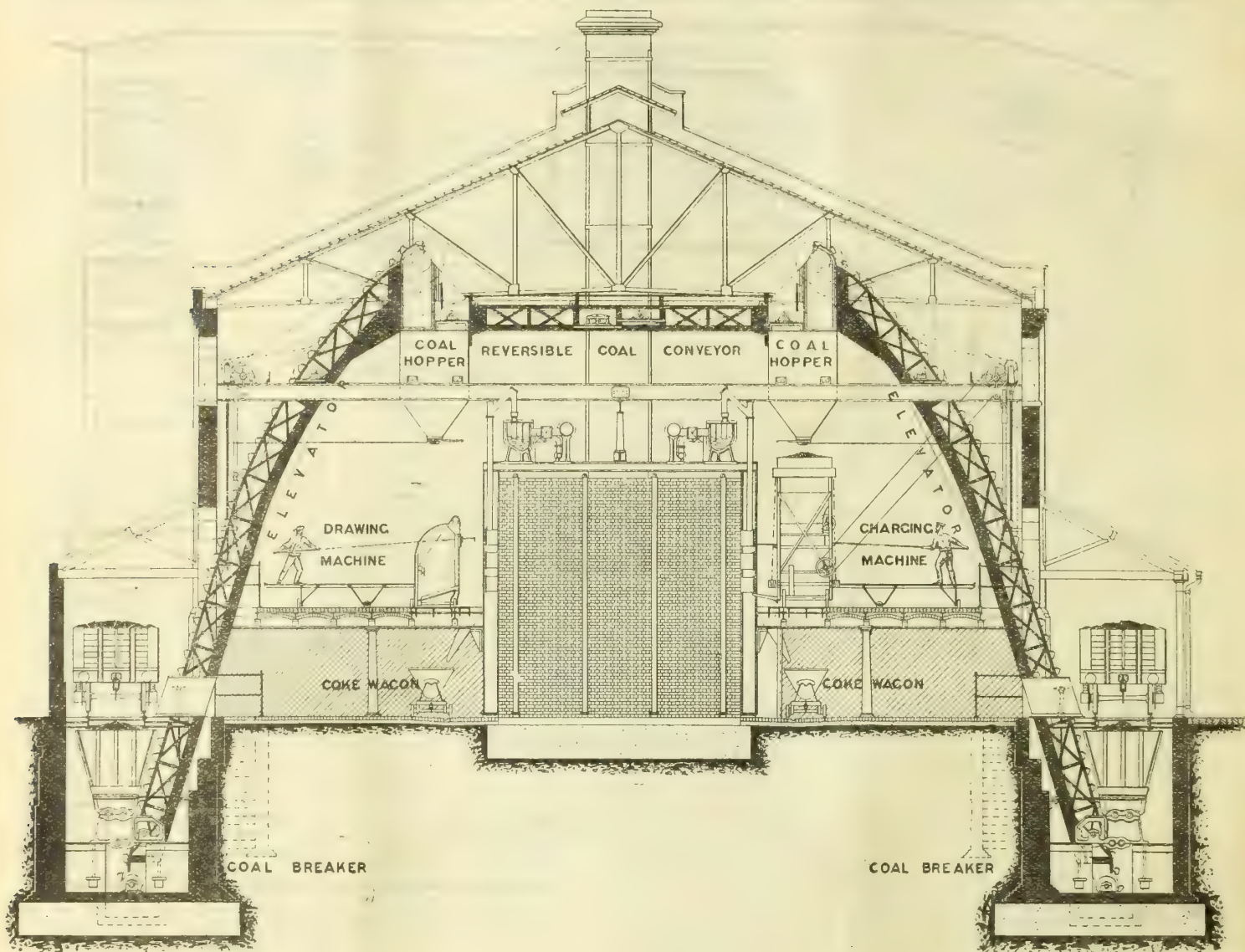


and are situated in houses, the walls of which are built of white-faced glazed bricks, which give them a clean and light appearance. The charging and drawing machines, which are of the well-known manual type, travel along rails laid in front of the retort-bench; and the coke from the retorts is directed by shoots to coke-waggons below the stage-floor, which waggons run on rails provided with points and turntables to the coke-yard. West's Gas Improvement Company were the contractors for the roof of the house, the coal breakers and elevators, and the stoking machinery; Winstanley's Speciality Company for the retort-settings and stage-floor; and Messrs. Tompkinson and Bettelley for the building.

Regarding the other parts of the improvement scheme, the exhauster plant has been completely remodelled—a new Waller engine and exhauster of 50,000 cubic feet per hour capacity having been fixed, and the two existing exhausters coupled to one engine. A Holmes rotary washer-scrubber, driven by a horizontal steam-engine, has been erected, and is capable of dealing with a million cubic feet of gas per twenty-four hours. A new station-meter house has been built, and contains a station

meter, by Messrs. Thomas Glover and Co., of a capacity of 50,000 cubic feet per hour, and a Maxim carburettor, capable of enriching 80,000 cubic feet of gas per day. The gas as made is of rather more than 15-candle power; and it is enriched up to 16 candles, although the Act only requires 14-candle gas to be supplied. The house also contains a Braddock station governor, Sugg pressure-registers, and other appliances. The gas-mains on the works have been re-arranged; and a new main leads to the Town Hall, where a trunk main is connected to supply Dresden and district. Workshops, containing fitters' shop, lamp, meter, and stove repairing shops and stores, also form important items in the extensions. The approximate cost of the reconstruction scheme has been £15,000.

An interesting feature of the works is a small electric lighting plant which has been put down, on the instruction of the Gas Committee, with a view to safety in the event of a mishap on the works at night time. The engine and dynamo only occupy a small corner of the exhauster-house; and the lamps are disposed over the works as follows: 24 in purifying-house, 2 in meter-house, 2 in engine-room, and 16 in offices and elsewhere.



SECTION OF RETORT-HOUSE AND RAILWAY SIDINGS AT THE LONGTON CORPORATION GAS-WORKS.

There was a formal inauguration of the new works on Thursday last by Alderman J. L. Johnson, the Chairman of the Gas Committee. The Mayor (Alderman J. Edwards, J.P.), the members of the Council, the borough officials, and a number of neighbouring gas engineers, accepted the invitation to be present; and altogether they were a numerous company. An inspection of the works was made; and many were the expressions of congratulation on the changed condition of the place. In the evening a dinner was given in the Town Hall to celebrate the event; the hosts being Alderman Johnson and Mr. John West, of West's Gas Improvement Company. Many toasts suitable to the occasion were honoured—the speeches all showing that the councillors have the fullest confidence in their Gas Engineer; that they are satisfied with the way the contracts have been carried out; and that they are in accord in believing that the large expenditure they have made will prove remunerative. There were one or two points in Mr. West's response to the toast of "The Contractors" which should be recorded. Speaking of the use of regenerative furnaces, he said that he remembered Mr. George E. Stevenson, now the Gas Engineer at

Manchester, having some correspondence with him on the subject 25 years ago, when he (Mr. West) was at Maidstone. It was 23 years since he (the speaker) obtained plans for these furnaces from abroad; and he believed he was the first man in England to put some up. But afterwards there was a little discussion as to whether he or Mr. George Livesey was the first. He only mentioned this to show how long it took for an advantageous improvement of this kind to get a good hold. He proceeded to call attention to the large waste of fuel and irregular heating that resulted in potteries through direct firing, and said it seemed to him that regeneration and gaseous firing should be universally adopted at such works. He was connected with works in Derbyshire where they worked up silica and china clays. There he had been making a large experiment on gaseous firing at a cost of between £5000 and £6000; and he had been successful—in fact, he had succeeded in doing for 4s. that which formerly cost £1. In his opinion, there was something to be done in connection with the application to pottery work of the principles embodied in the regenerative furnaces of gas-retort settings. There were other toasts, but space will not permit of fuller notice.

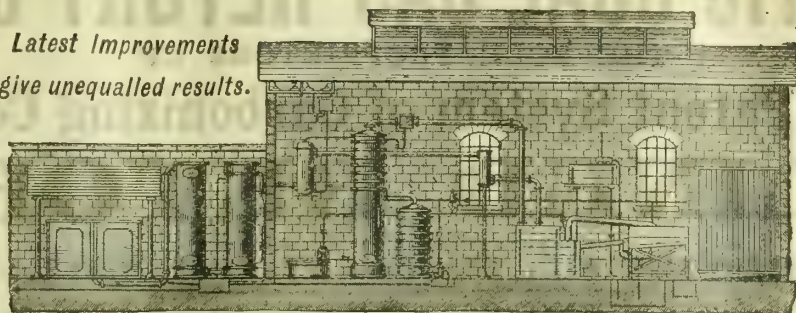


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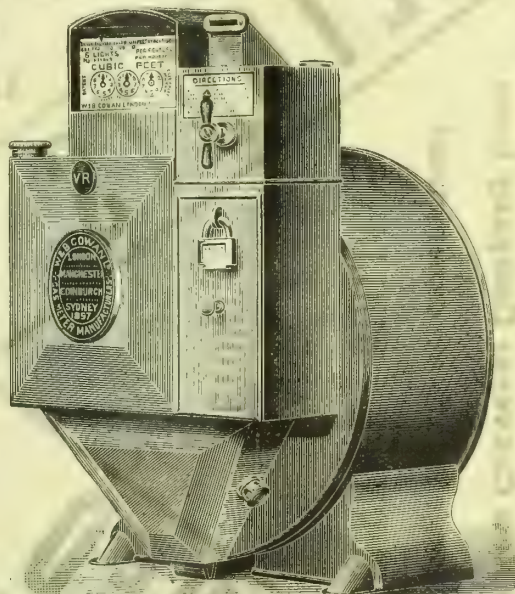
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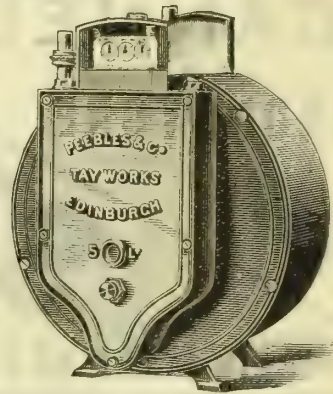
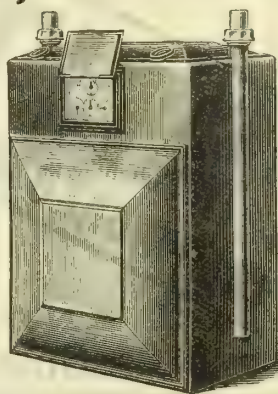
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# THE CHEMICAL COMPOSITION AND TECHNICAL ANALYSIS OF WATER GAS.

By EDWARD H. EARNSHAW,

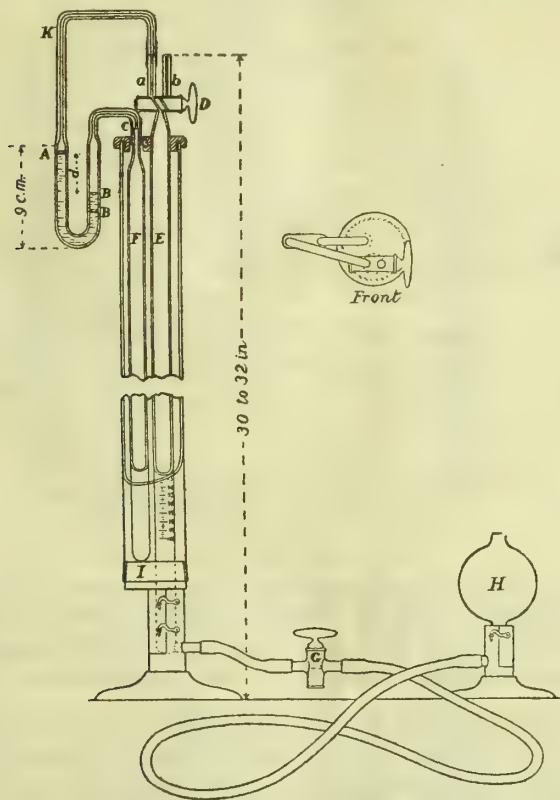
Chemist to the United Gas Improvement Company of Philadelphia (U.S.A.).

[From the "Journal of the Franklin Institute," October, 1898.]

## SUPPLEMENTARY NOTE.\*

The satisfactory performance of a gas analysis depends in great measure on the accurate measurement of the various gas volumes—a result difficult to attain in the more usual forms of apparatus. A most satisfactory instrument is found, however, in the burette with correction for temperature and pressure described on p. 28 of Hempel's "Gas Analysis." In this apparatus, the gas volume is not measured at atmospheric pressure, but by means of a manometer it is brought to the pressure of a constant volume of air enclosed in a Pettersson correction-tube. The enclosed volume of air is always at the same temperature as the gas volume, since the burette and the correction-tube both stand in the same wide tube filled with water.

Experience has shown the advisability of departing in the following particulars from the method of operation described by Hempel: A mark is placed on the manometer at A, and another mark is placed on the other limb of the manometer at B, about an inch above the bottom. The mark at A should be located so that the size of the space from A, to include the stopcock D, shall be exactly 1 cubic centimetre. This may be readily done thus: Withdraw the manometer-tube from the connection at C; then, by raising the level bulb H, fill the measuring-tube and



manometer completely full of water. Now draw some air into the burette, and note the volume of atmospheric pressure, after allowing sufficient time for the water to run down. Then turn the stopcock D so that the burette communicates with the manometer, and, by raising the level bulb, pass a little air over into the manometer, and at the same time force a little of the water out of the open end of the tube at C. By a slight manipulation, the volume of the air in the burette may thus be diminished by exactly 1 cubic centimetre, while at the same time the liquid in the manometer stands at the same height in both sides.

In the ordinary use of the burette, it is very inconvenient to measure the gas volume with the liquid in the manometer at the same level in both sides, because there is great liability that some of the water will be accidentally forced over into the correction-tube F, and also because a free space is needed to enable the water in the manometer to be moved up and down, and thus clear the correction-tube of the annoying drops of water which persistently remain in it. It is therefore better to make the measurement as follows: Draw the water in the manometer over into the burette until the liquid in one side stands exactly at the mark B, and the other side is completely filled to the stopcock D. When the gas volume in the burette is

to be measured, turn the stopcock so that the burette communicates with the manometer, and, by raising or lowering the level bulb H, bring the water in one side of the manometer exactly to the mark A. The liquid in the other side of the manometer will then stand at B'. Close the stopcock G, and note the size of the gas volume, which will be the reading of the scale plus 1 cubic centimetre. By this method the pressure in the burette, instead of being equal to the pressure in the correction-tube, will differ from it by a constant amount equal to the difference  $d$  between the levels of the liquid in the two arms of the manometer.

It will usually happen, in drawing the gas in the manometer back into the burette, that the liquid in the manometer will be drawn slightly below the mark B. This is of no consequence, as, when the gas has been passed from the burette to the absorption pipette, the stopcock D may be turned, and a little water passed from the burette into the manometer. By this method of operation it is assured that the measurements of the gas during an analysis will be made under absolutely uniform conditions.

Before beginning an analysis, it is advisable to bring the water in the manometer to the mark A, close the stopcock D, and draw the manometer-tube out of the connection at C. This will establish atmospheric pressure in the burette and correction-tube.

Some points in the construction of the burette are worthy of note. The measuring-tube E should have an internal diameter of about 15 millimetres; the instrument will then have a total height of 30 to 32 inches. The correction-tube may be about the same size, or slightly smaller, and must be just long enough to rest on the rubber stopper I, at the bottom, and project about half an inch above the wooden cap J. This cap serves to hold the tubes in their proper position in the water-jacket, and also prevents the manometer from sagging down. The water-jacket tube must be cut of such length that the rubber stopper rests firmly on the burette base, while the top of the tube ends about 1 inch below the stopcock D. In the large diagram, the correction-tube and burette are, for the sake of convenience, shown side by side. As a matter of fact, they are arranged as shown in the small one. The holes are carefully bored in the wooden cap and rubber stopper so as to bring the measuring-tube parallel to, and near, the front of the water-jacket. The correction-tube is placed behind, and to one side of, the measuring-tube, and the connecting-tube to the manometer is bent at an angle, as shown. The U-shaped part of the manometer is about 9 centimetres long and 8 millimetres internal diameter. The connecting-tube K is 6 millimetres outside diameter and 2 millimetres bore. The capillary tubes  $a$  and  $b$  are  $1\frac{1}{2}$  inches long and 1 millimetre bore.

The stopcock G should be large; and it will be found necessary to secure it in a small wooden block fastened to the table in a convenient position. The iron foot of the burette should also be screwed to the table, as the apparatus is quite top heavy. It is convenient to use two burettes for the analysis. One is graduated from the stopcock D to 100 cubic centimetres in tenths of a cubic centimetre, and is used for the direct absorptions; the other is graduated from 60 cubic centimetres to 100 cubic centimetres in twentieths—the upper part of the measuring-tube being enlarged into a cylindrical bulb and not graduated. This latter is used exclusively for the explosions and combustions, where great accuracy is essential.

**The Secretaryship of the Sheppy Gas Company.**—The final selection from the 86 applicants for this appointment was made by the Directors of the Company last Wednesday; and Mr. H. Barber, of the Portsea Island Gas Company, was unanimously chosen. He will commence his official duties on the 1st of January next, on the retirement of Mr. Marks, who has been invited to fill a vacant seat on the Board when he relinquishes his present position, which, it may be remembered, he has occupied for 36 years.

**Church Music by Mr. W. Gadd.**—Those of our readers who, like the late Mr. Frank Mead, of Sutton, and others, combine musical with engineering ability, and spend some of their spare time before an organ keyboard, may be interested to learn that Mr. W. Gadd, of Manchester, has lately published, through the agency of Mr. E. Donajowski, of Castle Street, W., settings of portions of the morning and evening services of the Church; the parts selected being the *Te Deum Laudamus*, the *Jubilate Deo*, and the *Nunc Dimittis*. They are all in the key of D; and though there are occasional departures into other keys more or less closely related, the parts run smoothly; while the organ accompaniment is their compression into short score, and not an elaborate production introduced apparently with the view of marring the effect of the vocal harmonies, and nullifying the efforts of the singers to give expression to them. Criticism of Mr. Gadd's work as a composer would be out of place here. Suffice it to say that his settings come well within the capacities of ordinary choirs, and they will take their proper rank among the many beautiful compositions of this class with which Church music has of late years been enriched. We notice that the words of the *Te Deum* differ in a few places from the English text to which Churchmen are accustomed; but this does not, of course, detract at all from the value of the piece as a musical composition.

\* Mr. Earnshaw's original article was recently given in the "JOURNAL" (see ante, p. 694; also p. 869).



## REGISTER OF PATENTS.

**Generating Gas for Motive Power, Illuminating and Heating Purposes, &c.**—Scott, F. S. D., of Clements Lane, E.C., and Hawkins, T., of East Ham, E. No. 21,833; Sept. 23, 1897.

The gas produced in accordance with this invention, when mixed with atmospheric air, possesses a very high explosive force, and may be used for driving ordinary gas-engines.

The patentees employ a vessel of copper or some material capable of resisting the action of the chemicals used. The vessel is divided by a horizontal plate into two chambers—the lower one in which the gas is generated, and the upper one to hold the solution employed as it becomes exhausted of its chemical action in producing the gas in the lower chamber. There are preferably three reservoirs connected with the vessel. The first contains about 12 gallons of water; glycerine, 4 ounces; and potash, 2 ounces, or suitable proportions thereof. In the second is sulphuric acid, about 40 lbs.; and bichromate of potassium, 2 ounces. The third contains benzolene or 680 petroleum spirits. Pipes lead from these reservoirs to drip-chambers, where the amount of chemical solution and also spirit can be regulated. With these drip-chambers is connected a pipe, which is carried through the upper chamber of the vessel into the lower one, and so arranged that the chemical solution is ejected in the form of spray on to the metal used in the production of the gas. This metal is supported on a grid or perforated plate. It consists of iron borings, or shavings, or turnings; zinc may also be used. The effect of the contact of the solution upon the metal is that chemical action is immediately set up, and gas is evolved, which, after passing through a condensing chamber, is taken off through pipes and used for the desired purpose.

**Gas Washer and Scrubber.**—Kirkham, Hulett, and Chandler, Limited, and Hersey, S., of Palace Chambers, Westminster. No. 25,019; Oct. 28, 1897.

The patentees remark that in washer-scrubbers as hitherto constructed, it has been found that, as the extraction of the ammonia from the gas

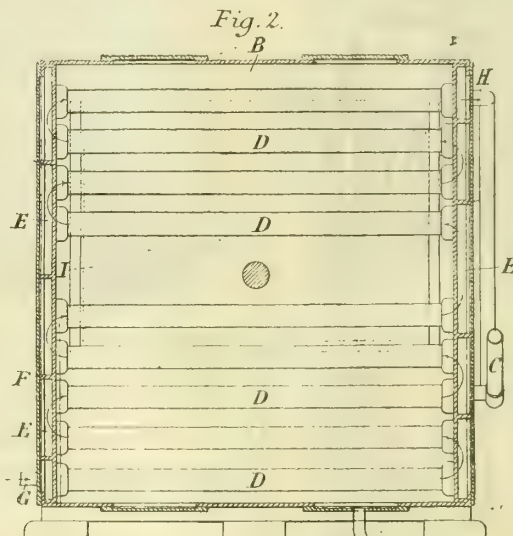
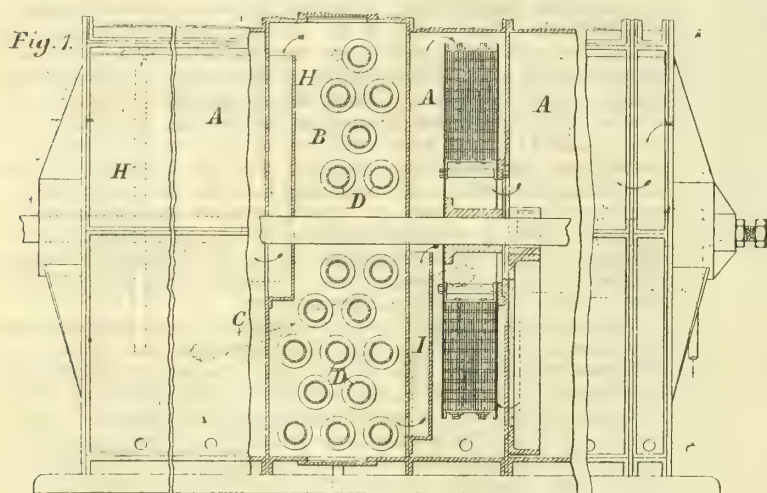
takes place, the temperature of the gas increases as it passes from bay to bay up to about the middle of the machine; and as a result the extraction of the final trace of ammonia becomes more difficult, and renders necessary a larger number of bays than would be required if the temperature of the gas were kept lower. To obviate this objection, and also to diminish or prevent the deposit of naphthalene from the gas at the outlet end of the apparatus, the patentees propose to employ apparatus of the ordinary construction; but they so arrange one or more of the bays that the washing liquor is bye-passed, and the bays are provided with a number of tubes through which the water for washing the gas is passed before entering the inlet to the apparatus.

Fig. 1 is a sectional side elevation of a washer-scrubber having the present improvements applied to it; and fig. 2 is an end view showing the interior of one of the gas cooling or condensing chambers.

A are the bays containing the rotary scrubbing surfaces in the usual manner; and B is a bay wherein the rotary scrubbing surfaces are dispensed with and around which the liquor passing from one washing bay to another flows through a bye-pass pipe C. The chamber B (which is practically dry) contains a series of transverse tubes D, communicating at the ends with boxes E, divided by partitions in such a manner that the water which ultimately reaches the washing bays enters the tubes D through the pipe G, and flows along them in the direction of the arrows. The water, as it leaves the uppermost tube, travels through the pipe H to the last of the series of bays, through which the gas passes as it leaves the apparatus.

The condensing bay B communicates with the washing bays through the pipes or channels I, which are so arranged that the gas which enters at the lower end of the condensing bay escapes at the upper end.

The gas, after having passed through one or more of the washing bays, enters the condensing bay B, where, owing to its contact with the tubes D, which are kept cool by the water flowing through them, its temperature is considerably reduced, and the extraction of the final traces of ammonia by further washing is facilitated. The cooled gas escaping from the top of the condensing bay again passes through one or more of the washing bays. The water which travels along the tubes D is obviously more or less heated; and this heated water flows into the bay in



which the last washing of the gas takes place before it leaves the apparatus. Owing to the contact of the gas with this partially heated water, instead of with cooled water as hitherto, the deposit of naphthalene is said to be diminished or entirely prevented.

**Incandescent Gas-Mantles.**—Martini, A., of Berlin. No. 26,202; Nov. 10, 1897.

The claims for this invention include: (1) The production and use of incandescent mantles containing compounds of potassium, sodium, lithium, rubidium, caesium, or tin, or of any number of such compounds, in combination with one or more of the rare earths, or with platinum and uranium. (2) A process for the production of incandescent mantles by second impregnation. (3) The production and use of incandescent mantles according to Chardonnet's method, in which an acid basic or neutral compounds of potassium, sodium, lithium, rubidium, caesium, or tin, or any combination thereof, are employed by association with a binding agent—such as a solution of collodion—in addition to the rare earths. (4) The production and use of an incandescent mantle impregnated in a solution of thorium nitrate in a quantity less than 97½ per cent., and small quantities of any of the rare earths in combination with any one or more of compounds of potassium, sodium, lithium, rubidium, caesium, and tin.

In carrying the process into effect, according to one modification, 97½ parts of thorium nitrate are dissolved with 2½ parts of potassium nitrate. With this solution the fabric which is to be impregnated is saturated; then dried, incinerated, and shaped in the fire. The incandescent material, which is very hard, is then dipped quickly into a solution of cerium nitrate, and can be used after being dried. Instead of an aqueous solution, it is preferable to employ a solution of caoutchouc, gutta-percha, and wax. The caoutchouc (as also the gutta-percha) are easily soluble in chloroform, ether, and benzol; but the solvents may be varied according to the origin of the substances to be dissolved. Gutta-percha rarely occurs in commerce in a utilizable form, says the patentee; so that it must be first dissolved in turpentine oil, precipitated with alcohol, and again dissolved in chloroform. A great quantity of caoutchouc contracts the incandescent material, and makes it temporarily harder; while wax and gutta-percha have a favourable effect upon its suppleness. Into the

solution so formed, a percentage of cerium nitrate is added; the cerium nitrate being first mixed with alcohol. If the mantle be dipped into a solution of this kind, the cerium nitrate will become deposited on the surface of the threads of the mantle fabric, and the volatile substances will rapidly evaporate. Mantles of this kind on being dried are ready for use.

Other mixtures may be employed for the skeleton of the fabric of the mantle—for example, 10 parts of tin chloride, 87½ parts of thorium nitrate, with 2½ parts of potassium nitrate; while the second impregnation with cerium can be wholly or partly replaced by other rare earths, or uranium and platinum. In this connection, it may be stated that the patentee has found that "the simultaneous use of cerium and didymium in the process produces a beneficial effect, contrary to the general view."

**Prepayment Gas-Meters.**—Anderson, J., of Edinburgh. No. 26,370; Nov. 12, 1897.

This invention relates to coin-freed or prepayment gas-meters, constructed on the same lines as that described last week, p. 870.

According to these improvements, a spur-pinion is mounted on a spindle connected to the coin-turning barrel, and gears into a spur-wheel on a boss or sleeve mounted loose on a parallel spindle. A bevel-wheel is also mounted on this sleeve; and a bevel-wheel is mounted on a radial stud or spindle connected to, and projecting out at right angles from, the aforesaid spindle. It gears into the wheel and also into another bevel-wheel (termed a secondary bevel wheel) on a sleeve mounted loose on the same spindle as the first-named bevel wheel.

As the coin-turning barrel rotates after the insertion of each coin, the spur-pinion turns the spur-wheel; and the bevel-wheel on the same sleeve turns the bevel-wheel on the stud at right angles. The parallel spindle is thus correspondingly turned; and a pin on the latter works into a groove or clutch on the spindle of the gas-controlling valve, and lifts and opens the latter to pass gas to the meter. A toothed wheel is mounted on the same boss as the secondary bevel-wheel, and gears into a worm on a spindle connected through wheel gearing to the ordinary mechanism of the meter.

As prepaid gas is being consumed, the worm and worm-wheel are actuated by the ordinary mechanism of the meter; and the secondary



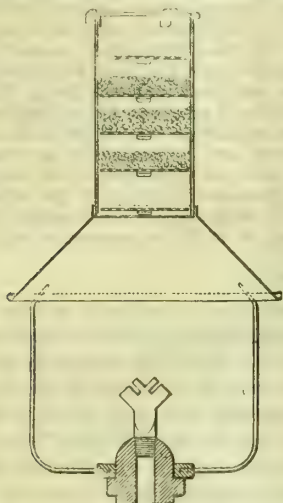
bevel-wheel acts on the wheel at right angles, and turns the spindle in the opposite direction to the first bevel-wheel, and so acts on and closes the valve when all the prepaid gas has been consumed.

A pointer is mounted on the end of the parallel spindle, to indicate the number of prepaid coins for which gas has still to be supplied; and a tilting lever is operated on by a pin on this spindle to obstruct the coin-slot when the maximum number of coins have been inserted.

#### Purifying the Combustion Products from Acetylene Flames.—

Billwiller, J. S., of St. Gall, Switzerland. No. 28,003; Nov. 27, 1897.

In order to remove from the products of combustion of acetylene gas flames, "injurious admixtures, such as, for example, phosphoric acid," the patentee proposes to pass the products through a tubular body (as shown), divided by strainers into several compartments. Some of these compartments are empty, and in them condensation takes place "which is promoted by the fact that the motion of the current of the products of combustion is retarded by having to pass through the strainers, and that the products of combustion are thereby several times divided or more distributed." The injurious admixtures (especially the phosphoric acid)

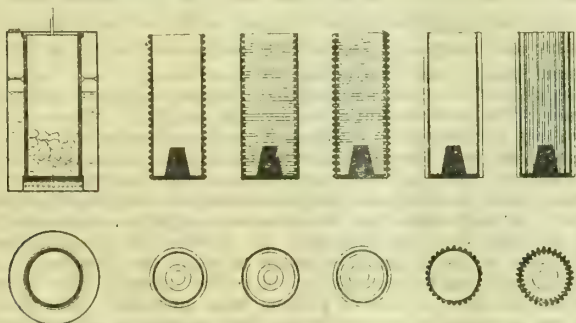


are precipitated after a short time in the form of a "sparkling coating" on the walls of the compartments. The other compartments of the tubular body are filled with an absorbent and refractory material impregnated with a basic liquid and subsequently dried. As an absorbent material, pumice stone, asbestos (in the form of fabrics or not), porous clay, or the like may be employed. As a suitable impregnating fluid for these materials, there is preferably employed a solution of potassium carbonate of 50 per cent. strength.

When the products of combustion pass through the compartments charged as described, the acids mixed with the products are neutralized by the bases. The last strainer of the tubular body consists of a narrow-meshed sieve, which has for its object to keep back any small particles of carbon that may be carried over.

#### Acetylene Generators.—Billwiller, J., and Rosenthal, K. E., of Berlin. No. 14,050; June 24, 1898.

The characteristic feature of this apparatus for the production of acetylene gas is that the carbide is placed in a closed receptacle, formed of porous material, permeable by water; so that, when the water from without enters the receptacle, a gas-generating action is brought about. But, if the pressure of gas be too strong, the water is forced back through



the porous sides of the receptacle, for the purpose of reducing the subsequent giving off of gas to the smallest possible extent. The receptacle is furnished with hollows, recesses, projections or the like, for the purpose of enlarging its contact surfaces for the carbide as well as for the water, and altering the cross-section as may be desired. The different forms it may take are shown in the engraving in section and plan.

#### Calcium Carbide Manufacture.—Woods, J. E. T., of Stockwell, S. W., and Byrom, W. A., of Great St. Helens, E. C. No. 14,453; June 30, 1898.

The process described in this invention comprises two stages—the production of the gaseous mixture necessary to make carbide of calcium; and the production of carbide of calcium proper.

In carrying out the first stage of the process, the patentees fill a number of retorts provided with suitable connections, as well as with an inlet and outlet pipe, with hydrated oxide of iron or bog iron ore, and heat to a temperature of about 1000° Fahr. They then cause a current of crude petroleum vapour, produced in a separately heated vessel, to pass through the retorts, whereby the oxide of iron is reduced to spongy iron, while a certain quantity of steam is formed, and some free carbon is deposited.

The gas escaping from the outlet-pipe of the last retort (consisting chiefly of acetylene and marsh gas) is conveyed to and stored in a suitable holder. A current of steam being subsequently allowed to pass through the retorts kept at the temperature named, the spongy iron is converted again into iron oxide, and free hydrogen is generated from the decomposition of the steam which takes place and partly combines with the free carbon deposited—forming both acetylene and marsh gas. The gas escaping at the outlet consists now of acetylene, marsh gas, and a large quantity of hydrogen, all of which is conveyed to the holder above mentioned. The gases intermingle in the holder, and constitute the gaseous mixture, the production of which is the first step of the process. The retorts and connections are of the same description as those used for manufacturing illuminating gas, and so need not be described.

To carry out the second part of the process—i.e., the manufacture of carbide of calcium—an apparatus is employed consisting of a conical casing or shell (preferably of steel), provided with two diaphragms or partitions fixed air and gas tight to the inside wall of the shell. The diaphragms form two chambers, the uppermost of which is an air-chamber, while the lower one is a gas-chamber. The chambers are each provided with an inlet fitted with a screw-valve of suitable construction; and the two diaphragms are furnished with a number of tapped perforations, into which are screwed the upper ends of central tubes with other tubes concentric to them. The lower ends of the tubes enter the perforations of a shield secured to the lower end of the shell or casing; the first-named tubes thus communicating with the air-chamber, and the latter with the gas-chamber. Air is forced in by means of a fan or blower, and the inlet is connected to the supply-pipe of the holder containing the gases produced in accordance with the first stage of the process. The crucible or furnace employed is provided with three of the blowpipe burners just described; the nozzles converging towards the centre, where is an opening through which a mixture of fine charcoal and lime is fed. As soon as the blowpipes are set in action, intense heat (reaching a temperature of from, say, 4000° to 5000° Fahr.) is quickly raised; and this converts the mixture in the furnace into carbide of calcium.

#### Substances for Producing the Automatic Ignition of Gas.—Pierron, L., of Brussels. No. 15,414; July 13, 1898. Date claimed under International Convention, March 9, 1898.

The object of this invention is "the production of compound bodies or substances capable of effecting the automatic ignition of gases by producing a condensation or a combination with the oxygen of the air, resulting in the high increase of temperature; the purpose in view being to produce an igniting body or substance not requiring to be withdrawn from the flame by mechanical means immediately after the ignition has been effected."

The claims advanced by the patentee (after detailing his proposals for forming ignition powders, pastes, &c.) are the following:—

First. Compound bodies for effecting the automatic ignition of gases consisting of one or more known bodies, with a base of platinum or of metals of the same group (an igniting element), capable of causing the gas to so combine with air as to produce ignition and combustion—such as spongy platinum—and a supporting element of substance, such as oxides of silicon, zirconium, titanium, niobium, tungsten, molybdenum, tantalum, vanadium, aluminium, iron, manganese, &c., or other bodies infusible under the conditions of use, non-volatile, unalterable in the presence of air, and incapable of reacting upon each other or upon the igniting element; the bodies or substances being employed in a porous or finely-divided state, either alone or in combination with each other.

Secondly. In a compound body or substance for effecting the automatic ignition of gases, the use as a supporting element (for preventing the igniting element from agglomerating) of oxides of silicon, zirconium, titanium, niobium, tungsten, molybdenum, tantalum, vanadium, aluminium, iron, manganese, &c., separate or mixed, the oxides being obtained in an absolutely pure state either by starting with the natural products, to which the desired shape is given, and subjecting them to the requisite chemical operations, or by precipitation and washing; the pure oxides being in the latter case mixed with an organic component, in order to form a paste which is subsequently moulded, dried, and calcined.

Thirdly. Compound bodies or substances for effecting the automatic ignition of gases, comprising an igniting element formed of one or more known bodies capable of effecting the ignition, and a supporting element fulfilling the conditions stated in the first and second claims in a solid or powdered state, obtained by reduction or calcination of a mixture of the two elements taken in solid or liquid form.

Fourthly. Compound bodies or substances for effecting the automatic ignition of gases after having been subjected to the action of heat, comprising an igniting element formed of one or more known bodies capable of effecting such ignition, and a supporting element fulfilling the conditions stated in the first and second claims in the state of a liquid, a paste, a tissue, or a thread, and obtained by a mixture of the two elements taken in a solid or liquid form.

#### APPLICATIONS FOR LETTERS PATENT.

21,285.—JUSTICE, P. M., "Lighting and extinguishing street and other lamps." A communication from A. G. Kent-Johnston. Oct. 10.

21,314.—BOULT, A. J., "Incandescent mantle supports." A communication from La Société Générale d'Incandescence par le Pétrole. Oct. 10.

21,337.—PORTEB, W. H., "Production of stable catalytic material and catalytic gas-lighting tips or burners and tufts." Oct. 11.

21,441.—GANTKE, H., "Improvements in illuminating contrivances." Oct. 12.

21,456.—SMITH, F., "Burners for incandescent gas lighting." Oct. 12.

21,462.—FOSTER, W., "Stoppers used in gas-retorts." Oct. 12.

21,564.—GLAHOLM, F. J., "Acetylene gas apparatus." Oct. 13.

21,576.—BARLTROP, W. P., "Acetylene lamps." Oct. 13.

21,601.—DAUBENSPECK, G., "Incandescent mantles." Oct. 14.

21,643.—DOMAN, W., "Generation of acetylene gas." Oct. 14.

21,691.—PRAAG, D. J. VAN, and HARKER, F. W., "Acetylene generating apparatus." Oct. 14.

21,760.—MICHÉROUX, Count A. D. DE, "Apparatus or oven for the production of coke and lighting gas, with recovery of the bye-products." Oct. 15.



## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### Intelligent v. Unskilled Labourers for Working Inclined Retorts.

SIR,—I think the remarks of Mr. Maurice Graham in your issue for Oct. 18 (p. 871), in reference to unskilled labour as applied to charging inclined retorts, ought not to pass unnoticed, for they do not, in my opinion, correctly state the case.

It is true that charging inclined retorts is not what is technically termed "skilled labour," any more than is the charging of horizontal retorts with the shovel, or any other of the operations of gas making; but that it requires no skill to perform this work satisfactorily I cannot admit. As well might it be said that the manipulation of stoking-machines for drawing and charging horizontal retorts is mere labourers' work; yet we pay higher wages to the men who work the machines than to any other men employed in the retort-house. If the object of applying machinery to do the work of the carbonizing department were to get rid of skilled labour, the men would have reason enough for objecting to its adoption. For my part, I regard it in a different light altogether. We do not want men who have learnt a "trade" to do retort-house work, but we do want men of intelligence, who understand, and take an interest in, the use of machinery; and such men we employ in preference to mere labourers.

The use of machinery has undoubtedly raised the standard of the men employed in the retort-house, and, in consequence, we have a better educated and more intelligent class of men than formerly. I am happy to be able to say that on works where stoking machinery has been long in use, most of the men regularly employed know how to work machines if required, and, although they cannot be always engaged on that work, their knowledge makes their services more valuable, and enables them to earn more on the average than they otherwise would.

Wherever inclined retorts are introduced, it will be found an advantage to put men to charge them who have already had some acquaintance with the working of mechanical appliances, and not raw labourers. The possession of a staff of such men forms a valuable reserve upon which to draw for all kinds of operations. Such men are doubtless more keen to get good pay for their work, and more ready to complain of excess of work being put upon them; but, on the other hand, they are more open to reason, and better able to understand their own interests than mere labourers, and they will not so lightly throw up their job, or relinquish the position they occupy.

Manchester, Oct. 19, 1898.

G. E. STEVENSON.

### The Swansea Gas Company's Reserve Fund.

SIR,—In your review of "The Gas Acts of 1898" in the "JOURNAL" for the 11th inst., you state, in reference to the Swansea Gas Act: "The capital is consolidated into 5 per cent. stock, increased by £120,000 with the usual borrowing powers . . . . The reserve fund is not to be increased, nor borrowed money to be converted into share capital." Allow me to correct the portion of the paragraph italicized, as otherwise it may mislead your readers.

Section 19 of the Act states: "The reserve fund of the Company in respect of their capital existing at the passing of this Act (£135,000) shall not be increased by reason of the consolidation of such capital." That is to say, the original capital of £135,000, consisting of shares entitled to 10, 7½, and 7 per cent. dividend, and increased by consolidation to £202,000, shall not be entitled to a reserve fund on the increased portion of the consolidated capital, £67,000, which was the amount added to the £135,000 to reduce the various dividends to 5 per cent. on the whole consolidated capital, now amounting to £202,000. The section does not refer to the new or additional capital of £120,000 authorized to be raised by the Act, which, of course, is entitled to the usual reserve fund. The Company are entitled to a reserve fund on the original capital of £135,000 under the Acts of "1861 and 1888," and also on the additional capital of £120,000, "New Capital, 1898."

Swansea, Oct. 22, 1898.

THORNTON ANDREWS, Engineer.

### The Origin of Gas Associations.

SIR,—Since my letter on this subject in the "JOURNAL" for the 27th ult., I have been in correspondence with my genial friend Carlow, of Arbroath, who, as Secretary of the North British Association, has everything at his fingers' ends; and he has furnished me with an excerpt of the minutes of the meeting, as follows:—

[COPY.]

At Cupar-Fife, the Twenty-fourth day of January, Eighteen hundred and sixty-two years. In a Meeting of Gas Managers.

Present: Mr. Lowden, of Leven; Mr. Myers, of Broughty Ferry; Mr. Procter, of Forfar; Mr. Mackenzie, of Cupar. Mr. Lowden was called to the chair.

Some conversation took place upon the subject of forming an Association of Managers of Gas-Works, for the purpose of cultivating friendly intercourse and good feeling amongst its members, and the free interchange of ideas upon all matters connected with the profession.

Each gentleman present having expressed an opinion favourable to the formation of such Association, the present meeting unanimously agree to invite the co-operation of managers in other places, especially those in the counties of Fife, Perth, and Forfar, with the view of carrying the same into effect, and appoint a general meeting to be held in Cupar upon the last Wednesday of July next, at twelve o'clock noon, for that purpose.

Mr. Mackenzie is requested to give intimation of these proceedings to the different parties in the counties above named, and request their attendance on the day named.

Signed in name and by appointment of the Meeting,

J. LOWDEN, Chairman.

[Certified to be a true copy.—Robt. S. Carlow, Secretary, Gas-Works, Arbroath, Oct. 13, 1898.]

From the foregoing, it is clear that my memory has played me false, and the meeting did not fall in "the summer of 1861," but on the eve of Burns's natal day, amid the blasts of January winds. I must suffer a little disillusionment, and yield the palm of pioneers to the men of

Waverley, or the country of Sir Walter Scott and the Ettrick Shepherd, and we men of the "Kingdom of Fife" and the "Little Minister's" county be content with a good place as second to the fore.

Smethwick, Oct. 20, 1898.

G. T. MYERS.

### The Wolff System of Purifying Acetylene Gas.

SIR,—In the "JOURNAL" for the 4th inst. (p. 744) there is a description of the domestic installations of acetylene plant of the Allgemeine Carbide und Acetylen Gesellschaft, of Berlin; and reference is made to my improved system of purifying, which is employed with all the Company's apparatus. Your description is not quite correct; and therefore I should like to rectify some slight errors in order to prevent misconceptions.

You very correctly state that the ammonia and the greater part of the sulphuretted hydrogen are abstracted by washing with magnesium chloride; but you proceed: "It [the acetylene] is then treated with lead acetate and silver nitrate, which remove the phosphuretted hydrogen and whatever sulphuretted hydrogen remains in the gas." This is incorrect, and is probably due to a wrong interpretation of the German text. The lead acetate and silver nitrate merely serve as re-agents to indicate the presence of the two injurious impurities named—thus showing the efficiency of the purification, and the time for renewing same; but they do not constitute the purifying material itself. It is best and most easily employed with Eckelt's acetylene tester, described on p. 745 in the same number. These substances cannot be used as purifiers—in the first place, because they are far too costly for commercial use; and, secondly, because the silver nitrate combines with acetylene. My method of purifying for phosphuretted hydrogen is to employ hypochlorite of calcium in combination with various other substances; and you have already directed attention to it in connection with an article in the "Chemiker Zeitung."

Berlin, Oct. 15, 1898.

PAUL WOLFF.

[Dr. Wolff's correction is very welcome, as our description of the scheme of purification elaborated, according to our German contemporary, by Professor Pictet and Dr. Wolff, was necessarily defective owing to the incompleteness of the account on which it was based. The scheme appeared to differ essentially from that of Dr. Wolff described in the "Chemiker Zeitung," and in the "JOURNAL" for June 14 (p. 1375). Certainly no mention was made of "hypochlorite of calcium" in the German account of the Pictet-Wolff system; and the use of magnesium chloride does not appear to have been contemplated by Dr. Wolff when he first described his system in the "Chemiker Zeitung." We hope to give shortly a summary of a very comprehensive paper by Dr. Wolff on the "Present Position of Acetylene Lighting," in which incidentally the purification of the gas is fully discussed.—ED. J.G.L.]

### A Question as to Extensions of Works.

A correspondent asks if any of our readers connected with gas-works owned by local authorities have been able to extend their works on land not originally scheduled, without obtaining the leave in writing of all "owners, occupiers, and lessees within 300 yards of the site;" and, if so, what was the process adopted.

## LEGAL INTELLIGENCE.

### Alleged Bribes on Gas Contracts.

At the Halifax County Court, a case recently came before Judge Cadman in which Messrs. Jonas Drake and Son, of Ovenden, sued the Rowley Regis and Blackheath Gas Company to recover the balance of an account for goods supplied. Defendants had deducted a sum of £20, on the ground that it had been offered to their Manager as a bribe for obtaining plaintiffs the contract, and that therefore they were entitled to the money. The total amount of the account was £543. After entering their defence, the defendants withdrew it; and application was made by Mr. Waugh that costs should be allowed the plaintiffs on the higher scale. He said Messrs. Drake had from the first repudiated that they promised any commission; and they were obliged to come into Court to defend their character. It was a case where the defendants ought to compensate them for all the costs they had incurred. Mr. Parker, for the defendants, quoted a case to show that a question affecting the character of an individual could not be regarded as of public interest. Mr. Waugh pointed out that here a class of persons were interested. His Honour said it was a matter of notoriety that the practice of offering bribes obtained very largely, and it was one that was highly immoral. To charge a firm with it was to charge them with a disgraceable thing. The question raised was undoubtedly of importance to a class of persons; and he thought the plaintiffs were entitled to the costs they asked for. Judgment was entered accordingly.

### A Rotherham Gas Worker Charged with Intimidation.

At the Rotherham Police Court, last Thursday, Joseph Worrall, a gas worker, was summoned for intimidating a workman named William Yates, with the view of compelling him to cease employment at the Rotherham Gas-Works. The Town Clerk (Mr. H. H. Hickmott) prosecuted. He stated that recently the Corporation had introduced inclined retorts, which had enabled the management to dispense with a certain amount of labour. The man Yates was engaged under the improved arrangements; but the other workmen had declined an offer made to them to work these retorts. On the previous Monday, the defendant, an ex-employee, met Yates in a public-house, threatened him, called him a "blackleg," and wanted to fight. Defendant took hold of the man's collar, and wished him to go on to some vacant land to fight the matter



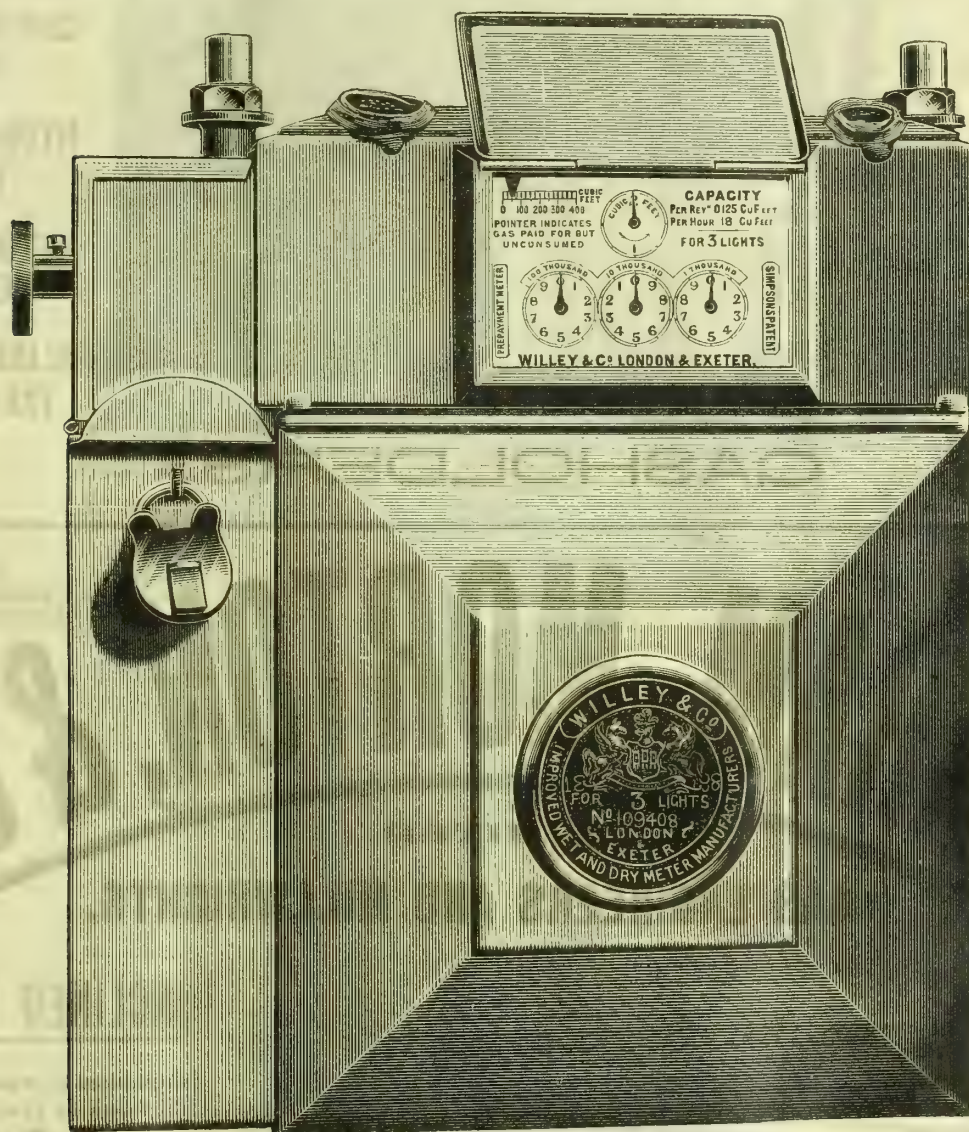
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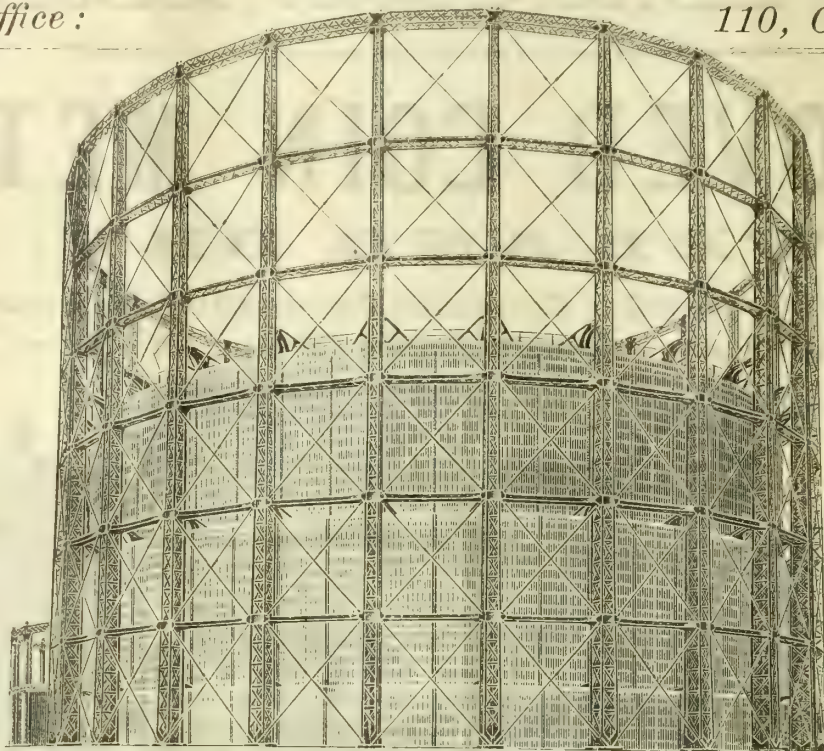
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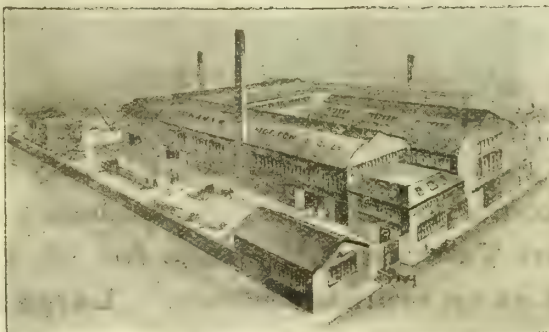
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out. Yates told the defendant that he should not fight, and that if he struck him he would go and report the matter to the Manager (Mr. F. A. Winstanley). He mentioned the matter to his foreman, who at once took further action. The Corporation were determined to protect their workmen, and they had suggested that these proceedings should be brought. The Corporation regarded it as serious that the men who worked for them should be interfered with. The section of the Act of Parliament under which the information was laid provided that the Bench might impose a penalty not exceeding £20, or imprisonment not exceeding three months. He should ask them, if they had the power, whatever decision they might come to with respect to defendant's punishment, to bind him over to keep the peace. He thought such a course would have a beneficial effect in dealing with the dispute at present pending at the gas-works, and in protecting the men in their service. The defendant elected to be tried by jury; and he was accordingly sent on trial at the Sessions.

### The Supply of Water at Ventnor.

At the Hampshire Quarter Sessions last week, two days were occupied in hearing an appeal by the Ventnor Gas and Water Company from a decision against them by the Ventnor Urban District Council at the Isle of Wight Petty Sessions on the 20th of August last (*ante*, p. 488), when the Company were fined by the Council for failing to supply sufficient water for public use. Mr. B. Davis and Mr. T. Cooke appeared for the appellants; Mr. H. Ruegg, Q.C., and the Hon. G. Colville represented the respondents. For the latter it was urged that on quite fifty occasions the Council had been unable to get water for flushing purposes; that the Company could have obtained plenty, but that the storage was insufficient to meet the needs of the town—being no greater than it was twenty years ago. The Company had asserted that they would be able to supply any quantity of water that might be required; but there had been great waste from inadequate storage, and in June and July last the supply was short, though up to the end of the latter month there had been no great lack of rain. The Chairman of the Ventnor Urban District Council (Mr. Wetherick) in substantiating the respondents' case, admitted that there had been friction between the Council and the Company; but he denied that the former had any desire to "buy the Company out." For the appellants, it was stated by Mr. Baldwin Latham that their pipes were ample in diameter for the requirements of the town, but that the springs in the Isle of Wight and in Ventnor itself had been reduced by the late drought to one-third of their average capacity, and that they had been falling since March last. Other evidence was given to prove that the deficiency had arisen owing to the misunderstanding between the officials of the Company and of the Council, which resulted in the water not being turned on at the time it was required. The Court took time for deliberation, and ultimately dismissed the appeal with costs.

### The Reinstatement of Roads after Pipe Laying.

At the Durham Quarter Sessions last Wednesday, before the Right Hon. J. L. Wharton, M.P. (Chairman), and other Magistrates, an appeal by the Sunderland and South Shields Water Company against the Castle Eden Bench of Magistrates came on for hearing. Mr. J. Strachan, Q.C., and Mr. Simey were for the appellants; and Mr. Glynn for the respondents. Mr. Glynn, in opening the case, stated that the appeal was against a conviction of £5 and costs made upon the Company by the Castle Eden Magistrates, under section 33 of the Water-Works Clauses Act, for neglecting to properly restore 550 yards of highway in the district of the Easington District Council, which had been taken up by the Company in order to put in a 21-inch main. The conviction followed proceedings instituted by the Council, who were responsible under the County Council for the proper maintenance of the road. The work commenced in December last; and before the trench was cut, the road carried a hard crust of macadam, was well shaped, and in excellent condition. The trench dug by the appellants was 5 feet in depth; but instead of reinstating and making good the road, they left it in a very unsatisfactory condition. The material which had been taken out of the trench was simply filled loosely into the hole; the result being that the road had now got into an exceedingly bad and indeed dangerous condition. Witnesses were called who spoke to the good state of the road before, and its bad condition after, the laying of the main. Mr. Strachan's case was simply a denial of these statements. The Company had, he said, a mass of evidence which would go to prove that the road was not as good as the Council asserted before the trench was cut; and, further, they held that the trench had been properly filled, and completed in a workmanlike manner. The work had been carried out by Messrs. Hawksley, whose name and reputation in work of this kind was a guarantee that it was properly executed. Mr. John Sellick, the Clerk of Works to Messrs. Hawksley, stated that the material was put in the trench in 6-inch layers, and rammed with 20-lb. rammers. The macadam was left to the last, and laid on to form the crust. Afterwards the road was well rolled. Mr. Edwards, County Surveyor for the West Riding of Yorkshire, and Mr. Walter Stead, Surveyor to the North Riding of Yorkshire, were called, and declared that the filled-in trench was generally a better piece of metalling than the other portions of the road. The Bench, after hearing other evidence, dismissed the appeal, with costs.

**A New Reservoir for Harrogate.**—The ceremony of cutting the first sod of a new reservoir to supplement the Harrogate water supply took place yesterday week. The site of the reservoir is at Scargill, where the Corporation—who recently acquired the Water Company's entire undertaking for £206,000—have purchased a gathering-ground of 1100 acres. The reservoir will have a surface area amounting to 32 acres, with a maximum capacity of 220 million gallons. It is anticipated that the work of construction will be completed in about three years; the estimated cost being £100,000. The work is being carried out by the Corporation, under the superintendence of Mr. W. E. Dixon, the Water Engineer. The cutting of the first sod was performed by Alderman C. Fortune, Chairman of the Water Committee; and the event was afterwards celebrated by a luncheon.

## MISCELLANEOUS NEWS.

### AGITATION AMONG GAS WORKERS.

#### An Appeal by the Gas Workers' Union—Troubles in the Provinces.

Reports which have lately reached us through the usual channels have furnished very significant signs that there is at present a good deal of agitation among the gas workers in various parts of the country. Complaints have been made of the hardness of the work and the smallness of the pay; and they have been followed up by applications for lightening one and increasing the other. As will be seen by what appears below, trouble has arisen at Rotherham over the inclined retorts; while at Yeading the men have come out on strike because an increase of wages was refused by the Directors. With regard to the Metropolis, evidences have not been wanting of there being something "in the air." It was reported that application had been made to The Gaslight and Coke Company, by the General Secretary of the Gas Workers' Union (Mr. W. Thorne), for an advance of 1s. a day in the men's wages; and that it had been refused. As a consequence, it was rumoured that the whole of the men belonging to the Union would be ordered out on strike.\* All doubts as to the existence of an agitation were removed by the publication of the following circular:—

To the Gas Workers of London.

Fellow-Workers,—In March, 1889, the Gas Workers' and General Labourers' Union was formed for the purpose of reducing the work and hours, and increasing the wages of all sections of men working in the carbonizing departments of the various gas-works. In the same year, it was successful in getting the hours of labour reduced from twelve to eight, with a slight reduction of work, but no extra wages. On the 11th of November, 1889, the Engineers of the London Gas Companies agreed to give double time for Sunday work between the hours of 6 a.m. and 10 p.m. An agreement was also made between the Engineers and the Executive of the Union that no extra work should be done unless they were short of gas, or in case any of the men stopped away from their work, and then only three mouth-pieces per man, or nine mouthpieces per gang. But what has happened to the men in the carbonizing department during the past few years? They have had to do more extra work than was agreed to between the Engineers and the Executive. They have to carbonize more coal in consequence of the scoops being made deeper, wider and heavier, and the "nigger driving" that prevailed before the Union started is becoming the practice again. But why? The gas workers themselves, perhaps know best. Let it be known that the men in the carbonizing departments have not had any direct increase of wages for the past 22 years, whilst at the same time the wages of all classes of workmen have been increased at least 25 per cent. Therefore, do you not think it worth while joining hands with the 40,000 of your fellow-workers who are in the Union for the purpose of getting better wages for the hot and laborious work you have to perform? We therefore ask you all—scoop drivers, front men, machine men, firemen, coke-hole men, coal-wheelers, and others, to again show the spirit you did in 1889, with a view of demanding that which you are justly entitled to—namely, higher wages and less work, which all gas companies can well afford to give. The profits of the London Gas Companies amount each year to about 1½ millions sterling. Think what this means, men! Think how much sweat is lost in making this huge profit! We therefore appeal to all London gas workers to at once join the Gas Workers' and General Labourers' Union, and not allow creed or nationality to divide you as it has done in days gone past, so that we may present that solidarity that was shown in 1889, and show to the Directors at least that you are human, and not mere profit-making machines.

The Executive Council,

W. THORNE, General Secretary.

Last Thursday, the stokers employed at the Rotherham Gas-Works invited the ratepayers of the borough to a meeting at St. George's Hall, to hear an explanation of the circumstances in connection with the dispute which has arisen at the works. Mr. J. Carroll presided. The Chairman remarked that, as a ratepayer, he was willing to lend assistance to the gas workers in order that they might ventilate their grievances. Contentions had, in his opinion, existed too long at the works; and it was time they were ended. Mr. Black, one of the workmen, said the first proposal they received from the Manager (Mr. F. A. Winstanley) was 4s. 8d. per day in connection with the new inclined retorts. The men refused this offer, and agreed to meet the Manager. They did so, and he asked them to see the Chairman of the Gas Committee. A deputation of the workmen afterwards waited upon the Chairman, who promised to put the 4s. 8d. on one side, and asked them to work at the new retort-house until the Committee meeting. He also told them the Committee would settle the rate of wages. After some conversation with reference to a scale of work, it was arranged that they should meet again. At a further interview, the Chairman and the Manager offered them 5s. per day; but the workmen refused it. He (the speaker) suggested that the men should go to work at the old rate of wages which had been previously decided by an Arbitrator—viz., 5s. 7½d. per day—until the Committee met, and the whole question was threshed out. Mr. Swallow was the next speaker. He dealt with the terms under which it had been proposed the men should work. They were to be paid according to the Arbitrator's award, as agreed between the Council and the men. They had only been working in the new retort-house a short time before the foreman told them they had the fires to clean. This was putting on extra work. Then in a short time they had 12 more retorts per day to draw and charge. He wished to know where this system was going to end. That was, they were informed, to be a final arrangement—that 48 retorts were to constitute a day's work. Under the Arbitrator's award, they were to carbonize the same bulk of coal as at Sheffield; and the men had accepted this as a basis. The speaker proceeded to describe a further interview between the workmen and the Manager on the wages question; saying a most ridiculous offer had been made to them. The Manager wanted to complicate their work by arranging it in five different sections. He (Mr. Swallow) said it was impossible; and the Manager told them that if they would not do it they would have to clear out. The men who had taken their places had been engaged on the same terms as the stokers had left upon. Had the Manager granted the same terms he had offered to strangers, there would have been no dispute pending. In

\* Since this was written, the Company, as will be seen by a paragraph on p. 933, have granted an advance in wages.—ED. J. G. L.



reply to questions, he stated that the notices sent in by the workmen would expire next Thursday morning. Six of the men had already stopped. The strangers were receiving 6s. per day for four retorts less than the old hands received 5s. 7½d. per day for. Mr. Clegg moved a resolution to the effect that the meeting, after hearing the men's statements, thought that they were justified in their demand, and that all ratepayers should support them; and it was passed unanimously. Mr. Grundy proposed—"That this meeting of ratepayers expresses an earnest desire that the Gas Committee will at once meet the representatives of the stokers, to try to come to an amicable settlement," and the motion was carried. Mr. A. J. Bartey (District Secretary of the National Amalgamated Union of Labour) said he believed in men, especially Corporation employees, being fairly and squarely dealt with. He, however, had no desire to agitate the question, and had come to the meeting with the full intention of preaching conciliation. He believed that there was a way out of the difficulty, and that if the Gas Committee would find it they would have the approval of the ratepayers.

At a recent meeting of the Gas Committee of the Oldham Corporation, an application was submitted from Mr. J. R. Clynes, of the Gas Workers and General Labourers' Union, asking, on behalf of all the retort-men employed at the Corporation Gas-Works, for an advance of 6d. per shift in wages, and for payment of the present Sunday rate (time-and-a-half) for three shifts on Sundays instead of for two, as at present. The Gas Manager (Mr. J. Chadwick) stated that when the duration of the shifts was reduced from twelve to eight hours, the men asked to be paid time-and-a-half for the morning and afternoon shifts on Sunday; and this was granted. Now they wanted the evening shift to be paid for at the same rate. Mr. Johnson said the Committee thoroughly investigated this matter a little short of twelve months ago, and had an interview with Mr. Clynes; and the bulk of the Committee thought the retort-men were as well treated in Oldham, both as to hours and wages, as elsewhere. It would be best if, before the matter was discussed by the Committee, the new members (Messrs. Letham, Ward, Crowder, and Lees) were appointed as a Sub-Committee to go into all the details and report to the Committee. Otherwise these four gentlemen could not vote with any degree of knowledge on this complicated question. Mr. Harrop thought the question needed meeting either in the affirmative or the negative; and the proposal was simply an evasion intended to postpone the application to some more convenient date. Mr. Johnson said he was prepared to deal with the matter then. Mr. Chadwick said an application came in July, 1897, for an advance of 1s. per shift; and when this was refused, there was a second application for 6d. per shift. Mr. Letham said the question hinged on this: Were the Committee paying the proper standard rate of wages for this class of labour? Could any official, having gone through the tabulated information obtained from other towns, give any information that would help them? Mr. Chadwick said that from the statements laid before them there was no question as to their paying the standard rate of wages, if there was any standard. There were very few paying more—one or two slightly more, but very few. What they paid was practically about the average; they were not below the average at all. Based on last year's accounts, the increase in expenditure, if the present application were acceded to, would be £3562 per annum. During the year ended March last, the wages of the retort-men amounted to £20,032. An advance of 6d. per man per shift would be equal to 10 per cent., or £2003. The number of retort-men employed during the year varied from 91 to 360 per week, the average being 218. If these men were paid time-and-a-half for the Sunday night shift, it would mean an advance of 2s. 9d. for each of the men on that shift; and in a year's time this would total up to £1558. Mr. Lees asked if they would be able to grant the increase without raising the price of gas. The Chairman (Alderman Gourlay) replied that they must either do so or reduce the reserve fund. The Superintendent (Mr. A. Andrew) said the reserve fund amounted to £45,000, or 10 per cent. on the capital invested in the plant. Mr. Harrop remarked that they were only making between 2 and 3 per cent. on the whole of the money sunk. He moved that the advance of 6d. be granted, as he regarded the retort hands as the hardest worked men under the Corporation. They had applied several times; and he thought they were fairly entitled to consideration. Mr. Chadwick pointed out that the men were not working eight hours at stoking proper, and that between each interval, which came every hour and twenty minutes, they had practically half the time for rest. Some men were quicker at their work than others, and might have 45 minutes, while their fellow-workmen only had 35. It was undoubtedly hard work; but he did not suppose there was more sickness among the stokers than with other workmen. Mr. Lees said he had no desire to be generous with other people's money. He was there to represent the ratepayers; and they had not instructed him to be generous with their funds. He was prepared to move that the matter be referred to a Sub-Committee. Mr. Johnson seconded this; and Mr. Harrop's motion not being seconded, that of Mr. Lees was carried. It was decided that the Sub-Committee should meet on the 24th inst.

It was announced in the "JOURNAL" last week that the stokers in the service of the Yeoman and Guiseley Gas Company had decided to come out on strike in consequence of the refusal by the Directors of their application for an increase of 3s. per week in their wages and the engagement of a "wheeler on" and a "wheeler off" for each shift. The men's notices did not expire till last Tuesday night; but, owing to the dismissal of one of their number by the Manager, they all turned out on the previous Friday. Pending the arrival of some workmen from Scotland, the manufacture of gas was continued with the aid of the yardmen, meter fitters, and other servants in the employ of the Company; but on Monday the quantity of gas in the holders had decreased to such an extent that it was deemed advisable to give notice to the Yeoman, Rawdon, and Guiseley District Councils, as well as to the Menston Parish Council, that the street lamps must not be lighted. This was particularly unfortunate, as the lighting of Menston by gas was only commenced on the previous Saturday, as recorded elsewhere. On Tuesday morning, a contingent of fifteen men arrived and were at once set to work on the manufacture of gas; and every effort was made to provide sufficient gas for the night's consumption. The new men, who were introduced by Mr. Graeme Hunter, were lodged on the works; and the latest news to hand is that they are going on very well.

The stokers in the Greenock Corporation Gas-Works, who lately made an application for an advance in wages of 6d. per shift, have received an increase.

## LEEDS CORPORATION GAS SUPPLY.

### Stokers' Wages and Hours—Radical Tribute to the Management.

The final meeting of the Leeds Gas Committee for the current municipal year was held last Thursday, at the Municipal Buildings, under the chairmanship of Mr. Joseph Lowden. An exceedingly satisfactory monthly report was presented; the make of gas per ton of coal carbonized being 10,375 cubic feet, as compared with 9626 cubic feet for the corresponding month of last year. The members were informed of the receipt of a letter from the local Secretary of the Gas Workers and General Labourers' Union, asking for an advance of wages for some of the men employed at the gas-works, and for a reduction of working hours for other employees. It was decided to defer the consideration of the application till next month, when the new Committee will be called early together. At the conclusion of the business, a very hearty vote of thanks was accorded to the Chairman for his efficient services during the past year. The resolution was proposed by Mr. H. Brown, seconded by Mr. G. Ratcliffe, and supported by Mr. F. Ambler. The speakers—two Radicals and one Conservative—testified to the successful working of the Gas Department, and likewise bore testimony to the great efficiency displayed by the Chairman, and his uniform courtesy and urbanity. Recognition was also made of the services rendered by the Deputy-Chairman (Alderman M. Walker); the speakers to the resolution being Alderman F. M. Lupton, Mr. A. Smithson, and Mr. Ambler. A third resolution, which was unanimously passed, referred to the management. By this resolution the Committee placed on record their appreciation of the excellent manner in which the General Manager (Mr. R. H. Townsley) had carried out the introduction of mechanical stoking at New Wortley, and the installation of inclined retorts at the Meadow Lane works, as well as other extensions; and also acknowledged the services of the Manager at Meadow Lane (Mr. Tooley) and the Manager at New Wortley (Mr. Bond) for their assistance in bringing these installations to the present satisfactory state of working. Mr. Townsley, in acknowledging the vote of thanks, alluded to the visit of the Corporation to the gas-works on the previous Monday, an account of which appears elsewhere. He said it was somewhat unfortunate that on that occasion there was a slight failure in the working of the retorts. Previously and since they had gone splendidly. There was, he added, no doubt whatever as to the success of the installation. Not only were they obtaining a much larger production of gas from every ton of coal, but they were also effecting a great saving of labour. He was confident that the results in the future would amply justify the action of the Committee in putting down the plant.

## BIRMINGHAM CORPORATION GAS SUPPLY.

### The Disfranchisement of the Chairman of the Gas Committee.

Early in the past week, a suggestion was made that the unfortunate disqualification of Alderman Pollack, the Chairman of the Gas Committee of the Birmingham Corporation, to which reference was made in the last number of the "JOURNAL," might be remedied by the Council electing him an honorary freeman of the city. A careful examination, however, of the provisions of the Honorary Freedom of Boroughs Act, 1885, showed that there was no remedy in this direction. The "freedom of the city" does not constitute a person elected to it a Burgess; it is simply the inscription of his name upon the roll of those who are considered by the Council to have rendered distinguished service. At a special meeting of the Board of Overseers last Tuesday, the subject of the blunder which led to the disqualification was discussed at considerable length. It appears that, in order to clear the register of voters who have died, who have gone to live beyond the prescribed limits, or who for other reasons are ineligible, the political agents send in to the rate office a list of such persons. The list upon which the word "alien" was placed against Alderman Pollack's name was sent in from the offices of the Conservative Association. The greater portion of this list was compiled while Mr. Barton, the Secretary, was incapacitated by serious illness; but it was eventually shown to him. He noticed the name of Maurice Pollack in perusing it, but was under the impression that it related to Alderman Pollack's brother. The matter never again came under notice until the Market Hall section of the Burgess list was published, and no one was more surprised at the mistake than Mr. Barton himself. The Overseers passed the following resolution: "The Overseers, having made full inquiry into the circumstances which have led to the omission of the names of Alderman Pollack and Councillor Barrow from the Burgess roll, express their great regret. They find that it is largely due to the short time allowed for the preparation of the lists; and they will take all the steps possible in future to prevent the recurrence of such errors."

**Oil Gas Enrichment Company, Limited.**—The annual report of this Company for the year to the 30th of September states that the balance at the credit of the profit and loss account is £535 19s. 6d., which the Directors recommend be disposed of as follows: To pay the fixed dividend of 5 per cent. on the preference or "A" shares, £250; to wipe off the balance of the preliminary expenses, £162 10s.—leaving to be carried forward to next year, £123 9s. 6d. The Directors regret that the continued fall in the price of cannel coal, and the high price of gas oil, have made it difficult to extend the Company's business. The investments stand in the accounts at cost; but their present value is stated to be £6258 8s. 9d.

**Sea Water for Roads, &c.**—During the last thirteen years the Yarmouth Town Council have pumped 1000 million gallons of salt water out of the North Sea. This is used for private baths, street watering, flushing drains, and extinguishing fires. Prior to establishing their own sea-water works, the Council used to pay 1s. per 1000 gallons to the Water Company. The cost of their own enterprise is 1½d. per 1000 gallons. During the first few years only 40 million gallons were raised each year; but for the past eight years over 100 million gallons have been pumped and used per annum. Recently the Council decided to spend £3000 in erecting further pumps capable of raising 25,000 gallons per hour, so that the available supply will be doubled. These pumps will be electrically driven by power supplied from the Corporation's generating station.



## NORTH SHIELDS WATER-WORKS ARBITRATION.

Tuesday, Oct. 18.

(Before Sir DOUGLAS GALTON, K.C.B.)

This was an arbitration to fix the price to be paid by the Tynemouth Corporation for the compulsory acquisition of the North Shields Water Company's works, under the provision of the Act obtained in 1897.

The Counsel engaged were: Mr. BALFOUR BROWNE, Q.C., and Mr. GERALD FITZGERALD for the Company; Mr. FLETCHER MOULTON, Q.C., M.P., and Mr. J. G. WOOD for the Corporation; and Mr. C. A. CRIPPS, Q.C., M.P., and Mr. CLAUDE BAGGALLAY, Q.C., for Earl Percy. Mr. F. R. Y. RADCLIFFE was Legal Assessor.

Mr. BALFOUR BROWNE, in opening the case, said the Company was a very old one, having been formed under an Act of 1786. At that time they contemplated supplying water from certain lands belonging to the then Duke of Northumberland to North Shields and Tynemouth; but instead of purchasing lands from the Duke, they made a bargain, which was contained in the Act, for giving rights to do a great number of things on his land, in return for which they agreed to give him one-seventh of the profits of the undertaking. So that, though the Act said he was not to be regarded as a partner, yet in one sense he was. The limits within which the Company were allowed to supply were the borough of Tynemouth and the townships of Whitley and Monkheaton, and parts adjacent. Two years ago, the Corporation promoted a Bill for the compulsory purchase of the Company's works; and though this Bill was resisted both by the Company and Earl Percy, Parliament passed it. The undertaking was burdened by a very large mortgage debt, which, contrary to the usual custom, was not to be handed over with the undertaking. In another respect, also, the present case differed from others, because, in addition to the claimant Company, the Lord of the Manor whence the supplies were drawn was separately represented. The question to be considered, however, was what the value of the whole undertaking was; and as the figures were practically agreed, there would not be much controversy. The water that the Company took from Earl Percy's estate and many of the original sources, proved inefficient, and some of it unfit for supply, owing principally to hardness, and had to be abandoned. The Company therefore entered into agreements with the Newcastle and Gateshead Water Company, who had mains not far away, and possessed a supply of water far in excess of their wants. Under these agreements, the Newcastle and Gateshead Company now supplied them with about three-quarters of their total quantity. This water was exceedingly good in every way; and the arrangement had the advantage that it saved the Company the necessity of spending large sums on capital account. The manorial water which the Shields Company obtained was pure, but exceedingly hard; and of itself they would hesitate to say it was a good water for a town's supply. The Company therefore mixed it with the Newcastle water at a reservoir constructed for the purpose. There were three agreements between the Companies, one of which expired in 1903, another in 1908, the third being subject to six months' notice. The other side would probably say that the fact that they derived three-fourths of their water under a terminable agreement militated very much against the value of the undertaking. He asserted, however, that, though there was no certainty in law, yet there was in fact, and the Newcastle Company would go on supplying the Shields Company in perpetuity. The net revenue—which would be easily ascertained, since the figures were practically agreed—would have to be capitalized; and the number of years' purchase would depend on the security of that income. The Corporation would say the figure should be low, seeing that the agreements would terminate in nine years; but, on the other hand, if he could show that from one place or another the Company were certain of a supply at all times, they would be in exactly the same position as any other company having their own reservoirs and sources of supply. The price paid to the Newcastle Company was, all round, 3½d. per 1000 gallons. It might be said that when the agreements expired that Company might exact a much larger figure, and that therefore the profits would be less. First of all, however, the Shields Company had 9½ years in which to turn round; and if they had been left alone, they might have done as the Tynemouth Corporation did last year—viz., go to the Font for a fresh supply. If they had threatened to do so, it was quite certain the Newcastle Company would have been only too glad to sell the water at a very moderate rate, rather than lose a customer for the very large amount they supplied now. In fact, the Newcastle Company, when they heard the Tynemouth Corporation were going to the Font, offered to supply them in perpetuity at 4½d. per 1000 gallons. This was in October, 1897, after the Compulsory Purchase Bill had passed, but before the Tynemouth Corporation had introduced their Bill of last session to obtain water from the Font. The very worst the Shields Company could expect, therefore, would be that they would go on paying 3½d. for the next 9½ years, and then 4½d. per 1000 gallons. In their calculations, therefore, they had had regard to this fact, while considering also that the supply was not secured by Act of Parliament. When the Company ceased using some of the manorial water and took that of the Newcastle Company, Parliament, by the Newcastle and Gateshead Water-Works Act of 1870, recognized the new supply. The starting figure in the valuations was the net revenue—viz., £4930 18s. 1d.—which was practically an agreed figure. There was a question as to whether this sum should not be increased by £20, which would make no difference to the Corporation, but was simply a matter as between Earl Percy and the Company. This was really the only matter in dispute between the Earl and the Company. The accountants on the other side brought out the net revenue at £4591, which was due to the fact that £238 19s. 1d. was deducted from the net profit; being the sum spent in resisting the Purchase Bill. He held, however, that the Company were entitled to object to being purchased, and certainly that sum should not be deducted from one year's revenue. Starting with the £4930 the question arose, was that income maintainable? That it was, was clearly shown by the expenditure which the Corporation were undertaking in going to the Font. Then if it was maintainable, the second question arose: How was it to be capitalized? On this point, he said that if the bargain with the Newcastle Company had been (say) confirmed by Parliament, he should have asked the Court to allow 33½ years' purchase. The whole question was: What difference were they to make, because

it was not a statutory, although a practical, certainty that the Company would continue to receive ample water from the Newcastle and Gateshead Company? Seeing that the offer of the latter Company was to supply at 4½d. per 1000 gallons, it would be wrong to assume that they would continue to get the water at 3½d. Therefore the Company's valuers claimed on the basis that the present income would continue for nine years, after which time the profit was adjusted by deducting the larger working expenses, or the difference between 3½d. and 4½d. per 1000 gallons. He asked the Court to allow the multiplier which they thought fairly and properly represented the practical certainty of the Company continuing to get water from the Newcastle Company. From the capital sum so arrived at, the Company's valuers deducted the amount necessary to make the works complete and perfect. Beyond this sum, he claimed an amount for what was erroneously called compulsory purchase. In this case, there was undoubtedly a future before the Company; and, for the prospects which the purchase would take away, and to cover the cost of re-investment, &c., he asked to be indemnified by being allowed 10 per cent. on the capital value of the concern. Another item included in this percentage was the sum which would have to be paid in respect of some debentures which would be liquidated without notice. In conclusion, he briefly referred to the reserve fund and undivided profits, which he stated would remain in the hands of the Company for their benefit.

Mr. FLETCHER MOULTON understood Mr. Balfour Browne to say there was only one question not settled between him and Mr. Cripps on behalf of Earl Percy. The rights of the Company were under a very peculiar Act, and certainly, according to the evidence given in the parliamentary inquiry, there were then questions between Earl Percy and the Water Company which were not settled. He should like to know if Mr. Cripps agreed that the easements which the Water Company acquired under the Act of 1786, for carrying water along pipes placed on manorial lands belonging to Earl Percy, extended, as a right, to water which was not acquired from manorial lands.

Mr. CRIPPS said, so far as Mr. Balfour Browne had opined, he agreed with him; but he was entitled to occupy the position of an independent claimant. As between the Water Company and Earl Percy, save as to the item of £20, he was not aware of any outstanding questions at all. It certainly had been the opinion of the Earl's legal advisers that the rights and easements attaching to the manorial water under the Act of 1786 attached also to the water derived from the Newcastle and Gateshead Water Company. On the one hand, the Company obtained these rights; and, on the other, the Earl obtained corresponding advantage through the seventh of the clear annual profits of the whole undertaking—not only the profits from the manorial water, but the profits from the Newcastle and Gateshead water. When the Court had ascertained what the net annual profits were, he should ask for one-seventh; and the only question that might arise was whether in capitalizing this seventh the Earl had not got a preferential position—whether the seventh should not be capitalized at a higher number of years than the rest of the profits.

Mr. FLETCHER MOULTON asked Mr. Cripps whether he agreed, on behalf of Earl Percy, that the right to carry water in the pipes and to store it in the reservoirs of the Company applied equally to water that was not manorial and to water that was.

Mr. CRIPPS replied that it applied equally to manorial water and the Newcastle water—all the water now supplied by the Shields Company.

Mr. BALFOUR BROWNE said Mr. Cripps meant that, if the Shields Company had gone to the Font, he would not have conceded that they could have taken that water through the pipes on Earl Percy's land.

Mr. FLETCHER MOULTON said what the Arbitrator had to value was what the Company actually possessed; and those rights were now defined by various agreements and Acts. Mr. Cripps's admission could not be considered in valuing the Company's concern, unless it agreed with the legal status of the waters. The clause in the Act of 1786 was very peculiar and went to the root of the valuation. If Mr. Cripps would admit that the Arbitrator was valuing the right to use these mains and reservoirs for all water, wherever it came from, it would simplify the matter; but his limited admission was legally incorrect, and could not therefore be accepted.

Mr. CRIPPS remarked that if Earl Percy had the right to take away the privilege as regarded the Newcastle Company's water, he would not exercise it, because he would never dream of doing away with revenue of which he obtained one-seventh.

Mr. FLETCHER MOULTON read the clause referred to in the North Shields Water-Works Act of 1786, from which he said it appeared that rights were given to take any manorial water and to lay down any pipes and works in the manor lands of the Duke of Northumberland necessary to deal with water derived from manorial sources. He thought it was perfectly clear that the limitation of easements granted by the Act was to water obtained from manorial sources. This was a private, and in no way a public right. In 1870, the Newcastle and Gateshead Water-Works Act was passed. The Company had run short of water, and wanted power to get it from another source. They would not have been entitled to supply it to the people and collect rates for it, however, without authority; and so there was an enabling clause which did not touch the private rights and agreement between Earl Percy and the Company, nor the nature of the easement the Company had over his ground, but simply authorized the Company to supply to the public water "B," instead of water "A." If Earl Percy had claimed payment for the use of the easement for Newcastle water, which he had granted for manorial water, unquestionably he could have exacted it—in fact he did so, for he took one-seventh of the extra revenue. If it was conceded that the Company had the right to pass foreign water through these pipes, paying one-seventh of the profits to Earl Percy, he was perfectly willing to take the valuation on that basis. But all that the Company had a legal right to, and could sell, was the easement of passing Earl Percy's manorial water through that pipe. They had no legal right to pass the Newcastle and Gateshead water through. He raised the question now, because there was going to be another arbitration between Earl Percy and the Corporation, as to what they were to pay for all the easements they were taking under another Act. Earl Percy's advisers were 'cute. They knew perfectly well that the Corporation were bound to go for a new supply, so that the power of passing the Newcastle and Gateshead water through these pipes was of no value to them. They would have to buy an absolute easement to pass whatever water they pleased through the pipes. Earl Percy would then say all he had sold



was the right to pass manorial water; and so the Corporation would have to buy the easement over again. The Arbitrator had to value what the Company had—viz., the right to pass water (which right would be absolutely useless to the Corporation) through the pipes which now existed. Either Earl Percy would agree to the works being valued now with the right to use them for any water—which he (Counsel) was perfectly prepared to accept—in which case they would proceed in the next arbitration on that basis; or the Corporation would buy what the Company had a right to sell, which was the right to employ the works for a perfectly useless water.

Mr. CRIPPS said as between the Company and Earl Percy the position had always been that the Company were entitled, in return for one-seventh of the profit of the whole undertaking, to utilize these manorial rights in respect of both sources of supply. The point raised by Mr. Fletcher Moulton, as to whether the rights granted by Earl Percy extended to water from all sources, did not arise under either of the Acts relating to the present proceedings. What Mr. Moulton was seeking to bring in was what might be the subject of arbitration hereafter, when the Corporation went for the Font supply.

Mr. FLETCHER MOULTON said he would take the legal rights of the Company, which were simply to convey and store manorial water, or the totality of an easement. But that must be by the consent of Earl Percy, because under the Acts as at present existing the only rights the Company had were as to manorial water.

The LEGAL ASSESSOR at this point remarked that the Arbitrator had no power whatever to value anything except what was included under the Act of 1897.

Mr. CRIPPS said if, in order to get rid of legal difficulty and possibly future litigation, he could meet the suggestion of Mr. Fletcher Moulton, he would endeavour to do it.

The following evidence was then called:

Mr. Henry Clarke, examined by Mr. FITZGERALD, said he had been Secretary of the Company since 1873. The Company became a joint-stock concern in 1846, when the capital was fixed at £20,000 in 2000 shares of £10 each. Practically the district now supplied was the parliamentary borough of Tynemouth and the outlying districts of Whitley and Monk-seaton, as well as the small township of Murton. The population of Tynemouth was nearly 60,000. Whitley had a winter population of 5000, which was nearly doubled in summer. Additional mains had been laid to meet the requirements of Whitley; but the Company had not yet reaped the full benefit of this expenditure. Monkseaton was also increasing; and the same remark applied here as to Whitley. The manorial water obtained locally—which was exceedingly hard—was supplied mixed with water from the Newcastle Company. The works of the Company consisted of three reservoirs known as the Ridges reservoirs, which were used for supplying the low town section; two reservoirs on Brock Farm in the upper part of North Shields, for the middle section; and the Billy Mill service reservoir, two filter-beds, shaft, and pumping-engine for the higher section; the Whitley springs; and the Marden well. There were also the mains and service-pipes for distributing over the Company's area of about 11 square miles, having a population of some 58,000—the total mileage of pipes being roundly 51 miles—and offices, workmen's houses, &c. Then there were the contracts with the Newcastle and Gateshead Water Company, who could supply 880,000 gallons per day, at an average cost of 3½d. per 1000 gallons. The total storage capacity of the reservoirs was 60,160,000 gallons—practically sixty days' supply. The quantity of water obtainable from the Company's own works daily averaged 105,000 gallons from the Billy Mill station, and 135,000 gallons from the Whitley springs—a total of 240,000 gallons. About 800,000 gallons daily was being taken from the Newcastle Company. Practically they took what they wanted. The water from that Company was delivered at two points—Holystone and Howdon Dene. Under contracts dated 1882 and 1886, the quantity at the former point was 440,000 gallons daily; and under another agreement, dated 1892, they received further water at the latter point, which had amounted to as much as 500,000 gallons in one day. The Howdon Dene water being at a low level, the Shields Company, in order to utilize it, laid down an engine and plant to pump it to a higher level, where it would be really useful to carry on the supply. The cost of this engine and works was £1687, of which only £181 appeared in the accounts. The Company therefore claimed for the balance. The same remark applied to the large capital expended on mains and services since April last. The mortgage debt totalled £37,297 10s., the bulk of which could only be paid off at six months' notice. The Company were in doubt as to when the notice should be given. If the notice could not be given before the transfer, the Company would have to wait six months before repaying the mortgages; and they claimed indemnification for the loss of the six months' interest, or the cost of inducing the bondholders to accept their money before the expiration of this period. The Company were authorized to charge 1s. 6d. in the pound upon the rateable value. They only, however, made this charge where there was a water-closet; where there was no water-closet, 3d. less was charged. The total rateable value which the Company could legally charge, at 1s. 6d. in the pound, and on which only 1s. 3d. was actually charged, was £45,169. If the full charge were made, the gross increase of income would be £514; or, deducting the actual cost of the additional water at 4d. per 1000 gallons, the further net income not shown in the accounts would be about £250.

Cross-examined by Mr. FLETCHER MOULTON: The Ridges reservoirs were now used to store the Newcastle Howdon Dene supply; they collected no manorial water. Originally the Red Burn water flowed into these reservoirs; but shortly before the use of this water was prohibited by injunction, it was diverted and taken to Whitley. Counsel suggested that the use of the water was forbidden on account of its quality; but witness held that the point as to quality was never raised. The action was settled on a question of law. The land on which the Ridges reservoirs were built was held in two pieces—one under the Act of 1786, and the other under an agreement of 1814. Under the latter, a rent of £15 was paid; but this ceased after an action in 1885 as to the mode of striking the one-seventh of the profits, following which an adjustment took place. In the same way, the rent of Brock Farm ceased to be payable. The Brock reservoir was fed now with water from Howdon Dene, so that that reservoir had nothing to do with manorial water. There was a source of manorial water at the Billy Mill reservoir—a shaft 360 feet deep; and water also flowed into the reservoir from Holystone. A rent

or acknowledgment of £20 a year was paid in respect of Billy Mill to Earl Percy's agent.

Mr. BALFOUR BROWNE remarked that this was the £20 which the Company said they should not pay, and regarding which they had not yet settled with Earl Percy.

Witness, in further cross-examination, said he knew nothing of the arrangement under which this £20 was paid. The Whitley reservoir was an old limestone quarry. The water there came from a spring in the reservoir, and from Marden well. This water was pumped at Whitley to the Billy Mill reservoir; and from the connecting main distribution went on. No filtration of this water took place before reaching Billy Mill, except in the case of the Marden water, which passed through a filter of sand and limestone before it entered the Whitley reservoir. The area of the Whitley works was held, part under the Act of 1786, and part under an agreement of 1861. Under the agreement, which was terminable on either side at six months' notice, a rent of £45 was payable.

Mr. FLETCHER MOULTON also handed in the agreement showing that Brock Farm was held at six months' notice, and at a rent of £37 10s.

Cross-examination continued: Until 1882, the water supplied by the Company was all local. Under the 1882 agreement with the Newcastle Company, the North Shields Company could take 15 million gallons at 4d. per 1000 gallons; and if more were wanted, the price was fixed.

Mr. FITZGERALD: They were not obliged to furnish you with any amount if it interfered with their own supply?

Witness: There is a clause to that effect.

They were prohibited also, by statute, from supplying to your Company in any year in which they did not keep 200 million gallons of water between May 1 and Sept. 30?—Yes; down to the repeal by a subsequent Act of the Newcastle and Gateshead Company in 1889.

In further cross-examination, witness said that the next agreement, dated Sept. 13, 1896, was for 12 million gallons monthly, at a cost of £150 a month, whether the water was taken or not; the charge for any in excess being 3d. per 1000 gallons. There was a restriction under which, whenever the Newcastle Company's reservoirs contained less than 800 million and more than 700 million gallons, they should not, unless they chose, be compelled to supply more than 9 million gallons per calendar month. Then there was a sliding-scale under which, if the reservoirs contained less than 500 million gallons, they were free from obligation to supply. The price of 4d. per 1000 gallons for the excess water under the old agreement was cancelled by this agreement, and put at 3d. The prices actually paid for water were: 15 million gallons at 4d.; all the water under the second agreement, 3d.; and the 440,000 gallons under the 1892 agreement, 4d.

Mr. FITZGERALD: Although there was an agreement whereby you were to pay 3d. per 1000 gallons, the Newcastle Company would not supply you excepting at 4d.?

Witness: On the 1892 agreement it was arranged for at 4d.

Although there was an existing agreement fixing the price at 3d.?—We have already stated that. I cannot say anything more.

They were able to name their price?—Yes; after negotiation we agreed to their price of 4d.

You are wholly unable to perform your duties unless you get the assistance of the Newcastle Company?—We would not have gone to the Newcastle Company if we could have done without them.

You could only supply one-fourth of the water required if it were not for that Company?—Certainly.

The one-fourth you get from local sources would not be fit to supply, if it was not mixed with the Newcastle water?—It is not a first-class water alone. I cannot say it is not fit to be supplied. We have to use it because we cannot do without it.

Do the Company say this is water fit to be supplied for domestic purposes by itself?—It is not a first-class water; we must mix it. If we supply it by itself, it is so hard.

The Whitley Quarry reservoir has 94 grains of salt to the gallon, has it not?—It is saline, certainly.

Perceptibly saline?—No; but on analysis the saline shows largely.

The Billy Mill water has sulphuretted hydrogen in it, has it not?—The sulphates are present in it.

Sulphuretted hydrogen that can be smelt?—Yes; there is an odour of it. But it is perfectly eliminated when the water is filtered. At the pump-head, it is perceptible. No drainage, so far as I am aware, goes into it.

Witness was then taken to several local Acts, which he agreed afforded protection to the Newcastle people by excusing the Newcastle Company from supplying the Shields Company in times of pressure.

Mr. FITZGERALD: One quarter of the water you supply comes from local sources?

Witness: Yes.

The whole of the remainder is liable to be cut off in times of serious drought?—Then everybody would be alike.

In times of serious drought?—It would be so.

Very well; and half of the remainder is purely an optional supply?—It is optional. But we have no reason to distrust them.

So that if they get a better customer, they could leave you in the lurch?—They could, if water companies ever do such a thing as drop hundreds of pounds a year. The engine referred to is for the purpose of raising to a higher level water obtained from the Newcastle Company.

Re-examined by Mr. BALFOUR BROWNE: With regard to the pumps and mains laid last year, any increased revenue from them did not appear in the accounts because it had come in since they were made out. As to the suggestion that without the pumps to raise the Newcastle water they could not have performed their duties, it was a fact that the previous year they did so without the pumps. As they had received no revenue from those pumps, a claim on the Corporation was made. Whitley water was being supplied absolutely direct to the consumers, unmixed, because the main from Whitley was used both as a supply and raising main. The analysis which the Company had of the mixed water showed that it was good potable water for domestic consumption.

Mr. BALFOUR BROWNE: As to the agreement with the Newcastle Company, my learned friend suggests that you are precluded from getting the water just at a time when you require it most. Do you think that the water in the large reservoir of the Newcastle Company will ever be so reduced as to make it necessary for them to stop supplying it?

Witness: If it is, it will be at a time of general water famine.



As a fact, the storage of the whole system of the Newcastle Company will be 5000 million gallons when the Catclough reservoir is completed?—That is so.

### Wednesday, Oct. 19.

It had been arranged at the close of the first day to commence this morning at 10.30; and at that hour the parties assembled. From that time, however, till nearly 1 o'clock, Counsel for the Corporation were engaged privately in consultation with the Counsel for the Company and Earl Percy. The principal witnesses were also summoned to the conference; the Arbitrator being assured, on more than one occasion, that the delay would certainly result in shortening the proceedings, and might lead to practical agreement. An adjournment was at length taken till 2 o'clock, when, on the parties re-assembling,

Mr. FLETCHER MOULTON said: My learned friends and myself have been utilizing the time this morning in an endeavour to come to an amicable settlement; and I am happy to say that there is every prospect of its succeeding. In fact, an arrangement has been offered by my friends Mr. Balfour Browne and Mr. Cripps to my clients which all their representatives here are prepared to advise should be accepted. I am glad to say it settles many other things besides those that are formally included in this arbitration; and therefore it is necessary that my clients' representatives should go back to their Council for formal authority to accept it. We therefore ask you to adjourn the arbitration *sine die*. The exact form of the settlement will be, I think, a matter for Counsel to consider, because it may be that one method of carrying it out will involve less legal difficulty than another. But as the nature of the settlement is agreed, the actual formal manner in which it is carried out will not be a serious question. I make this request with the more certainty of its being accepted from the fact that my clients bear all the costs of the arbitration, and so anything that would cause greater expense would come on them. They are sure, therefore, not needlessly to ask for an adjournment.

Mr. BALFOUR BROWNE said they had arrived at a settlement which would embrace perhaps even more than had been fully discussed. He believed that the Corporation would endorse the views of the Committee who were instructing Mr. Moulton. It was really only a formal adjournment they were asking. Probably when they had put into writing the terms which were agreed, the award might be made as an agreed award.

Mr. FLETCHER MOULTON thought that would probably be best. Perhaps it would be better to appoint the present Arbitrator as Arbitrator also under the other Act, and have the award under both.

Mr. CRIPPS, speaking for Earl Percy, quite endorsed what Mr. Fletcher Moulton and Mr. Balfour Browne had said, that the subject was a mere point of form, the matters being agreed. He thought it would probably be best to enlarge the Arbitrator's power so as to make his award settle all the matters between the parties.

The proceedings were then adjourned *sine die*.

## THE PROPOSED PURCHASE OF THE FALMOUTH GAS AND WATER WORKS BY THE CORPORATION.

### Mr. Silverthorne's Report.

In anticipation of the statutory meeting of ratepayers to consider the proposal of the Falmouth Corporation to purchase the gas and water undertakings, there has been circulated in the borough the report which Mr. A. Silverthorne has made to the Corporation on the scheme. The report is prefaced by a brief note by the Mayor (Mr. C. Deeble), in which he says that he and other members of the Corporation in favour of the scheme believe it will be to the advantage of Falmouth and lead to a reduction of the rates.

Mr. Silverthorne expresses the opinion that the purchase of the two undertakings will be a perfectly safe investment of municipal funds, which will relieve the rates, and greatly add to the sanitary interests of both Falmouth and Penryn. In the ratepayers' interest, questions of value sometimes cannot be treated as fully as desirable, because of inducing inflated demands on the part of the sellers; but in this case there appears to be no reason for keeping anything back from the ratepayers—the Gas Company having already raised claims for which there can be no justification whatever, “and which they will never establish should they ultimately prefer arbitration to negotiation.” Both the gas and the water undertakings are paying concerns, and will come under the head of productive assets. There are a large number of precedents of cases in which such undertakings have been acquired by the ratepayers—some comparatively recent—which have given perfectly satisfactory results to the purchasers. The one instance opposed to this is the Cowes case, and that has been seized upon to raise a claim for £60,000 for the Falmouth Gas-Works, which is perfectly ridiculous.

The usual advantages appertaining to the purchase of gas-works are described by Mr. Silverthorne as reductions in price, relief of rates, redemption of capital, abolition of meter-rents, and reduction of expenses in public lighting. This class of undertaking is purchased absolutely on its invested capital. This is £13,500 in the case of Falmouth. There may be some difference of opinion as to what the £1 shares of the Company have fetched when totally uninfluenced by prospects of purchase; but Mr. Silverthorne contents himself by indicating that at £2 14s. each, at which a considerable number of shares changed hands early this year, the value of the undertaking could not exceed £36,460. The opinion expressed in his report of October, 1896, that the undertaking is not worth more than £33,750 is, however, strengthened by the circumstance that the Company have lately introduced a water-gas plant. This is a tacit admission that they are unable much longer to go on supplying ordinary coal gas with safety, upon the resources of their undertaking. It would have paid the Company to remove their works; and it will eventually pay the Corporation even better to remove them, because they will be able to take advantage of the cheapness of money. One reason why the works afford an advantageous purchase is because they are not over-capitalized; but they should not on this account be paid for on the footing that they are fully equipped to go on, just because the Company have been advised from London to put up a water-

gas plant to eke out their existence in their present situation. The supply of water gas in a locality like Falmouth is most undesirable. The total profits of the Company were £2034 in 1895, £2353 in 1896, £1941 in 1897, and £1319 in 1898. The depreciation of the profits last year was chiefly due to extensions and the erection of the water-gas plant. Under normal conditions, there should be a profit of £2536 with gas at 3s. 4d. per 1000 cubic feet, inasmuch as in 1899 his estimate that the sale of gas would reach 34 million cubic feet is clearly about to be realized. Interest on the purchase-money (£36,450) at 3 per cent., and the amount necessary for the sinking fund to extinguish the debt in forty years, would come to £1574 annually; leaving a margin of about £1000 net profit on the present price of gas. Mr. Silverthorne explains, however, that he never contemplated that £1000 should be made out of the works, and 3s. 4d. per 1000 cubic feet is too high a price to be charged to consumers.

The purchase of the water-works is desirable because Falmouth depends entirely on maintaining a high reputation for sanitation and water supply. The Falmouth water is evidently of the highest purity, and without the least contamination at its sources; and there is no evidence that the pollution which exists cannot be entirely removed by care and attention. Municipal control could alone keep the supply permanently above suspicion. The present reservoir is too small to deal with the increasing supply of a district of 16,000 inhabitants. The watersheds of the two feeders are capable of contributing a daily supply of a million gallons to Falmouth and Penryn, but not upon the present capacity of the reservoir. The ordinary and preference stock of the Company amounts to £37,500; and the mortgage and mortgage debentures, to £8750. If it be possible to acquire the works either by negotiation or compulsorily, a better opportunity than the present for acquiring them upon reasonable terms will never occur. The Company have paid no dividends on the ordinary stock for two years, and the present outlay on filtration works, and prospective expenditure on reservoirs, mains, &c., may prevent them for some years reaching the maximum dividend on the ordinary stock. The Company have besides an unexhausted capital amounting to £33,500, which may be issued as the ordinary stock or as preference stock at a maximum dividend of 6 per cent. A time must be reached, as the undertaking develops more revenue and requires further outlays of capital, when the dividends paid will be greater in amount, and the proportionate cost of acquiring the works far in excess of what it would be now. The present value of the stocks on a liberal computation is £52,125; and in addition there are loans amounting to £8750 which would have to be taken over. The amount required for interest and repayment over a term of sixty years is £2454. Allowing the benefit of the saving due to the abolition of Directors' fees, commission, and London charges, the amount would be £2552. This admits of the Corporation making a small surplus, to which should be added the increase in revenue, which is 3 per cent. per annum, by the time the purchase could be carried out. This would, however, be sunk in the reduction in rental, consequent on the transfer of charges from the rental to the net rateable basis. No rate-in-aid should be needed from this loss of rental. On the contrary, a slight relief of rates should result from the different basis of charge.

In conclusion, Mr. Silverthorne sums up the result of the purchase of both undertakings. The net income which the Corporation would receive from the profits on the gas and water would be £5088. The liabilities are as follows:—

|              | Purchase-Money.   | Interest. | Sinking Fund.   |
|--------------|-------------------|-----------|-----------------|
| Gas . . .    | £36,450 at 3 p.c. | £1,094    | £481 (40 years) |
| Water . . .  | 52,125 “          | 1,563     | 459 (50 years)  |
| Water loans. | 8,750             | 355       | 77 (50 years)   |
|              | £97,325           | £3,012    | £1,017          |

On the basis of this calculation, the Corporation would, Mr. Silverthorne says, have a net annual surplus profit of £1059. The cost of the Act would be about ten annual payments of £156. Surplus profits on the water would probably be devoted to the reduction of water-rates. As to the gas, the consumption doubles in nineteen years; and the Corporation would have at the end of this period a further developed source of profit equal to about £1600 per annum. The idea that such undertakings cannot be as well managed by corporation committees as by boards of directors is a perfect misconception; and a great injustice to their managers, who are chiefly responsible in either case. The purchase of the two undertakings is explained as a financial measure calculated to ensure the ratepayers against risk of loss. If they should not succeed in getting parliamentary sanction for the purchase of the water undertaking, the whole of the costs would, if it were taken singly, fall upon the ratepayers. With a joint scheme this cannot happen, as under their Act of 1890 the Gas Company are obliged to sell; and the costs of the Bill will be borrowed on short loan.

**The Public Lighting of Downham Market.**—The lighting controversy at Downham Market is now ended, and the streets of that brisk little Norfolk town will in future be lighted by paraffin lamps. The Gas Company, it may be remembered, wished to increase the contract price for the public lamps; and the Council declined to agree. The new lamps are reported to be very good of their kind; while the cost for oil is said to compare favourably with that for gas.

**Heywood and Middleton Joint Water Board.**—Last Wednesday the first meeting of the newly-established Heywood and Middleton Joint Water Board was held at Heywood. Prior to the formation of this Board, the Heywood Town Council have been the owners of the water-works in the Nayden Valley; and their area of supply has included Middleton and other places. In the last session of Parliament, Heywood promoted a Water Bill; and as the result of negotiations between the Councils of the two boroughs, it was agreed to insert in the Bill clauses providing for the formation of a Water Board (consisting of six representatives of each Council), in which the Heywood water undertaking should be vested, and by which its affairs should be controlled. There was not much business to be transacted at the first meeting of the new authority; but Mr. Sutcliffe Firth, Chairman of the Heywood Water and Baths Committee, was elected the first Chairman, and Mr. J. Aspell, of Middleton, the Vice-Chairman. The meetings of the Board will be held alternately at Heywood and Middleton.



## SALES OF STOCKS AND SHARES.

At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards conducted a sale of debenture and ordinary gas and water stocks and shares, mostly by order of the Directors of the several Companies. The first lots submitted for competition consisted of £10 shares in the Southend Water Company, ranking for a maximum dividend of 7 per cent.; the dividend for the year ending Dec. 31 last having been at the rate of  $5\frac{1}{2}$  per cent. per annum. The prices averaged £16 3s. 1d. per share, yielding upon the investment £3 8s. per cent.; the total amount realized being £8077 10s. The next lots consisted of the new issue of 4 per cent. perpetual debenture stock by the Directors of the Alliance and Dublin Consumers' Gas Company, already referred to in the "JOURNAL." The whole of the stock was not disposed of; but that which was sold realized £120 per £100 of stock, yielding the purchaser £3 6s. 8d. per cent. Some £10 "A" shares in the Walton-on-Thames and Weybridge Gas Company, bearing 7 per cent. dividend, were sold (by order of executors) at an average of £16 10s. 1d. apiece; producing £4 4s. 10d. per cent. A new issue, by order of the Directors, of ordinary stock of the Plymouth and Stonehouse Gas Company, bearing  $6\frac{1}{2}$  per cent., was next offered; and a large proportion of it was disposed of at £150 per £100 of stock—returning the purchaser £4 1s. 8d. per cent. The last lots were £10 shares in the Hampton Court Gas Company, bearing 7 per cent. dividend. These were sold by order of executors, and fetched, on an average, £17 3s. each; giving the purchaser £4 1s. 7d. per cent. upon his investment.

Among other recent sales of shares, the following may be noted: At Tamworth yesterday week, 275 £2 shares (£1 15s. paid) in the Fazeley Gas Company were sold at prices ranging from £2 5s. to £2 8s. each. In order to meet the cost of an extension of the mains, the Directors of the Marlow Gas Company, Limited, decided to issue £2500 of new capital (7 per cent.) in £10 shares. These were offered for sale by auction by Messrs. Lawrence and Son, at the Crown Hotel, on the above-named day. The prices per share ranged from £11 5s. to £12 2s. 6d.; the average being about £11 9s. The remaining 775 new ordinary shares of the Airdrie and Coatbridge Water Company, authorized to be issued under the Airdrie and Coatbridge Water Company's Amendment Act, 1892, were offered for sale in the Airdrie Burgh Court Hall last Tuesday. The shares, which were £10 each, and put up at 10 per cent. above par, were sold in lots of 20. The average price realized was £13 16s. 3d. per share; being a decrease of 9d. on the average of the previous sale. Recently 60 £10 shares (7 per cent., but now, under the sliding-scale, carrying 9 per cent.) in the Bideford Gas Company were sold at an average of £18 15s. 6d. each. At Winchester, ten original shares of £25 each in the Winchester Water and Gas Company were lately disposed of for £61 apiece; five similar shares fetching £60 each.

## THE LONDON COUNTY COUNCIL AND THE WATER SUPPLY.

## Proposed Purchase of the Water Companies' Undertakings.

The following are the recommendations of the Water Committee of the London County Council, forming the conclusions of a report to be considered at the meeting of the Council next Tuesday. They are dealt with in our article on "Water and Sanitary Affairs":—

- 1.—That a Bill be promoted in the coming session of Parliament for the purchase by the Council of the undertakings of the eight Metropolitan Water Companies, by agreement, or failing agreement by compulsion.
- 2.—That, subject to such provision as may be made by Parliament as to the ultimate relationship between London and the outside authorities, provision be made for the undertakings of the Companies vesting in the Council at a date not later than six months after the passing of the Act.
- 3.—That the Bill contain provisions authorizing the Council to proceed forthwith with the connecting and laying of mains and other works necessary in order to enable it to protect any part of the Metropolis from want of water.
- 4.—That the arbitration clause be so framed as to render it certain that in the case of each Company the arbitrator will have regard to all such circumstances as may be brought before him, and that no allowance shall be made in respect of compulsory sale except for cost of reinvestment (if any).
- 5.—That, subject to further negotiation thereon with the Local Authorities, the clauses with respect to the supply of outside areas should follow the principle of the Bills promoted by the Council in 1895.
- 6.—That the understanding with the Corporation of the City of London, with regard to their representation on the Water Committee, be adhered to, if they so desire.
- 7.—That a Bill (or Bills) be promoted in the coming session of Parliament for the purpose of empowering the Council to bring an additional supply of water to London from the watersheds of the Wye and Towy on the general lines of the report of the Water Committee approved by the Council, April 21, 1896, in so far as it applies to the Wye section of the Engineer's scheme.
- 8.—That it be referred to the Parliamentary Committee to prepare and present to the Council the necessary Bills for carrying out the above resolutions.

**Unaccounted for Gas at Huddersfield.**—Some time ago, Mr. Barras, a member of the Huddersfield Corporation, made a statement to the effect that the average leakage of gas amounted to more than 20 per cent. At the meeting of the Town Council last Wednesday, the Chairman of the Gas Committee (Alderman Stocks) called attention to the matter. He reminded the Council that at the time he stoutly denied the statement, which he expected would have been withdrawn. He said he had recently made inquiries of the Gas Manager (Mr. E. A. Harman), and he had found that the average leakage was only  $8\frac{1}{2}$  per cent., which was a very favourable comparison with other large towns. Mr. Barras said he did not intend to withdraw the statement, and in support of it he submitted figures to the Council, which, he said, proved the leakage to be about 20 per cent. of the quantity manufactured. He would, however, return to the subject at an early date with fresh facts. Alderman Stocks said it only remained for him to declare that Mr. Barras's statement was untrue, and that the leakage of  $8\frac{1}{2}$  per cent. was the exact quantity.

## ELECTRIC LIGHTING NOTES.

The Local Government Board have declined to receive a deputation from Bury St. Edmunds as to re-opening the question of electric lighting in the borough. After holding a public inquiry, the Board decided not to sanction a loan of £20,000 for electric lighting purposes. A modified scheme was suggested; but it did not find favour with the Town Council, who reverted to the original scheme. In the hope of urging its advantages, the deputation had been appointed with the view of obtaining an interview with the Board.

Singularly enough, Brighton was not the only place put to inconvenience last week by the failure of the electric light. On Wednesday night and Thursday morning, one side of almost the whole area over which the electric lamps supply the public lighting of Dublin was in partial darkness. The appearance of the principal thoroughfares was very gloomy. The absence of the usual amount of electric light is attributed to the relaying of cables, which necessitate the non-working of some circuits during the operations.

"May I be allowed to inquire how long the inhabitants of this part of the city are likely to be annoyed, and their property damaged, by the immense clouds of dense black smoke which are being poured forth in such volumes from the chimney-stack of the electric light works?" So writes an aggrieved resident of Exeter to one of the local papers. His complaint shows that London is not the only place in which electric light works have come into disagreeable prominence as polluters of the atmosphere. The writer is of opinion that "in any other place such an exhibition as we are daily being subjected to would not be tolerated," which proves that either his faith in municipal management outside Exeter is large, or that his knowledge of other places is small."

A step has been taken by the Huddersfield Corporation the result of which will be awaited with considerable interest. The General Purposes Committee (which consists of the whole Council) have instructed the Borough Engineer, the Water Manager, the Electrical Engineer, and the Tramways Manager to report upon the practicability of utilizing the water of the Corporation works in the Wessenden Valley, seven miles from Huddersfield, for the purpose of generating electricity for traction or lighting purposes. They have given those officials power to obtain such expert opinions as they, in consultation with the Mayor and Town Clerk, may deem necessary. A few months since Sheffield was making a similar investigation; and the conclusions then arrived at might be useful to Huddersfield.

On Sunday, the 9th inst., there was an extinction of the electric light at Oldham just before six o'clock in the evening; and it lasted for about twenty minutes. It appears that the current had been turned on, when a man in charge at the supply station switched it off, and must have lost himself, for he could not again get the supply along the particular cable. After a few minutes, he went for the Chief Electrical Engineer (Mr. S. W. Newington), who soon put the matter right. In the meantime, much inconvenience was felt at the various churches and other places lighted by electricity. At public-houses where this illuminant had been introduced, and the gas-brackets removed, the inconvenience for the time being was the greatest. In referring to this matter a local paper says: "This shows that it is not wise to solely depend upon electricity, either as a lighting medium or for power purposes."

One by one the towns in the West of England are receiving the attention of the promoters of electric lighting schemes. The latest to be so honoured is the quaint old borough of Totnes. A firm of electrical engineers in Westminster have entered into a contract to purchase the Town Mills and buildings, with the intention of obtaining a Provisional Order for the supply of electricity in the town. In communicating this information to the Town Council, they asked that body to not only give the scheme their hearty support, but to undertake not to oppose their application for a reasonable time, in order to enable them to apply with greater confidence to Parliament. The Council decided to consent to the application on terms to be arranged. The Mayor (Mr. R. W. Hayman) remarked that the Gas Company had done their best to give the town a good light; but it was useless to oppose the introduction of electricity. Mr. Kellock, a Director of the Gas Company, assented, and expressed the opinion that there was room for both illuminants.

With a view to satisfying the users of electric light at Cape Town that they have not been greatly overcharged for the last winter's consumption, the Town Council have directed the preparation of an elaborate return, showing the electric current generated and sent out. It is to give the quantity of electrical energy sent from the generating stations every 24 hours, the quantity received at the battery with the percentage of loss in transit, the quantity sent from the battery station to the street-lighting system and to private consumers, with monthly statements of the total debited to the Council and to private consumers. The return is to apply to the four winter months of May, June, July, and August in each of the three years 1896-8. It is to be hoped the consumers will be satisfied when they have it. The object of requiring the return for previous years as well as this one is, of course, to test the truth of the allegation that the consumers' meters formerly in use registered less than the actual quantity. As the number of consumers and lamps has greatly increased, the process of checking the individual account from the gross consumption will be an elaborate one. On June 30, 1896, there were 203 consumers, with a total of 8000 8-candle power lamps or their equivalent; by June 30, 1897, the consumers had increased to 275, and the lamps to 13,000; and on June 30 last there were 360 consumers and 16,000 lamps in use.

Last Tuesday was an eventful day in Belfast, inasmuch as it witnessed the laying of the foundation stone of the New City Hall, on the site of the Linen Hall in Donegall Square, and the opening of the new electric light station—both functions being performed by his Excellency the Lord Lieutenant of Ireland (the Earl of Cadogan). The old station being found inadequate, a site for a new one was obtained in the Lagan Bank Road, where a building has been erected to contain machinery equal to 1000-horse power; the station being large enough for five times this power. The entire site will be equal to 20,000-horse power. The whole scheme has been devised by Mr. V. A. H. McCowen, the Chief Electrical Engineer to the Corporation. In the engine-house are three sets of Belliss-Parker steam dynamos—two of 100, and two of 200 kilowatts; while the boiler-house is arranged to take ten Lancashire boilers, 30 ft. by 8 ft., four of which are at present erected and working. The current



is distributed on the three-wire low-tension system, 440 volts between the outer wires, or 220 volts between the outer and the middle wire. The most distant point supplied is about 2½ miles from the generating station. There is at present an equivalent of 29,000 8-candle lamps connected to the mains, including 150-horse power in motors; and applications have been received for an equivalent of 8000 similar lamps in addition. The Brighton system of charging for the current has been in operation since July 1.

More complaints were made at the Hampstead Vestry on Thursday about the eccentric conduct of the electric arc lamps in the High Street. This time the reason given by the Engineer was that the current was generated by a new dynamo which was not in thorough working order. Several members instanced other occasions when the electric lamps refused to give light; but Sir Henry Harben, the Chairman of the Vestry, practically stopped further discussion by vehemently deprecating these public admissions of the failure of the electric lighting plant. As a trading concern, he argued, it was unwise, and was comparable to a bird fouling its own nest. The Engineer should always be consulted on such matters. During the discussion on a recommendation that 28 additional gas-lamps should be affixed in certain scheduled thoroughfares, a member suggested that the incandescent system should be tried; but Sir Henry pointed out that this subject had already been considered. The Committee reported that during September 47 consumers were connected, representing 2840 8-candle lamps; making a total of 71,367 8-candle lamps in use. Several ratepayers have complained that the rural aspect of Haverstock Hill would be entirely spoilt if any further cutting away of the foliage of the trees in immediate proximity to the arc lamps were allowed. The Vestry decided that no further cuttings should be made. The bad position of the lamps is responsible for this latest trouble.

The following appeared in last Friday's "Daily Telegraph": "A sensation was caused at Brighton last night by the sudden failure of the electric light service. The stoppage was only temporary—beginning at ten minutes past nine o'clock, and lasting for twenty minutes. During that period, however, Brighton had a unique experience. For the first time on record, its magnificent sea-front was in darkness save for the gas-lamps always kept burning outside the Old Ship Hotel and the Alhambra, the electric lights over the portico of the Hôtel Métropole (which has an independent installation), and the lanterns dimly burning of the line of cabs on the ranks on the seaward side of the King's Road and Marine Parade. On the West Pier, some gas-lights also helped to break the darkness; otherwise the only lights visible were the lines of lamps that illuminate the Hove quarter. The contrast between the gloom of a rainy night and the brilliant illumination which makes the Brighton front as bright by night as by day, was extremely striking, owing to the energetic management that the Corporation have bestowed on their electric installation. Not only the King's Road and Marine Parade—in other words, about three miles of the sea-front—have been provided with an electric illumination, but the main arteries of the town, including North Street, Queen's Road, West Street, the valley of the town, and many of the tributary streets in all parts of the borough have been furnished with the new illuminant, conveyed partly through the lamps formerly used for gas, but in the main by lofty standards. In a great number of public-houses, hotels, and private residences, electricity has also been introduced, as well as in all the theatres and music halls. The surprise caused when the light suddenly grew dim, and then became extinguished altogether, was accordingly widespread. The inconvenience that resulted was felt chiefly in the private houses where, the electric light having been furnished, the fittings for gas had been discarded. In the theatres and music halls, the managements have in all cases retained the use of gas as well as employing electricity. This precaution, fortunately, was the means of averting any possible cause for alarm. In the public-houses, candles were promptly pressed into service, and business went on as usual amid considerable merriment."

The subject of "Municipal Corporations and Electric Lighting" was discussed at the autumn meeting of the Association of Municipal Corporations, held at the Westminster Palace Hotel last Wednesday. It came up on a motion submitted by the Mayor of Nottingham, in the following terms: "That this Association affirms the principle that where local authorities have, with the sanction of Parliament, established undertakings for public benefit, and have not failed in the performance of their duties, it is not right or expedient that powers should be granted to companies to compete with such local authorities." He remarked that while the municipal authorities were manifesting a growing desire to undertake the responsibility of lighting their towns by electricity, the Bill promoted by the General Power Distributing Company must have startled many of them; and they must have been still more surprised that a Committee of that House of Parliament which some of them were accustomed to regard as the one which could be relied upon to protect the rights of property and of Corporations, had passed the Bill. It applied to a large and populous area, comprising some 2000 square miles in the Midland district, including in its limits the cities of Lincoln, Sheffield, and Nottingham; and it proposed to allow a Company to supply electricity in that area without any Order or proceedings of the Board of Trade; to compete in Sheffield, Lincoln, and Nottingham with the Corporations of those cities; and to compete not only with those municipal bodies which had already obtained the power to supply electricity, but also with those who might hereafter obtain such powers. It was wrong and vicious in principle that the settled practice of Parliament should be set aside in favour of a particular Company by a Private Bill. The question was of importance to all municipal authorities, for, if the Bill passed into law, it would establish a precedent that would quickly be followed in regard to other districts, and its evil effects would be felt throughout the country; but if the public authorities represented in the Association were united and determined in their opposition, they possessed the power to defeat the measure. The Lord Mayor of Sheffield seconded the proposition; and it was carried unanimously. The matter was referred to the Council of the Association, with the view of opposition to the Bill being organized.

**Incandescent Lighting at Gravesend.**—By twelve votes to six, the Gravesend Town Council have passed a resolution instructing the Paving, Lighting, and Watch Committee to make arrangements for lighting the streets with incandescent gas-burners.

## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The subject of the supply of water-pipes from America to the Glasgow Corporation is not out of sight yet, and is not likely to be for some time. It was mentioned at a meeting of the Town Council on Thursday, when one of the members asked whether it was true that Messrs. Wood and Co., of Philadelphia, were likely to be unable to fulfil their contract. The reply given by Mr. Osborne, the Convener, was that there had been correspondence with Messrs. Wood, from which it appeared that there was a possibility of their not being able to deliver the pipes within the contract time. If this should happen, the Committee would be put to great inconvenience. The Committee wished power, in this event, to fall back upon the offer of Messrs. McLaren and Co., of Glasgow. This power was granted. I observe that a town councillor, speaking at one of the ward meetings, stated that he voted for the acceptance of the American tender in order to break up a ring of pipe manufacturers in Glasgow, who were sweating the ratepayers; and that it had had effect, for a contract had been signed for 5000 tons of pipes at a rate 15s. per ton cheaper than the price paid to the American firm.

At this season the air resounds with the voice of the municipal candidate, whose number is legion. The most conspicuous of these speakers this week was Treasurer Williamson, of Peebles, who explained to the electors on Monday night the position of the gas question in that town. Mr. Williamson has been the soul of the movement for the transfer of the gas undertaking to the Corporation. He deserves to have it recorded of him that he has managed the matter with the most consummate skill and ability. There was a threatened danger, at first, of his endeavouring to unduly depreciate the Gas Company's undertaking; but it is altogether to his credit that, whenever facts were placed before him, he accepted them without reserve, and that he has since striven, with success, to promote an agreement which is without doubt fair to both parties. One other meritorious feature of his action is that, in the course of the process of informing himself upon gas subjects, he has procured, at what must have been great trouble and cost to himself, the most reliable information obtainable with reference to the prices paid in other transfers. It was these that he chiefly dealt with in his address to the electors. He brought out that, while in Peebles the proposed price would be at the rate of £1000 for every million cubic feet of gas sold, in Dunfermline the price was at the rate of £1700 per million; and that, while in Peebles they were to redeem their mortgages at the rate of £157 10s. per £100 of stock, in Edinburgh the redemption of annuities was fixed at the rate of £285 per £100. Mr. Williamson made out his case, that they were getting the gas undertaking upon terms which were more favourable than any that he knew of. The ratepayers are likely to homologate his action. If all goes well the transfer will be the cheapest on record. For one thing, the Corporation have not gone the length of even taking the advice of a gas expert on the matter. Mr. Williamson was asked about this, and his reply was that in Mr. W. Young, of their own town, they had an expert than whom there was no better in Britain. Mr. Young is a Director of the Gas Company; but they were satisfied that he met them in a fair, upright, and honest spirit, and gave them admirable counsel. This tribute to Mr. Young is one which everybody will endorse.

In Dundee, one of the subjects before the electors is the extension of the Corporation Gas-Works. Speaking on this question, Mr. Longair, who is at present in the Town Council, said that while Dundee was fighting for its commercial existence, he was not one of those who thought that the city had no future before it. During the past six months, 17 million cubic feet more of gas was made than in the summer six months of last year. They might therefore expect that it would be a difficult matter to get through the coming winter with the present plant.

At Dunfermline, Mr. Blair, a town councillor, makes the complaint that when the Gas Committee were appointed, the understanding was that no business of vital importance would be done without consulting the whole Commission. The fixing of the price of gas was, he considered, a matter of importance; and he was much surprised when, on the balance-sheet being presented last year, they were told that the Committee had fixed the price of gas, and that the Commissioners had no right to interfere. If he were returned to the Council he would insist that the whole Commission should have a say in matters of importance.

At Hamilton, Bailie M'Hale, the Convener of the Gas Committee, made a few interesting comparisons. He said that in justice to the Gas Manager, and also to the Committee, he thought he might be allowed to give some contrasts of the present state of gas supply as compared with former times; and he believed these contrasts would be ample justification for the expenditure made at the works. The funded debt amounted to £36,250; and on the other side, there was the value of the gas-works as a commercial concern, which he put at £110,000 or £120,000. But taking it at £110,000, this left £73,000 in favour of the works. The contrast between the wages bill of 1892 and last year was only £170; and yet they were making almost double the quantity of gas. In other words, they were making as much more for an increase of £170. The results mentioned were in great measure due to the Manager (Mr. Ewing) and also to the staff under him. He went on to show that in 1892, the average wage of the workmen at the gas-works was 25s. 6d., and now, with much shorter hours, it averaged 30s. per week; so that the difference was not made at the expense of the men, but by improved methods.

The Sub-Committee of the Glasgow Corporation Gas Committee, on Monday, discussed at considerable length the subject of the site for the new gas-works. Their recommendation to the parent Committee is to adopt the site at Blochairn; but it is stated that there was considerable difference of opinion in regard to the recommendation. It may be taken for granted that those who object to a gas-works being planted in their neighbourhood will wield, with all the power they can, the argument that the site is not in itself suitable, on account of its elevation. Mr. Foulis will be able to deal with that argument to the satisfaction of everyone except those who may have an objection to being convinced. This is an excellent time for gauging public opinion on the subject; and I should say, judging from the tone of the remarks at meetings of electors, other than those in the East-end, the reception given to the proposal to build a gas-works there is not hostile. If, therefore, the Gas Committee adopt the site, it should be easily carried in the Council.

That acetylene gas is likely to take the place of coal gas in some places—chiefly small ones—may be expected. It has done so already in



one or two little towns in Scotland. In Portsoy, as has been already stated, an installation has been started. It appears that the gas-works were for about 10 years the property of Mr. Adam L. Gillan, a resident in the town, and that the Police Commissioners acquired the whole plant from Mr. Gillan for £200. The works were quite worn out, as is the case in many small towns. There was a favourable opportunity for making a change, if a change were to be thought of. The Commissioners resolved to give acetylene gas a trial. They have had erected a Kay's patent No. 8 generator, with eight retorts, each capable of holding 20 lbs. of carbide, a scrubber and washer, two purifiers, and a station meter. The gasholder is the one that was used for coal gas. In the town the whole of the mains and service-pipes have been renewed. The cost of these works is about £1500. This sum, with the £200 paid to Mr. Gillan, will make an exceedingly small capital for the supply of gas to a town with a population of slightly over 2000. So far the venture has been successful. If it continues to be so, the Police Commissioners will not be grudging the credit which will be their due; but it was a bold undertaking on the part of the Police Commission of so small a town to convert the whole of the gas supply at one stroke from one system of lighting to another. It would have been more prudent to have had an experiment for at least one season in a particular district.

The first of the thoroughfares in Edinburgh which the Gas Commissioners have agreed to light by means of the new Welsbach incandescent gas system, has been fitted with the burners. It is what is known as the Middle Meadow Walk. There are 27 lamps in it, two of which are clusters of three lights. With the lamps 25 yards apart, the illumination is an undoubted success, if other conditions should prove favourable. As to ability to stand the weather, no better test could have been brought to bear upon the system than on Monday and Tuesday last, when the mantles had been in use for a few nights. The storm of wind and rain which then beat upon the lanterns, in a very exposed situation, too, was sufficient to try them most thoroughly. When the storm was at its height, the illumination of the mantle was not so perfect as in still air; the top part being considerably duller. Next day it could be seen that the mantles had been somewhat knocked about, and were, in some instances, a little frayed. None of them, however, were broken, or required renewal. This result must be considered to be altogether satisfactory, when it is remembered that a gale of such severity and continuance has not been experienced during the past 25 years. Since the beginning of the week, the lamps on one side of the thoroughfare have had holophane globes fitted on to them, which improves the effect.

The Arbroath Gas Corporation met on Monday to consider the motion, notice of which was given by Mr. Strachan last week, to rescind a resolution to apply to Parliament for borrowing powers to the amount of £15,000. Mr. Strachan moved his motion, and in support of it used the very negative arguments that they did not require to borrow money in the meantime, and that he would like to know what it was wanted for. It was explained that the borrowing powers were exhausted; and that if they had authority to borrow a considerable sum, they would get money cheaper than if the amount they could borrow were small. They had, it was further explained, no particular object in view in seeking the borrowing powers. Mr. Strachan's motion was rejected by 11 votes to 20.

The Stirling gas controversy would appear to be almost interminable. The Town Council had another hot discussion upon it on Monday. This time it was the expenses of the opposition to the Gas Company's Bill which was the bone of contention. These have been taxed by the Auditor of the Court of Session, and reduced from £2662 to £2595—a difference of £67. A long discussion took place, of a not very friendly nature, at the end of which the Council agreed to remit to the Town Clerk to say from what fund the money is to be drawn to pay the accounts.

Provost Mitchell, of Montrose, is necessarily a Magistrate, and is, in the course of his duties, under the necessity of, at sundry times, applying his mind judiciously to various questions. That he is not very specially gifted in that direction is demonstrated by his conduct in allowing himself to be sued by the Montrose Gas Company for £16 13s. for gas supplied to him between Feb. 1, 1896, and May, 1898. The action came before Sheriff Lee at Forfar on the 13th inst.; and the defence, which was simply that the quantity of gas charged for was not burned, was pressed to the extent of taking the evidence of Mr. T. Douglas Hall, the Manager at Montrose, of his meter inspector (Mr. A. Low), and of the Provost himself. The evidence disclosed that the dispute had reference only to the gas charged for in the quarter beginning in February, 1896. Since May of that year, there had been no cause for complaint. In that quarter, the quantity of gas consumed amounted to 51,200 cubic feet, as compared with 35,600 cubic feet in the corresponding quarter in 1895. When complaint was made, the meter was sent to Edinburgh to be tested, and it was there certified to be one-half per cent. slow, and was stamped as correct. The Sheriff said he did not think there was any doubt that the Provost had good grounds for complaint at the charges for gas which he had been called upon to meet, but he thought it must be the experience of every careful householder that such great discrepancies in gas accounts were quite common. One knew from experience that a large gas bill produced for the next quarter an amount of vigilance which resulted in a quite startling reduction of the account. He had little doubt here that, had the Provost made careful inquiries, he might have discovered where the waste was going on in his own house. He was displeased at the extent of the account, and, his Lordship had no doubt, showed his displeasure in his own house as well as to the Gas Company, with the result that there had been in subsequent periods the very large reduction referred to by the defence. The resisting of payment practically amounted to a counter-claim brought by the Provost against his own meter. On the part of the Company, the statutory regulations had been complied with; and decree must be given for the amount sued for, with expenses.

**Proposed New Water-Works for Warrington.**—The Corporation of Warrington have under consideration the question of providing additional storage accommodation for water for manufacturing purposes for the town; and with a view of increasing these facilities, they have called in to advise them Mr. James Mansergh, of Westminster. This gentleman has inspected the district, and has notified the Council that he is in favour of the provision of a new reservoir on the Cheshire side of the town, in close proximity to the old water-works. Further extensive works at Winwick are suggested. Powers will be sought next session to enable the Corporation to carry out the proposed works.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Oct. 22.

**Sulphate of Ammonia.**—The market on the east coast continues to be very quiet; and the quotation f.o.b. Hull and Leith remains at £9 10s. per ton. At Liverpool, there has been a fair demand; and, supplies being small, full prices have been paid in the case of urgent orders for immediate delivery. The closing quotation is £9 13s. 9d. to £9 15s. per ton. Consumers mostly maintain an attitude of indifference; and the buying has mainly been for covering purposes. The forward position is unchanged; London make, Beckton terms, being still quoted £9 10s. per ton, delivery last three months of the year.

**Nitrate of Soda** is steady at 7s. 7½d. per cwt. for good, up to 7s. 9d. per cwt. for refined quality, on spot.

LONDON, Oct. 22.

**Tar Products.**—There seems no bottom to the depths which benzol may go. A large business is reported in 90's benzol at 7½d. f.o.b. As this price includes casks and some carriage on the benzol, the maker will probably not net more than 5½d. naked for the benzol at his works. If the cost of refining and chemicals are again taken off this figure, benzol appears to be of little more value than creosote oil. There is a steady market for creosote and carbolic acid, both of which are moving off freely for home as well as foreign consumption. Pitch is fairly firm, but that produced on the east coast at the moment enjoys some advantage over other positions in Great Britain, possibly on account of cheaper freights. Naphthalene is asked for. But the prices offered form no inducement to extract it from the oils; and the same remark applies to anthracene, which is as dull as it can be.

The following are the market quotations: Tar, 14s. to 19s. Pitch, east coast, 25s. 6d.; west coast, 22s. 6d. Benzol, 90's, 7½d.; 50's, 8d. Toluol, 1s. 1d. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 0½d. Crude, 30 per cent., naphtha, 3½d. Creosote, 2½d. Heavy oil, 40s. to 50s., according to gravity. Carbolic acid, 60's, 1s. 11d. Naphthalene, 50s.; salts, 30s. Anthracene, nominal "A," 4d.; "B," 3d.

**Sulphate of Ammonia.**—The market continues dull; and buyers are also shy, particularly in respect to forward purchases. Spot parcels for considerable quantities have been done at about £9 7s. 6d. per ton, less 3½ per cent., which may be said to be the average price obtaining at all ports. The firmer position of nitrate of soda again puts sulphate out of parity as regards nitrogen value—a condition of things which ought not to be.

## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—The position throughout the coal trade of this district remains much the same as reported last week. The better qualities still move off but moderately for house-fire requirements; and the output of the collieries working five days per week is generally ample to meet the demand, with the result that comparatively little or nothing is being filled up out of stock. Common round coals move off readily for steam and forge purposes; and prices for all descriptions of round coal on inland sale are firm at the full quotations. For shipment, there is not more than a slow inquiry, with a continued easing down in prices. At the pit, best Wigan Arley is quoted 11s. to 11s. 6d. per ton; Pemberton four-feet and seconds Arley, 9s. 6d. to 10s. 6d.; and common round coal, 7s. 6d. to 8s. 6d. For delivery at the ports on the Mersey, ordinary steam coal can be bought at from 9s. to 9s. 6d. per ton, or even a trifle less in some cases. Engine classes of fuel are rather more plentiful on the market; and rates are scarcely maintaining the strong, hardening tendency which has been noticeable recently. Sellers are, however, very firm at the full current prices, which average 3s. 6d. to 3s. 9d. per ton at the pit for common, 4s. 3d. to 4s. 6d. for medium, and 4s. 9d. to 5s. 3d. for best qualities.

**Northern Coal Trade.**—There has been considerable interference with the coal trade by the stormy weather, which delayed steamships, and thus caused some of the collieries to experience idle time, and occasionally to take lower prices. Arrivals of the delayed vessels are now giving greater activity, and stiffening prices. Best Northumbrian steam coals are steady at 9s. 9d. per ton f.o.b.; second qualities being 9s.; and steam smalls, 5s. 9d. Manufacturing coals are steady; consumption being well maintained, and prices unaltered. In the gas coal trade, the deliveries have been a little interfered with by the storm; but they are now very heavy, though to a great extent on old contracts, at prices that are much lower than the current quotations. For occasional cargoes of best Durham gas coals, up to 10s. 6d. per ton f.o.b. is asked; while contracts over next year are being arranged for at prices equivalent to 9s. 3d. per ton f.o.b. Prices of gas coke are unaltered.

**Scotch Coal Trade.**—The market has become steadier, which it was expected to do. Steam coal is in least request. Ell and splint are moving off quite freely. There is a good foreign demand. The prices quoted are: Main, 8s. per ton f.o.b. Glasgow; ell, 9s.; and splint, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 205,178 tons—an increase of 8679 tons upon the previous week, and of 40,268 tons upon the corresponding week of last year. For the year to date, the total shipments have been 7,853,183 tons—an increase over the same period of last year of 1,463,775 tons.

**Failure of the Electric Light at Wolverhampton.**—The shopkeepers and residents of Wolverhampton who are supplied with electric light by the Corporation had an inconvenient experience on Saturday night of the treacherous character of this illuminant. The electric lighting station was opened three years ago by Lord Kelvin; and since then on three or four occasions mishaps have occurred which have plunged the centre of the town in semi-darkness. On Saturday night, about half-past seven, the whole of the street and private lamps went out; but just before eight o'clock the current was rectified for a few minutes, when darkness again reigned and the light did not reappear until ten minutes past nine o'clock. The incandescent lamps then shone again in the various buildings; but it was not until after half-past ten that the streets were illuminated by the arc lamps. Candles, paraffin, and other lamps had to be brought into use to enable people to transact their business.







**St. Helens and the Water Supply at Rainford.**—In response to an application by the Rainford District Council, the Local Government Board have sanctioned the borrowing of £6000 for constructing the works necessary for obtaining a supply of water for the town from the pumping-station of the St. Helens Corporation at Eccleston Hill.

**Colonial Gas Association, Limited.**—The annual accounts of this Company show a profit of £3473, including the dividend on the shares held in the Charters Towers Gas Company, Limited. From the amount named, £756 was paid to the shareholders as an interim dividend; and after providing for interest on debentures, &c., to June 30, there remains a balance, including the amount brought forward, of £2099. The Directors now recommend a dividend, for the second half of the year ending the 30th of June last, at the rate of  $3\frac{1}{2}$  per cent. per annum, free of income-tax.

**Ceara Gas Company, Limited.**—The report of the Directors of this Company for the year ended June 30 last discloses a satisfactory increase in revenue; the consumption of gas being nearly 10 per cent. more than in 1897. But the charges in Ceara have again been largely augmented, mainly in consequence of the continued fall in exchange, and the action of the State Government in exacting additional taxes and duties on imports. Notwithstanding these additional charges, and the higher price of coal and freight, the result of the working is a net profit of £3589, which, added to the balance brought forward, gives a total of £3676. Deducting the interim dividend paid in April last (£1611), there remains £2065 available for division. The Directors recommend the payment of a dividend for the six months ended June 30 of 5 per cent. on the preference shares (less income-tax) and of 4 per cent. on the ordinary shares; making together £1911. These payments, with the interim dividend, will make for the year 10 per cent. on the preference shares and 7 per cent. on the ordinary shares.

**The Camborne Water Company and the Outbreak of Typhoid Fever.**—It was recently reported to the Camborne District Council that the Water Company had agreed to pay £75 as a donation towards the expenses incurred owing to the outbreak of typhoid fever in the district last year. At the meeting of the Redruth Board of Guardians, a member called attention to this, and asked if a return could be prepared showing the cost the Guardians were put to in connection with the outbreak. If they were liable to the District Council, were they not also liable to the Guardians? Mr. W. Rabling said the Company did not admit liability. The Clerk said the question of the liability of the Company had already been asked; and he had taken Counsel's opinion upon it. Counsel advised that, as the law stood, they could not get a verdict of the Courts in their favour until they went to the House of Lords. There was a judgment of a Court below which Counsel thought might possibly be upset in the Upper House. Were they prepared to go to the House of Lords? As to the costs incurred, they could only get an approximate return from the relieving officers; and he was afraid it would be misleading. The Board took no action in the matter. In future, the Medical Officer of the Camborne Council is to inspect the sources of water supply once every two months, and report the result.

**New Mills Water Supply.**—A well-attended meeting of New Mills ratepayers last Tuesday evening authorized the District Council to promote a Bill in Parliament to enable them to purchase the existing water-works, which are quite inadequate, and construct other works. The cost is roughly estimated at £40,000.

**The Filey Water and Gas Works Purchase.**—Under the scheme for the distribution of the £55,000 paid by the Filey Urban District Council for the gas and water undertakings, every old £5 share is represented to be worth £15 10s.; the £10 shares, fully paid up, are estimated to be worth £21 14s., and the £10 shares (£6 paid), £13 0s. 5d. each. The sum of £500 is to be divided between the Vice-Chairman (Mr. Pirie), the Managing Director (Mr. Tobey), the Secretary (Mr. Rowe), and Mr. W. Dowland.

**The Norwich Corporation and the Water-Works.**—At a special meeting of the Norwich Town Council, held at the Guildhall, last Tuesday, a report of the Law and Parliamentary Committee was presented, dealing with the negotiations between the Council and the Water Company as to the acquisition of their works by the Corporation. The Committee were willing to recommend the Council to give each share and debenture holder for his interest in the Company such a sum of Norwich Corporation 3 per cent. stock at par as would produce the same amount of income as that now received by the holder from the Company—an income which would not be subjected to the possibility of reduction from such accidents and causes as all water companies are liable to. The Secretary of the Company wrote to say that the Directors were unanimously of opinion that the proposal of the Corporation did not offer such an inducement to the shareholders to part with their property as would justify the shareholders being called together for considering the matter. The Committee recommended that further action be delayed until next year. The report was adopted.

**A Relic of the Old Uxbridge Water-Works.**—According to the "History of Uxbridge," water-works were constructed in the town by Mr. J. Yarnold in 1701, subsequently converted into copper-mills, and since used as plate-glass mills. "The river water was conveyed to the houses at reasonable rates, by means of large wooden pipes. Mr. Yarnold had a lease from the Lords of the Manor and Borough of such parts of the waste land as were necessary to lay the pipes, for 99 years, at the annual rent of 40s. and a couple of fat capons. The inhabitants, upon paying a rate of £1 per annum for each house, were allowed to insert leaden pipes into those of wood. The water was laid on to the top of the town in the morning and to the bottom in the afternoon of one day, and the reverse the next day. The supplies of water from the water-works ceased in 1799 or 1800." An item of interest to record in connection with these works is, that during some excavations recently the workmen engaged by the Uxbridge Urban District Council have come across two of the old, and indeed now antiquated, pipes, one of which had to be taken out of the direction in which the men were working, while the other was left. The wooden pipe, which looked like a trunk of an old tree, was in excellent condition, and the holes where the leaden pipes were allowed to be inserted were clearly discernible.

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## EDITORIAL NOTES.

## The Gas Companies' Protection Association.

THE First Annual General Meeting of the Gas Companies' Protection Association was held last Thursday, at the Westminster Palace Hotel—Mr. George Livesey in the chair. There was a representative, but not a large, attendance; and the tone of the proceedings was businesslike, if somewhat subdued. The truth of the matter is that, while it is a new thing for the representatives of Gas Companies to find themselves banded together for mutual protection, they must recognize in one another the dwindling survivors of an older industrial period. The age of Gas Companies has not passed, nor is it passing away; but the continued existence and assured future of the remaining Gas Companies, big and little, cannot obscure the reflection that the service has been municipalized to a very large extent. Reference was made in the course of Thursday's proceedings to the older organization of Gas Companies in their own defence; but times have greatly altered since that Association flourished. The Gas Companies that remain in the land should be drawn more closely together than was possible of yore; and it begins to look as if the new Association were quite competent to facilitate this union. There appears to have been a little misunderstanding at the outset as to the qualification for membership of the Association. It was by no means certain at the start that an organization of the kind could be brought about; and, in order to test the feelings of possible members in this regard, prospectuses of the proposed Association were sent to Gas Companies having a capital of £30,000 and upwards. The response was satisfactory, and assured the formation of the Association; but the limitation of the invitation created an impression among the smaller Gas Companies that they were not esteemed eligible for membership. This was an entire mistake, and has now been corrected. All *bona fide* Gas Companies will be welcome to join the Association; and the smallest concerns will have the advantage of knowing that their legitimate interests will be watched over by an organization which contains, and is advised by, the most experienced representatives of the gas industry of the United Kingdom. The rules of a trade protection society may as easily be too wide as too narrow; and it is not to be wondered at that there should have been some discussion of the way in which the Association will act. One rule permitted the Association—that is, the Committee—to "take proceedings;" and this sanction alarmed the Liverpool Gas Company, not without reason. Eventually it was agreed, on the motion of Mr. H. E. Jones, to limit the office of the Association to informing the members as to all proceedings threatening to affect the interests of Gas Companies. Since Mr. William King afterwards allowed himself to be placed upon the Permanent Committee, it is to be supposed that he was satisfied with this amended rule. Circulars inviting all British Gas Companies to join the Association are now to be sent out; and the Association will be fully equipped for dealing with whatever business it may find to do during the ensuing parliamentary session.

## The Midland Association Meeting—An Annoying Incident.

THE prospect of an opportunity of inspecting the new gas-works which, under Mr. Henry Hack's direction, are being built at Saltley, was sufficient inducement to the members of the Midland Association of Gas Managers to make last Thursday's meeting in Birmingham one of the strongest (numerically) of the past few years. Before the visit there was a short programme of business to be got through; but, short as it was, it gave rise to a regrettable incident which had a disturbing influence on the remainder of the day's proceedings. A paper had been promised for the meeting by Mr. W. S. M'Gregor, on the reconstruction of the Longton Gas-Works; and in the publication of an article on the subject in the "JOURNAL" before the meeting, the Committee thought they saw something which affected the dignity of the Association. With altogether inordinate haste, they arraigned, tried, and condemned Mr. M'Gregor on the flimsiest of evidence; and subsequently, at the meeting of the members, the "JOURNAL" was unfairly implicated in the matter—the impression being created that the article in our columns and the paper by Mr. M'Gregor were identical productions, or at any rate had some intimate relation to each other.



That it is not so is shown by the explanatory statement with which we open our report of the proceedings at the meeting (see p. 971); and certainly it should not require any very laborious exercise of mental power to compare the article and paper, and establish their distinct origin.

The whole question really hinges on the point as to whether Mr. M'Gregor was responsible for the fixing of the opening day for the new works on Oct. 20, which date enabled the "JOURNAL" to report upon the event in last Tuesday's issue. At the meeting of the Association, Mr. M'Gregor emphatically said: "The opening day was not 'fixed by me;' and it was unfortunate—indeed, it is more than surprising—that, on this assertion, the gentlemen who had been sitting in judgment on him and the paper (having themselves worked under Gas Committees and Directors, and knowing how frequently their own wishes have to be subservient to those of the bodies by whom they are engaged) did not at once see that any liability for what they deemed to be a grievance did not rest with the person on whom they had cast it. If they had done so, the matter might have ended then and there. It is true, as will be seen by the report, that late in the day the Committee of the Association were led to make some atonement. But at the same time we cannot help feeling that the unpleasantness surrounding the affair, and the pain occasioned to Mr. M'Gregor, might have been avoided by a little judicious inquiry before the meeting, the opportunity for which was just as available then as after the mischief had been done.

Beyond the remarks made on this subject, there was little to engage the attention of the members at the business meeting. The officers for the ensuing year were elected; and the honour of the presidency was bestowed upon Mr. J. S. Reeves, of Bilston, than whom few have done more excellent work in the administration of the affairs of the Association. He is succeeded in the vice-presidency by Mr. J. F. Bell, of Stafford, whose work in the profession will ensure for him a hearty welcome to the higher office in twelve months' time. The visit to the Saltley Gas-Works was the most successful part of the day's proceedings; and the indebtedness of the Association to Mr. Hack for this and previous favours was fully acknowledged.

#### Municipalization at Falmouth.

FALMOUTH has a way of managing local affairs which is peculiarly its own. For several years past it has been talking more or less seriously of municipalizing the gas and water works. An incentive to this course exists in a clause in the Gas Company's Act of 1890, which empowers the Corporation to acquire the works on arbitration terms; while periodical scares about the purity of the water supply have given colour to the demand that control of the means of supply should be vested in the Corporation. Two years ago this body, in a half-hearted way, came to the conclusion that the time was opportune for buying up the two undertakings. They consulted Mr. A. Silverthorne; but though he reported in favour of the purchase, the members of the Corporation were by no means enthusiastic over it. When the statutory meeting of ratepayers was called, the Mayor submitted a resolution in favour of the scheme without a single word of explanation or commendation; remarking that it was for the meeting to say "aye" or "nay" to the proposal, and it was all the same to him. With such an introduction, the end was not far to seek. The opponents of the scheme then took possession of the meeting; not a single word was spoken in support of the scheme; and consequently the result of the vote was its unanimous rejection. Again the matter has cropped up; for the time has now arrived when the powers of purchase vested in the Corporation must be exercised if they are not to be allowed to drop. The scheme has therefore been revived. This time Mr. Silverthorne reports even more strongly in favour of municipalization, though the financial outlook, as shown by his figures, seems less rather than more favourable. For instance, he puts the cost of the gas-works to the ratepayers at £36,450, as compared to £53,750 in 1896, while that of the water-works is increased from £56,050 to £60,875. This means, of course, an additional requirement for interest and the sinking fund. Singularly enough, Mr. Silverthorne also increases his estimate of the cost of the proceedings in Parliament, though the previous sum was thought, even by the supporters of the scheme, to be so serious an item

that failure to obtain the Bill would be overwhelming. This time he has found that the Corporation are in a more complacent mood.

The preliminary proceedings have been got through without serious hitch; and though some of the members of the Corporation were reluctant to commit themselves to a positive declaration, the statutory resolution was passed by something more than the necessary majority. The remarkable part of the proceedings was reserved, as on the previous occasion, for the ratepayers' meeting. This time the mayoralty is vested in a gentleman of a different character from the one who expressed such complete indifference in regard to the result a couple of years ago. Mr. Deeble, it was seen, not only himself spoke in favour of the scheme, but took care that no one spoke against it. The outcome was that the resolution was put and declared carried without a single argument in opposition to the proposal having found expression, although there were clearly many opponents present at the meeting. This way of confining speeches to the advocates of one side is peculiar to Falmouth, and will, it is to be hoped, remain so. As an excuse for the Mayor's action, it has been said that the effect of it will be to leave the burgesses free to vote quietly and without excitement upon a question of great local importance. It would have been more in accordance with English ideas of justice if both sides had had their say before the vote was taken.

#### Cases under the Workmen's Compensation Act.

IT was mentioned in this column last week that the County Court Judge at Liverpool had reserved judgment in a case under the Workmen's Compensation Act where the victim of an accident had left property for the widow which constructively rendered her less dependent upon his workman's earnings. Judgment has since been delivered for the full amount of compensation provided for by the Act; thus excluding all consideration of the independent estate. His Honour Judge Collier took a week to consider the point, and concluded without hesitation that the Act does not permit of any such set-off as suggested. It is difficult to see how the Court could have decided in any other sense. The Act provides for paying compensation in regard to the employment; and the only consideration affecting the basis upon which the amount is computed is the rate of wages. A man's dependents are those who must look to him for maintenance while he lives and has the right of disposing of whatever estate he may possess. He cannot divest himself of his legal responsibilities to his dependents; and the amount of his accumulations is as immaterial to his employer as it would be to anyone else against whom his dependents might have a lawful claim.

Another point brought before the same excellent Judge is as to whether the whole of certain premises is a factory within the meaning of the Act. This is a very important question indeed. Is the whole of a manufacturing or trading establishment a factory because some part of it unquestionably is so? In the case in point, a carman in the employment was loading timber in the public street outside the premises of his employers; and he fell, and was killed. Judgment has been reserved; but we have little doubt as to how it will go. A man who fell in a Manchester warehouse while going for tea for himself and a salesman during business hours has been held not to have been engaged in his lawful employment. An interesting case has been decided at the Southwark County Court. It applied to the question of "overside" labour in ship discharging; and the point raised was whether a labouring stevedore, working at a barge moored alongside a steamer moored to a quay, could be said to be working in a factory according to the meaning of the Act. The defence was that the Act was not intended to include operations between ships and barges. The extraordinary thing was the contention that, in these circumstances, one side of a ship would be within the meaning of the Act and the other not. The Judge decided that the applicant, working in a barge on the off-side of the ship, had not brought himself within the scope of the Act. The parties may appeal.

#### The First Workmen Directors.

THE announcement made elsewhere of the result of the voting of the South Metropolitan employees in the first election of Workmen Directors signalizes the commencement of a new era in gas-works administration. May the end fully justify the beginning! Messrs. Austin, of East



Greenwich, and Butcher, of the Old Kent Road, have the distinction of being the first Workmen Directors of any gas undertaking; and they will take their seats at the South Metropolitan Board to-morrow. We understand that there were 48 qualified workmen, under the Company's Act, distributed over the various stations. Preliminary voting for the selection of station candidates was only necessary at the Old Kent Road; because at the other stations not more than the one candidate offered himself for the suffrages of his co-workers. Thus there was nothing like a "rush" for the honour—and responsibility—of a seat at the Board. By a course of selection, the candidates were worn down to four, who were voted upon last Friday. Any of these would have been acceptable to the rest of the Board, and, indeed, there was little to choose between them; but on the whole it is considered by all parties that the most suitable men have been elected. It only remains to add that the workmen shareholders have taken a most active and intelligent interest in the voting—quite five-sixths of all the voters recording their votes. The general result is regarded as very satisfactory.

#### Technological Examinations.

THE report of the Examinations Department of the City and Guilds of London Institute for the past session has been issued. It claims that the work of the department has made good progress during the past year. The satisfactory relations established between the Institute and the Technical Education Committees of County Councils and various Trade Societies have been continued, "with the result that the number of technical classes throughout the country registered by the Institute shows a marked increase, and the instruction is in closer touch with industrial requirements." The latter effect was certainly well worth producing. It is only justice to here recognize the perseverance of the Examinations Department of the Institute in the endeavour to make their pass certificates and prizes of distinct market value. The Superintendent of the Technological Examinations (Sir Philip Magnus) is now of opinion that this point has been attained in the case of some branches. Thus it is recorded with pardonable pride that the Post Office have recognized the Institute's certificate in Telegraphy as qualifying the holder of it for increased remuneration. This official recognition has had the effect of nearly doubling the number of candidates for examination in the subject; and employers generally are asked to exert the same influence, "by giving some kind of reward to such of their employés [*sic*] as succeed in passing the Institute's examinations." The observation is just. What the Post Office can do, other employers can do even more easily; and it is quite conceivable, for example, that the announcement on the part of Gas Companies and Municipalities of their willingness to give a rise of salary to such of their young officers and workmen as can show the Institute's pass certificate, would greatly encourage the study of "Gas Manufacture." From the returns of the number of candidates in the different practical examinations, it may be inferred that the Institute is getting into closer touch with the trades; though much remains to be done in this respect. The proportion of failures to passes in the Ordinary Grade examinations is far too large in most subjects. Having regard to the simple character of the tests imposed, which ought not to daunt the most diffident individual actually engaged in the trade, it can only be inferred that the examinations are still merely the happy hunting-grounds of elementary school teachers desirous of providing themselves with as many certificates as possible.

The Examiner in Gas Manufacture (Mr. Alfred Colson) does not appear to be troubled with many of these outsiders. He reports that the examination is gaining in popularity, and that the quality of the candidates' papers is improving "all round." This is eminently reassuring. For, as the Examiner is careful to point out, a successful gas engineer is necessarily an all-round man. He must know something of chemistry, as well as engineering and building construction. Unfortunately, young men who get into gas-works through the laboratory or by way of the "shops" usually betray their early training much too conspicuously. The young chemist does not know anything at all about carbonizing work or valve connections; while the fitter is ignorant of what goes on in the apparatus which he knows how to put together. Still, Mr. Colson is able to say that this weakness is now being corrected.

He complains, we regret to notice, that the "sketching" of his candidates is poor. This is a very sharp criticism that all gas engineering students should make a careful note of. Every aspirant for any engineering employment ought to remember that he can never be too well up in his work; but an engineer who cannot be trusted to indicate at a moment's notice, by a sketch, how a joint should be made or a structure put together, is literally fit for nothing in this line. It should never be forgotten that it is the engineer who makes the sketch, while it is only the draughtsman who makes a finished drawing. We should like to ask the Examiner in what sort of style the papers were composed; for good composition and clear treatment of the subject are half the battle as regards an engineering paper. One expects a gas engineering student to show a fair degree of general training. This is not a matter that an examiner in technology can take official cognizance of; but we may be sure that a candidate who was incapable of expressing his knowledge clearly and correctly would greatly disappoint the examiner. It is so important that students of science or technology should not confine themselves to these subjects!

Speaking recently at the Royal College of Science, Sir Norman Lockyer laid great stress upon the truth that "scientific studies gain enormously by the results of literary culture, without which we can neither learn so thoroughly nor teach so effectively as one could wish . . . . To keep a proper mind-balance, engaged as we are here continuously in scientific thought, literature is essential, as essential as bodily exercise." It is more than ever important that this caution should be observed, now that type-writing has disestablished penmanship as a sign of general education.

#### A Trade Union Agent Punished.

A SALUTARY example was made in Dublin on Saturday of an agent of militant Trade Unionism. The Recorder had to dispose of a case in which a confectioner sought to recover damages for libel and slander perpetrated against him by a bill-poster and advertising contractor. The plaintiff had received a visit from a Trade Union official who threatened him for having discharged a workman; and as he persisted in managing his business in his own rather than in the Trade Union way, offensive handbills were distributed in the street opposite his shop by the defendant, presumably acting for the Union. Some difficulty appears to have been experienced in putting the law in motion; but when the defendant actually got into Court, he declared that he received the bills complained of from the Secretary of the Trade Society, and "knew nothing of the case." Afterwards he apologized to the plaintiff; and he begged for mercy from the Recorder. The Court, however, took a serious view of the offence. The Recorder described it as a deliberate attempt on the part of the Trade Union, working by the defendant, to ruin the business of a respectable man, and to make his life as intolerable as malice could devise. "Anything more calculated than the method adopted to bring a man into hatred and contempt with an entire class, he could not conceive; and if he had the gentry before him who were the instigators of this document, he would give the very largest sum that his jurisdiction enabled him to give, in order to teach those people who, he supposed, were upholders of the liberty of the people, a lesson as to the difference between the liberty of the freeman and the tyrannical license to ruin one's neighbours." The defendant was then let off with 20 guineas damages, and a stern warning that were there a renewal of the acts complained of, the matter would be reported to the Attorney-General. The Recorder further expressed his opinion that if the men who were behind the defendant "had a single sentiment of honour," they would pay his fine for him. The constant tendency of Trade Unionism to break out into lawless acts is one of its besetting evils. The public need to be protected against this danger; and since Trade Unions are not responsible bodies, the only way of checking their lawlessness is to bring their agents to a sense of their personal liability for their actions. It should be no excuse for a man, but rather an aggravation of his offence, if it is shown that he acted on the instigation of an irresponsible society.

#### An Instructive Lamp Accident.

A GOOD example of the nonsense talked about the deadliness of low flash-point lamp oil was furnished at a recent London



inquest. Somebody upset a lighted lamp in a bedroom, and the clothes of the deceased, who was in the bed, caught fire. The victim was severely burnt, and subsequently died from the effects. An Inspector of the London County Council under the Petroleum Act attended the inquest, and is reported to have said that "the container of the lamp" was composed of extremely fragile glass, and the flashing-point of the oil was  $92^{\circ}$ . The flashing-point recommended "by the Council was  $105^{\circ}$ ." The Jury returned a verdict of "Accidental death," and added a rider that the flash-point of oil should be raised, and the sale of lamps with other than metal reservoirs stopped. It is to be observed that the report does not state that the lamp was broken. Assuming this to have been the case, however, is it really meant by the London County Council to be inferred that any material difference would have been noticed if the flash-point of the oil had been  $105^{\circ}$  instead of  $92^{\circ}$ ? Not even the most fanatical partisan of Scotch oil who gave evidence before the Petroleum Commission would have committed himself to so absurd a contention. The accident in question really goes to stultify the action of the County Council; for supposing there to be superior safety in  $105^{\circ}$  oil as compared with  $75^{\circ}$  oil—at least an intelligible case, with a considerable margin of flash-point to go upon—how much ground is left for the presumption of safety at  $105^{\circ}$  and danger at  $92^{\circ}$ ? This is, indeed, "cutting it fine." The recommendation to abolish glass containers is behind the times. This point has been settled, and there is no valid objection to glass containers, provided they are made strong enough. In this particular fatality, the trouble was evidently with the lamp, rather than with the oil; but so long as lamps are portable, they will occasionally be upset. If perfect safety from this class of accidents is desired, the fixed gas-burner is the "only wear."

## WATER AND SANITARY AFFAIRS.

TO-DAY the London County Council are expected to enter on the discussion of the report of the Water Committee, with its proposals for legislation in 1899. It is difficult to see, apart from the chapter of accidents, what practical result can accrue from these proceedings. The movement, if we may so term it, has all the weakness of a premature effort. There is an attempt to pluck fruit before it is ripe, and to forestall something which ought to be waited for. "The Times" declares it difficult to escape the conclusion that the Water Committee have been ambitious rather than discreet. The leading journal finishes its comment by saying that, even if the conclusions presented for acceptance should be agreed to by the Council, they are "hardly likely," in the present state of the question, either to commend "themselves to the Government or to be adopted by the Legislature." The recommendation of the Water Committee, that the Council shall promote a Bill for the purchase of the undertakings of the eight Metropolitan Water Companies, is met by an amendment, to be moved by the Earl of Onslow, that the proposal be referred back to the Committee, as Parliament cannot be expected to deal with the whole question of the London Water Supply pending a report of the Royal Commission which has been appointed to consider the subject. This is so obvious a consideration as to commend itself to the judgment of everyone who is not possessed with the wild notion promulgated by the "Daily Chronicle," that by proposing measures of their own the Council can compel the Government either to provide facilities for such Bills, or else to promote something which shall be equivalent. It would be extraordinary compulsion indeed that could lead the Government thus to pour contempt upon a Royal Commission which it had itself called into existence. Lord Onslow may very well propose, as he does in his amendment, that the preparation of a Bill for purchasing the undertakings shall be deferred, partly for the reason that the Council should wait to see how far they can harmonize their policy with the views of the Royal Commission. Parliament will undoubtedly wish to know what conclusions have been arrived at by the Commission before proceeding to discuss a scheme for handing over everything to the County Council.

The Earl of Onslow is conciliatory towards the Water Committee. They propose that the Purchase Bill shall contain a clause to enable the Council to proceed at an early date with the requisite works for connecting the eight systems of supply. Lord Onslow, while objecting

to an immediate attempt at purchase, proposes that the Council shall promote a Bill providing that any Metropolitan Water Company may be required, in case of emergency, to supply water to any other such Company whose supply may be deficient. The Bill is to provide for connecting the reservoirs and mains of the several Companies, so as to facilitate arrangements for this purpose. Of course, this involves a remarkable interference with the ordinary operations of the Companies; and it may occur to legislators of a reasonable type, should the matter come before Parliament, that a less authoritative interference would be sufficient. So far as experience goes at present—and this is not likely to be exceeded—there is only one Company who are likely to need help from their neighbours, and that help has already been provided for. A question here presents itself as to the mode of "providing" for the connection of the reservoirs and mains. Is this operation to be superintended by the County Council? If not, the Council may become lukewarm in their promotion of a measure which may—in their apprehension—give increased value to the undertakings, and which will disarm one species of attack.

But the Finance Committee have something to say about the report of the Water Committee; and we always like to hear what the Finance Committee have to tell us. However, they have a very partial story to relate at present. Concerning the expenditure which would be incurred in carrying out the recommendations now before the Council, they are not prepared to add to what has already been given in evidence before Lord Llandaff's Commission or expressed in official reports. "Indeed," they say, "the data for framing a trustworthy estimate of the cost of purchase do not exist." So even Lord Llandaff must be in the dark; and it is no wonder that such should be the case, seeing that his information so far comes from the Council. "Trustworthy estimate" is a happy phrase. The Council are great in estimates; and we find that the Finance Committee are able, with the help of the Comptroller, to pile up a few figures on the subject, not of expenditure but income. It is reckoned—and Mr. Haward so told Lord Llandaff—that the authority purchasing the Water Companies would in 1901-2 enjoy a net income of £1,030,000. Lord Llandaff asked what was the amount of capital, the interest and sinking fund on which could be met by such a revenue. The Committee say this is "a matter of simple calculation, dependent on rate of interest and term of redemption." But the Committee do not present us with any such calculation, though they say: "By these data the Council may measure, to some extent, the financial result which may follow from purchase."

Treating of additional supply, the Finance Committee say a large outlay within a comparatively short time is inevitable, whether the system adopted is that of storage or bringing a supply from a fresh source; and they signify that storage, though cheaper at first, may be the dearer plan in the end. How far off the end may be, they do not estimate; but they have "no hesitation in recommending" that the period of redemption, both for purchase and additional supply, should be fixed at a hundred years.

**Hints on Painting Structural Ironwork.**—Professor Alvain H. Sabin has published an essay on the painting of ironwork, basing his remarks on a notable example of the corrosion of an iron bridge carrying Washington Street, Boston, over the line of the Boston and Albany Railway. This bridge was erected in 1871, and is now completely worn out; the lower portion of the girders having been perforated and practically destroyed by the action of the exhaust gases and steam from the funnels of the locomotives running beneath. Painting, though done at frequent intervals, seemed to be quite ineffective in checking the mischief. Professor Sabin accordingly insists on the necessity of thoroughly cleaning all structural steel by pickling, by the sand blast, or by some equivalent means, if painting is to give good results. He points out that in electro-plating, enamelling, and the like, the greatest care is taken to chemically clean the surfaces treated. Paint should have something like the same chance of justifying itself. Also, as far as possible, favourable weather conditions should be chosen. Summer time is obviously the best season for this work. At other periods of the year moisture is liable to condense on the metal work, and prevent the proper adhesion of the paint. This tendency to the condensation of moisture may even be aggravated by the addition to the paint of benzine, or similar volatile medium, with the object of rendering it quick drying. The rapid evaporation of such fluids cools down the surrounding iron; and if the hygro-metric state of the air is at all near the dew point, moisture may be condensed on the cooled surface before the painter's brush.



## ESSAYS, COMMENTARIES, AND REVIEWS.

## GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 989.)

THE course of movements on the Stock Exchange last week was extremely chequered. The opening was much depressed. Apprehension that hostilities with France could scarcely be avoided, and the fear that the Money Market was going to be exceedingly tight, had a very lowering effect. On Tuesday, things had reached their worst. The rush to sell knocked prices down rapidly; and Consols actually touched 106½. Then a smart recovery set in. The scare about money was found to have been unwarrantably exaggerated, as is not unfrequently the case; and then the political outlook was regarded as brighter. A few buyers came forward, and prices recovered. Thenceforth to the close things remained steady and quiet; the markets just marking time. Demands for money for the Stock Exchange settlement were satisfied at advanced rates; and the market keeps strong. Business in the Gas Market seems to have gone to sleep entirely. Such a quiet time as has now ruled for some while past is probably unprecedented. The market might almost as well be closed without anyone suffering much inconvenience. Movements last week were very few and slight. As a matter of course, prices rather tended to give way where they had no support. In Gaslights, a few transactions were marked in the "A," at about middle figures—the opening and the closing prices being 29½; and there were a couple of bargains in the secured issues which also gave no indication of a change. A little business was done in South Metropolitan, which was inclined to droop, and the quotation gave way accordingly. Commercial were quite unnoticed. The Suburban and Provincial group were as quiet as the rest. British was decidedly flat; but the quotation fell only slightly. The Continental Gas Companies were quite neglected. Imperial was done two or three times; but generally it seems to be awaiting further developments of the Vienna position. There were a few movements among the undertakings located in the remoter world. Cape Town receded a point, and Oriental half a point; but Buenos Ayres was fractionally higher. In the Water Companies, business was at a very low ebb. Prices were steady, and almost entirely unchanged. Lambeth is making another stride ahead, being about to join the small group of Companies paying something on account of back dividends unpaid. Kent is paying 4 per cent. on this account; Chelsea, ½ per cent.; and Lambeth will do the same.

The daily operations were of the smallest. On Monday nothing moved; but on Tuesday South Metropolitan receded 1½. On Wednesday, there was a fall of ½ in British, and ¼ in Oriental. On Thursday, Buenos Ayres improved ¼. In Water, Lambeth 7½ per cent. rose 1; but East London fell 2. On Friday, East London was put up again. A fall of 1 in Cape Town on Saturday closed the week.

## ELECTRIC LIGHTING MEMORANDA.

A Newspaper Account of the Brighton Breakdown—Wanted, a Lantern—Making a Convenience of the Gas Supply.

A BRIGHTON newspaper has published an interesting, not to say amusing, account and explanation of the collapse of the Municipal electric lighting of the town, to which reference was made in this column last week. It is narrated how "a trifling accident" at the generating station "had the effect of throwing the whole town in darkness for a period of twenty minutes." Opinions differ; but if the magnitude of causes is to be gauged by their effects, we should not think this particular mishap could be properly described as "trifling." If, however, the cause of the collapse is underrated in this newspaper description, the consequence is unduly magnified; seeing that the Corporation electricity supply does not yet light the whole town. We imagine that the gas supply was maintained as usual during the eclipse of the municipalized illuminant; thus preserving the town from utter darkness. But to resume. The report states that the breakdown occurred at about five minutes past nine, when the dynamos were under their heaviest load. The machinery and dynamos at the works are all of the latest pattern, and, of course, "are fitted with appliances which should have rendered an incident like that of last night impossible." In some human concerns it is the impossible, as well as the unexpected, that always happens. In the present case, "the cessation of the light was caused by the heating and ignition of an armature, coupled with the failure of the automatic 'cut out' to perform its task of throwing the damaged dynamo out of the circuit." Just so. These armatures are ticklish things; and as for the automatic "cut out"—well, it must have been a bit behind-hand this time. The report continues, in the familiar strain, to tell how the officials and members of the Lighting Committee of the Corporation hurried to the spot. The reporter would consider himself seriously lacking in the performance of his duty if he were to omit a single name that could by any possibility be dragged in on such an occasion. In this case, the devoted officers and town councillors

who distinguished themselves by hastening up to the works "to see what was the matter," lost their labour; for the works themselves were in "utter darkness, except for the glow of the furnaces." The Committee had scorned to keep a few gas-lights available for use at the station; and consequently it shared the fate of all the other consumers of the electricity supply.

When the fault had been groped out and the collapsed dynamo put out of circuit, it was by no means easy to make a fresh start with the others. All the load was waiting for them; and it was like starting an overloaded horse against a hill to get the current once more "whistling through the cables"—to use the reporter's picturesque language. After a time, however, all was right again; and, as the report allows, "the manner in which at night a totally unexpected emergency was met, and the unusual difficulty overcome, reflects great credit on the Electrical Engineer and his staff." One of these gentlemen must have been in possession of a box of wax matches, by the light of which he and the others could make their way to the switchboard and around the station—not a nice place to stumble about in the dark. Evidently, a lantern or two are useful adjuncts to an electricity generating station replete with all the latest improvements. Naturally, the Brighton public are assured that no fears of a recurrence of the mishap need be entertained. Nothing of the kind, it is asserted, has occurred before during the seven years that the Corporation have been carrying on the undertaking. The circumstances are declared to have been of an "unusual character"—in what respect? The armature of an overloaded dynamo will burn out at any time, and any number of times, under certain conditions. It is not to be supposed that the Electrical Engineer of the Brighton Corporation had any reason to suspect the existence of these conditions on the 21st ult.; nor will he ever know how far removed from a similar breakdown his plant is at a particular moment.

Judging from the newspaper report, Brighton was very much frightened at what happened at the electricity works. It was believed at first that a fire had broken out at the works, "and, indeed, the singular appearance of the generating station, with all the lights in front extinguished, and in the rear the red glow from the open mouths of the furnaces, the plunging roar of the dynamos, whirling in the semi-darkness, and the vast clouds of steam rising from the roof, appeared to give some confirmation of this story." It can easily be conceived how disgusted a partisan of electric lighting must be with the lurid language of this too graphic report. It is very inconsiderate to make so much of a "trifling accident." In the town, although a good deal of inconvenience was caused for a time, patience and a little gas helped to pass it over. "At the Pavilion a bazaar was in progress in the King's Apartments; and for the moment stall-holders and visitors were in complete darkness. *Fortunately the gas-fittings still remain in these rooms, and in the corridors and entrance hall; and these being quickly lighted, little inconvenience was caused.*" The italics are ours. If this is the kind of thing that happens after seven years of electricity supply, the gas-fittings are likely to "remain" in a good many places. We lay stress upon this feature of the Brighton mishap, in order that gas manufacturers, and those authorities who are responsible for public security, may not be caught napping. It is all very well for gas-fittings to be kept as a stand-by in public assembly rooms and elsewhere, in order that people may indulge in the luxury of electric lighting without fear of being caught in a dark trap in the event of anything going wrong at the works or with the distributing plant. It is obvious, however, that unless these gas-fittings are regularly looked after and occasionally used, their presence may inspire confidence which might be found misplaced. Attendants in the performance of the ordinary operations of dusting and cleaning are liable to knock unused fittings about without becoming aware of the mischief done. It is a good deal to expect gas-burners (say) at the Brighton Pavilion, to be instantly available for service years after the electric light had been installed in the building. We are not sure of how the burden of responsibility would rest in all cases of the kind, as between the suppliers of gas and those who harbour meters for occasional use. As a rule, the gas company's responsibility ends at the stopcock on the meter. It used to be considered that the suppliers of gas had nothing to do with whatever happened to the gas after this; but the judgment of the House of Lords in the famous Nine Elms case, opened out possibilities in this regard which have never yet been fully explored. Nobody has had occasion to travel farther into this country; but circumstances might arise to throw the burden of investigation upon any statutory gas undertaking of which a "convenience" is made by another interest.

**Electrical Purification of Water.**—At Blankenberghe, in Belgium, the water is purified by means of electricity. The water is drawn from the Bruges Canal. After filtration, it goes into a storage reservoir, whence it is pumped into the sterilizers—electric machines of 1000 volts. It is then ready for distribution.

**Lowering Large Gas-Globes for Cleaning.**—Messrs. Falk, Stadelmann, and Co., Limited, have devised a rod for lowering with safety the globes of their "Veritas" gas arc lanterns for cleaning purposes. It is attached to the lantern by means of a hook, a pin and chain being placed inside the tube; and the globe will slide down and may be turned round or tilted without fear of breakage.



## MECHANICAL TRAMWAY TRACTION.

## FIRST ARTICLE.

IN our Electric Lighting Memoranda last week, mention was made of a report upon tramway traction furnished by Mr. J. Allen Baker to the London County Council, and ordered by the Council to be printed for sale as one of their official publications. This report is very well worthy of attentive study by everybody interested in any way in the problem of mechanical tramway traction. It is hardly necessary to explain how the subject touches the interests that are bound up in the gas industry; but the fact of gas power traction having been put forward as a possible solution of the problem is only one consideration in point. A still more considerable matter in this connection is the electrolytic effects that have so far proved inseparable from the system of electrical tramway working most generally used—the single overhead trolley-wire system. The weighty observations in this regard of Dr. J. A. Fleming, at the recent meeting of the British Association (*ante*, p. 689), supply ample reason why gas engineers should follow the current developments of tramway practice, with the object of securing the integrity of their distributing plant against unnecessary and preventible injury.

This is, shortly, how the matter stands: Tramway authorities everywhere are being pressed to improve their services by introducing some form of mechanical traction. The only real question remaining to be answered in this regard is: What system should be adopted to supersede the obsolescent horse haulage? The great mass of electrical engineering opinion answers—the single overhead trolley-wire system, as adopted to an enormous extent in America, and now being introduced into certain Continental and British towns. Many electricians affect to laugh to scorn any suggestion that this is an objectionable system. The two leading English electrical journals—both remarkably well conducted and authoritative publications—take this view. They definitely accept the proposition that whosoever says mechanical traction for tramways means electrical traction, and that electrical traction means the single overhead trolley wire. In the "Electrician" of the 21st ult., there is an expression of hope that the conditional withdrawal of the opposition of the London County Council to the overhead trolley will mean the introduction of the "thin end of a wedge which, when driven completely home, shall signalize the adoption of electric traction throughout the London tramway systems." This journal jeers slightly at Mr. Baker's report as favouring a conduit system; remarking that "when they see the prices they would have to pay for conduits, the ever public-spirited London County Council will advocate the trolley system after all." Similarly, the "Electrical Review" of the same date lays stress upon the evidence that "of 204 (tramway) companies in Europe, 173 employ the overhead system;" and it argues fairly enough of this system that, while nobody claims perfection for it, "the method which is going to supersede it has to convince the army of practical men who have been responsible for the 30,000 miles of overhead trolley which exists to-day."

We trust it will not be esteemed disrespectful to these 30,000 miles of trolley wire, if we venture to observe that the supreme test of any system of tramway working must still be its admissibility to the streets of London. This is the crucial point; and the London County Council are deserving of the strongest commendation for insisting upon the rejection of all proffered proofs, presuming that what is good enough for anywhere is good enough for London. The very fact of certain imperfections being admitted, is tantamount to an admission that London is asked to put up with some drawbacks for the sake of obtaining some degree of benefit; and it is obvious that the Metropolitan conditions are peculiarly severe upon both drawbacks and advantages. The evidence of the 30,000 miles of overhead trolley wire is that electrical traction upon this principle is somewhere able to supersede horse haulage on its merits. But it does not prove that the system, with all its concomitants, is suitable for adoption as a solution of the problem of improved tramway working for London. The advantages of the system are cheap and rapid tramway working, yielding a fair profit. The drawbacks are disfigurement of the thoroughfare, obstruction by the overhead wires and posts, injury to gas and water pipes—all to be summed up in the one word, an "imperfect" system. The absolute and relative importance of these various considerations naturally differs for different localities. The case of London in this regard is not to be measured by analogy. Put as briefly as possible, London wants every possible benefit, without the slightest drawback, to say nothing of positive danger. Only to mention one kind of consideration here—the one with which we are naturally most concerned—what counterbalancing advantage could compensate for the liability of the gas and water mains and services in a main London thoroughfare to destruction by electrolysis?

It is not specially our province to defend the cause of street amenity from the overhead trolley wire; but it is very remarkable that every illustration of the installation of the system published in the electrical journals, or in Mr. Baker's report, only serves to show how complete and hopeless is the disfigurement by the overhead wires of thoroughfares having any pretension to elegance. Of course, one can shut one's eyes to them

after a time, and endeavour to ignore them, as in the case of the "sky-sign" and the monstrous advertisements of soaps and pickles. But they are there all the same; and they utterly spoil a street vista. It is sometimes argued that the supports of the overhead wires can be made useful in another way, to carry electric arc lamps; but the first objects to be lit by the lamps are the very wires and tackle which everybody would prefer to have left in the dark. There are in Mr. Baker's report many illustrations of this disfigurement of town thoroughfares. Of the obstruction of the roadways by the overhead trolley system, it is superfluous to speak. The system could only have originated where telegraph and telephone networks are permitted to be carried at a low level through the streets, instead of over the house-tops, as in England.

It is time, however, to return to the consideration of Mr. Baker's report as a storehouse of information respecting the "forms of mechanical tramway traction that have been tried, and more or less successfully worked, in various towns and cities in England, on the continent of Europe, and in America." The author admits to notice mechanical motors for tramway traction operated by "steam, oil, gas, compressed air, cable, and electricity." The steam trams are "out of the race," and consequently need not be discussed. Oil motors are neither successful nor popular. With regard to gas motors, Mr. Baker refers to the examples of Dresden, Dessau, and Blackpool. He admits that the last-named installation has numerous improvements over the original German systems, and appears to work economically. "The expense of running per car mile is stated to be 4½d.—a cost which compares favourably with other systems of traction." The system of working the gas-power cars is described. The cars will run nine miles for every charge of compressed gas. Mr. Baker says "the engine requires to be kept working continually, even when the car is at rest; the gear connecting to the axle being thrown in and out by the driver. Supplemental gearing, to give greater power at slower speed, is provided to ascend gradients. But even with this provision, although the steepest gradient on the Blackpool line is 1 in 26, the laden cars have sometimes difficulty in surmounting it; and if a stop is made half-way up, the car needs to go back and recommence the ascent." This is a question of gearing. Mr. Baker enumerates as the advantages of this system that each car is self-contained, and no overhead or underground wires are necessary. A well-constructed horse tram-line could be used with these motors without alteration further than installing the necessary gas-compressing stations, pipe connections, &c.

The disadvantages enumerated are: "Considerable vibration of the cars, occasional smell of gas from engines, difficulty in ascending gradients, and the periodical stoppage for recharging the gas cylinders. This must be done at the compressing station or a sub-station to which the compressed gas could be conveyed through a system of underground pipes." The most damaging thing Mr. Baker can say of the gas tramcar, however, is that the deputations from the Birmingham and Sheffield Corporations who examined the system, "reported unfavourably as to its adoption in those cities." This he seems to think conclusive. We venture to observe that he is mistaken. More will be heard of the gas-power tramcar before it is definitely classified. Our "Correspondence" columns to-day bear witness to the existence of another aspect of the matter. It would be a dangerous doctrine to admit the unfavourable opinion of a Corporation deputation as settling any question. The British Gas Traction Company may or may not have been as enterprising as the nature of their circumstances permitted; but they have done, and are doing, more to improve their system and extend its operation than Mr. Baker states. If the gas-power tramcar is the cheapest mechanical means of working a tramway now before the world, both to instal and to operate; if it is a self-contained arrangement, capable of being put in service at any hour of the day or night; if the cars will run as fast as the Board of Trade regulations permit—then the system must have a future, in London as well as in the Provinces. There is no necessary connection between the use of gas power for propulsion and excessive vibration of the car. Cars can be built to ascend all gradients; and the necessity for stopping to re-charge occasionally is no real hindrance. Of course, if people start out prepared to see no good in anything but electricity, they will come back convinced of the wisdom of their prejudice; but those who are prepared to regard the problem of mechanical tramway working as still an open one, will be well advised to suspend judgment as to gas traction until they know more than Mr. Baker can tell them about it.

## THE WATER ACTS OF 1898.

(Continued from p. 915.)

The following Acts of Parliament confer additional powers upon statutory Water Companies:—

The Brompton, Chatham, Gillingham, and Rochester Water Act authorizes the construction by the Company of new works, including a pumping-station at or near the Headley Well, at Luton, and a service reservoir at Woolman's Wood. A footpath is to be diverted. Clauses for the protection of the War Department are inserted, one of which requires all pipes to be buried to a depth of at least 30 inches. The Company are to pay the



Secretary of State £3 a year for wayleave. Certain lands are to be compulsorily acquired; and the works constructed thereon are to be completed in five years. The area of supply is extended to include the parish of St. Margaret Extra. The rates chargeable for domestic supplies are set out in detail, and are referred to rateable value instead of annual value, as provided by the Company's Act of 1860. New capital to the amount of £60,000 is authorized, with increased borrowing powers. The register of a meter is to be *prima facie* evidence of the quantity of water consumed; and any dispute as to the quantity is to be referred to a Court of Summary Jurisdiction, whose decision is to be final and binding upon all parties. Fittings may be removed from any houses left unoccupied for three months; and meter supplies may be cut off if unused for 48 hours. Demands under £50 may be recovered through the County Court.

The Cranbrook District Water Act extends the limits of supply to several parishes named in Kent and Sussex. These powers are to be acted upon within eighteen months. Clauses are inserted for the protection of the borough of Tenterden, by which the Corporation may acquire possession of the undertaking in the borough in the event of the Company not fulfilling their engagements to furnish a sufficient and constant supply. New works are authorized, comprising wells and pumping-stations at Goudhurst, Rolvenden, and Hawkhurst, to be completed within seven years. New capital to the amount of £36,000 is authorized, with the usual borrowing powers. So much of the South Kent Water Act 1889 as authorizes the South Kent Company to supply water within the limits of this Act is repealed.

The Folkestone Water Act extends the Company's limits of supply to four neighbouring parishes. The powers are to be exercised within seven years. New works are authorized, including a pumping-station at Lydden, and another at Hawkinge. The works are to be completed within ten years. The Company are to give a constant supply from and after the beginning of 1901, when the mains are to be kept charged with pure and wholesome water, sufficient for the domestic use of the inhabitants, at a pressure to command the top storey of the highest houses erected or to be erected within the area of supply, subject to the limit of 300 feet above Ordnance datum. Water is to be supplied by meter at the maximum price of 1s. 6d. per 1000 gallons, and 1s. per 1000 gallons for public purposes. The Earl of Radnor having granted to the Company facilities for obtaining an additional supply of water, clauses are enacted for the protection of the Radnor Settled Estates. The charge for domestic supplies is not to exceed 7 per cent. upon the rateable value. New capital to the amount of £200,000 may be raised, with the usual borrowing powers.

The Hartlepool Gas and Water Act sanctions the construction of an impounding reservoir upon Amerston Beck, at Crookfoot or Quaker Gill, and another similar work upon Dalton Beck at "the Howls." The water from these reservoirs is not to be supplied for domestic purposes. Whenever the Company have occasion to supplement the supply of water for other than domestic purposes by the addition thereto of water which they would otherwise supply for domestic purposes, they must notify the Corporations of the two Hartlepoons at least 24 hours in advance. The discharge of compensation water is provided for. The works are to be completed within ten years. Additional water capital to the amount of £80,000 is authorized, not more than £50,000 of which may be issued as preference capital. The usual borrowing powers were conferred.

The Higham and Hundred of Hoo Water (Amendment) Act provides that section 4 of the Company's Act of 1890 shall be amended; and the Company are bound to make use of their powers to supply certain parishes within eighteen months. The rate of interest payable on consumers' deposits is reduced to 4 per cent.

The City of Norwich Water-Works Act authorizes the issue of new capital to the amount of £60,000, to bear 6 per cent. ordinary or 5 per cent. preference dividend, and carry the usual borrowing powers. Section 44 of the Water-Works Clauses Act, 1847, is amended by dispensing with the owner's consent. Additional works are to be constructed within ten years, comprising a subsiding tank and filter-beds to be formed on lands adjacent to the Heigham pumping-station of the Company, and a service tank at Mousehold.

The Newcastle and Gateshead Water-Works Act enables the Company to issue new 5 per cent. capital to the amount of £480,000, with the usual proportion of loan. Additional works are to be constructed, chiefly pipe-lines and tramroads. For the protection of the Newcastle-upon-Tyne and Gateshead Gas Company, certain clauses relating to the pipe-laying are enacted. The new works are to be completed within seven years. The authorized tramroads may be worked by "mechanical" power, which is defined as meaning any motive power other than electrical and animal power. The time limited by the Act of 1894 for the completion of a certain pipe-line is extended to July 3, 1904.

The Southend Water-Works Act sanctions the raising of £176,000 of new capital, to bear a 5 per cent. ordinary or preference dividend, and carrying the usual borrowing powers. Additional works are authorized, comprising a well and pumping-station in the parish of Fobbing, others in the parish of Vange, and another in the parish of Bowers Gifford. Lands are to be acquired compulsorily within five years; and the works are to

be completed within fifteen years. From and after the construction of the works and the taking of water from the parishes of Bowers Gifford or Vange, the Company are to supply the Billericay Rural District Council with sufficient water for the use of the inhabitants of Bowers Gifford, Pitsea, and Vange; such supply being calculated on a basis of not less than 4 gallons nor more than 18 gallons per head per diem during the months of April to September inclusive, and not less than 4 gallons nor more than 15 gallons per head per diem from October to March inclusive. But the summer supply is not to exceed the quantity required during the succeeding winter season by more than 20 per cent. The supply is to be paid for, whether the quantity required is actually taken or not, at the price of 1s. 6d. per 1000 gallons. The same conditions are attached to the taking of water from Fobbing; the Orsett Rural District Council being the Local Authority acting for the inhabitants of the parishes of Fobbing and Langdon Hills.

The Southwark and Vauxhall Water Act authorizes the construction of additional works for water taken from the River Thames, in the parishes of Walton and West Molesey. Clauses are inserted for the protection of other London Water Companies, and of the Thames Conservancy. Power is given for the abstraction of water from the River Thames, under certain conditions and upon recited terms. Additional debenture stock to the amount of £650,000 is authorized, redeemable after 25 years. A sinking fund is to be formed in a specified manner. The capital value of the Company's undertaking is not to be increased by the passing of the Act.

The Staines Reservoirs Act amends in certain respects the Act of 1896. It sanctions the construction of larger reservoirs than the works authorized by the Act of 1896, and permits the diversion of a road in Hanworth. The works are to be completed within seven years. It is provided that if the Penton Hook Weir is constructed, water shall not be drawn from the Thames when it is flowing over that weir at a rate per day of 24 hours of less than 300 million gallons. The nominal amount of Staines Reservoirs Guaranteed Debenture Stock may be increased to £1,250,000. Trustees are enabled to invest in this stock.

The following Acts deal with the transfer of water undertakings from Companies to Local Authorities:—

The Felixstowe and Walton Water Act authorizes the Urban District Council to purchase the undertaking of the Company, who obtained an Act in 1895, in which preliminary provision for the purchase was made in the usual way. The Act sanctions the transfer at a price to be ascertained by arbitration under the Lands Clauses Acts, if the proceedings are carried through within six months. The Council are to give an effective supply to the outlying parts of the district within five years.

The Filey Water and Gas Act authorizes the Urban District Council to supply water and to acquire the undertaking of the Company, who obtained their first Water Act in 1856. The amount of the purchase-money has been agreed upon, and is named in the Act. The rate for domestic supplies is 10 per cent. on the rateable value. Meter supplies are to be charged 2s. per 1000 gallons. Right of entry upon consumers' premises is given, between the hours of nine and five, for the purpose of preventing waste of water or removing unused fittings. The water loan is repayable in fifty years.

The Forres Water Act enables the Corporation to purchase the undertaking of a Limited Company formed in 1845, upon the terms of a scheduled agreement. New works are authorized, including the conversion of Loch Romach into a storage reservoir, and an intake on the Black Burn in the parish of Rafford. On completion of the new works, the existing intake on the Black Burn is to be discontinued. All sporting rights on the lake are reserved to the landlord. The rate for domestic supplies is to be 1s. 6d. in the pound of the annual rack rent of the full annual value. A loan of £18,000 is sanctioned.

The Heywood Water-Works (Transfer) Act establishes a Joint Board for the water supply of Heywood and Middleton, and vests in the Board the existing undertaking of the Heywood Corporation. The terms of the transfer are stated in a schedule. The time prescribed by the existing Acts for the construction of certain authorized works is extended to seven years from the passing of this Act. The sum of £55,000 may be borrowed for the works, besides £10,000 for strengthening the embankment of the Nayden higher reservoir.

The Kettering Water Act authorizes the purchase of the undertaking upon six months' notice, for a sum to be ascertained by arbitration under the Lands Clauses Acts. The rates for domestic supplies range from 8 to 7 per cent., with the higher rate for all inns. The sum of £16,500 is to be borrowed for improving the works.

The Liskeard Corporation Act provides for the purchase of the Company's undertaking upon terms set out in detail. Rates for domestic supplies are to range from 8 to 6 per cent.

The Maldon Water Act incorporates the Company, and authorizes the transfer of their undertaking to the Corporation, according to the terms of a scheduled agreement. The existing debenture debt of the Company remains as a first charge upon the property. The works comprise two pumping-stations and wells; and a new water-tower is to be constructed. Rates for domestic supplies range from 1s. 6d. to 1s. 2d. in the pound. Prices are stated for meter supplies. A water purchase loan of



not exceeding £20,000 is sanctioned, with £10,000 for improving the works.

The Matlock Urban District Council Act authorizes the Urban District Council to acquire the undertaking of the local Company, who obtained their first Act in 1860. The transfer is in accordance with the terms of a scheduled agreement. The water-works are to be improved by the construction of an impounding reservoir upon the Bentley Brook, from which compensation water is to be discharged at the rate of 209,560 gallons per day. Rates for domestic supplies range from 10 to 6 per cent. Prices are stated for meter supplies. The works are to be completed within ten years. A clause is inserted for the prevention of plumbism. A water-works improvement loan of £48,000 is sanctioned.

The Newtown Water Act provides for the transfer of the undertaking to the Urban District Council of Newtown and Llanllwchaearn. The price is to be ascertained by arbitration, which is also to allow for £300 of parliamentary expenses, and compensation to the Clerk of the Company. Rates for domestic supplies range from 8 to 6 per cent. The sum of £10,000 is to be raised for improving the works.

#### PERSONAL.

Mr. T. H. ALDERSON, Assistant-Manager at the Halifax Gas-Works, has been appointed Gas Manager to the Selby District Council, in succession to the late Mr. W. J. Mott.

Mr. W. MACKIE, Engineer and Manager of the Port-Glasgow Gas-Works, has received an honorarium of £20 for extra services rendered by him in connection with the telescoping of a gasholder.

#### OBITUARY.

Mr. J. BRIGDEN, of Church Cobham, who until a few years ago was Chairman of the Cobham Gas Company, died on Friday, the 21st ult., at the advanced age of 81.

The death is announced of Mr. JOHN REAY FORSTER, who for many years was Resident Engineer to the Newcastle and Gateshead Water Company. In his youth he served his apprenticeship with Messrs. Morrison at the Ouseburn Engine-Works. He afterwards became Engineer for the Cramlington Coal Company, and next officiated in a similar capacity for a colliery company in South Wales. Having been there some time, he secured the important appointment in Newcastle which he held for nearly 35 years. About a fortnight ago, he caught a chill, which terminated fatally on the 21st ult. The deceased gentleman, who was 77 years of age, was not only greatly admired for his ability as an Engineer, but was also very much respected for his kindly disposition.

We regret to learn that, at an early hour last Tuesday, Mr. WILSON JOHN MOTT, Gas Manager to the Selby Urban District Council, succumbed to an attack of brain fever, accelerated by influenza. Deceased, who was only 38 years of age, was highly esteemed at Selby, to which place he went in April last to take charge of the gas-works on the removal of Mr. Dunn to Goole. Deceased leaves a widow and four children. The funeral took place on Friday, at Stockton-on-Tees. At the meeting of the District Council the same day, the Chairman (Mr. T. Liversedge) referred in high terms to Mr. Mott's efficiency as a manager; and a resolution was passed expressing sympathy with Mrs. Mott in her great bereavement. A public subscription has been started on her behalf; and the Chairman and two members of the Council have each contributed £5 thereto.

**Developments in the Commercial Uses of Gas as a Fuel.**—As the pioneer in the development of the commercial use of gas as a fuel, it is only natural that Mr. Thomas Fletcher, of Warrington, should direct the attention of its suppliers to any extension in this direction. He takes as an example the singeing of cotton fabrics; and it is interesting to learn from him that coal gas now plays an important part in producing the finished material, as compared with the time when charcoal and coke fires were used, as they still are by some who are behind the times. For singeing the loose "fluff" of wide sheetings, a gas-burner giving a perfectly equal flame 7 ft. 6 in. long is required; and the higher the temperature obtained, the more work can be done by one machine. As the machines are very costly, and take up a great deal of room, speed is of the utmost importance. A burner giving a perfectly equal flame 7 ft. 6 in. long and of a high temperature requires a gas consumption of 800 to 900 cubic feet per hour. Scores of these are in use; and if gas managers were to look after their interests hundreds would be employed instead of scores. A burner consuming the above-named quantity of gas for eight or ten hours daily for 313 days per annum is worth considering. That such burners are made, and used, and repeatedly ordered, is a simple fact. The profit is a very small matter to the maker of the burners, but it is not to the makers of the gas. Mr. Fletcher says this is by no means the largest example of the kind, and the sooner that gas companies see their power the better. It is quite certain that no user would consume 800 to 900 cubic feet of gas per hour without showing a profit; and this profit goes to the gas-maker.

#### NOTES.

##### Liquor Ammonia as a Fire Extinguisher.

A French writer in a pharmaceutical journal has once more made the suggestion that "aqua ammonia" should be kept for extinguishing fires in workshops and factories where highly inflammable substances are stored or used. Referring to a fire which occurred at Savenay, France, the writer states that the vapour from a tank containing 50 gallons of gasoline caught fire in the linen-room of a laundry. The room was instantly a mass of flames; but 1½ gallons of liquor ammonia thrown into it, completely and almost instantaneously extinguished the fire. The ammonia was in a carboy in a druggist's shop next door to the laundry; and the druggist, who was naturally interested in preventing the fire from spreading, threw it into the room by way of experiment. According to his own graphic description, the effect was instantaneous—torrents of black smoke rolled upward in place of the flames, and in a moment every trace of fire was gone. So completely was the fire extinguished that workmen were enabled to enter the room almost immediately, when they found the iron tank of gasoline intact. Anything that will quell the flame of burning petroleum spirit is worth knowing. Some years ago, it was the practice to place glass jars of liquor ammonia upon the vessels containing gasoline in store, with the object of their being broken and liberating the ammonia in the event of any explosion. It would be interesting to know if this practice is still followed.

##### A Test of Good Mortar.

In 1892, Mr. J. Hughes contributed to the "Builder" the result of some observations upon the character of certain ancient mortars, from which he deduced the important conclusion that the higher the proportion of amorphous or gelatinous silica soluble in alkali, the better the quality of the mortar. And as this kind of silica is associated originally with the lime rather than with the sand, it becomes a serious point that the character and composition of any lime intended to be used for mortar should be inquired into, and the best quality selected. Mr. H. F. Hills corroborates this conclusion, from an examination of the mortar used in building the chancel wall of Bow Church, in East London, which dates from 1480-90. The results of Mr. Hills' analysis of this mortar are given in a recent issue of the "Builder." The stone employed with the mortar was Kentish ragstone. The proportions of sand and lime used were probably one of sand to one of lime; and the wall is in excellent condition. In contrast with this ancient mortar, was a sample of grout, or mortar, believed to be about 150 years old, taken from another part of the same building. This mortar could easily be broken up and crumbled in the hands. It had been made of a mixture of gravel and lime, in the proportion of about three of gravel and one of quicklime. The proportion of silica soluble in a 10 per cent. solution of caustic soda (Mr. Hughes's test) was very low; being only about 2 per cent., as compared with over 8 per cent. in the good mortar.

##### Calcium Nitride and the Fixation of Atmospheric Nitrogen.

M. Moissan has communicated to the "Comptes Rendus" an account of his experiments in connection with the preparation of calcium nitride, some results of which bear upon the remarks of Sir W. Crookes at the British Association meeting concerning the fixation of atmospheric nitrogen. Starting with pure crystallized calcium, prepared according to a method previously described by M. Moissan, it is easy to prepare calcium nitride by the direct combination of the two elements at a suitable temperature. In the cold, nitrogen and calcium do not act upon each other. But on gently heating them, in contact with one another, a slow absorption takes place. The white metal takes on a bronze-yellow tint, due to the presence of the nitride. If the temperature is raised to a low red, the calcium catches fire, and burns in the nitrogen, with a very rapid absorption of the gas. The reaction is best carried out in a nickel tube. At the temperature of the electric furnace, the nitride is completely decomposed by carbon; calcium carbide remaining in the tube. Water decomposes the nitride with violence; ammonia and calcium hydrate being formed. Hence the suggestion is offered that this substance, calcium nitride, may find a commercial application in the formation of ammonia from atmospheric nitrogen. The various stages of this process are not further explained; and no attempt is made to estimate the cost of working, as Sir W. Crookes did in the course of his British Association address.

##### Protective Metallic Coatings for Iron and Steel.

The above-named subject was dealt with in a paper read by Mr. Sherard Cowper-Coles, at the meeting of the Society of Engineers on the 3rd inst. The author directed attention to the comparative corrodibility of iron and steel under varying conditions, and emphasized the importance of the subject, now that steel, which corrodes more rapidly than iron, is so largely used in construction. He gave some interesting examples of failures in engineering structures owing to rapid corrosion. Sea water dissolves iron quickly, and acts upon it more powerfully than upon steel. Raw tar has a very marked effect upon wrought iron. The author cited the case which had come under the notice of Mr. Carulla, of Derby, in which some bolts, fixed



in valve-boxes, had been badly pitted. Particulars of this case were given in the "JOURNAL" about two years ago. The boxes were used for pumping water which had been contaminated with tar residues, and which smelt strongly of naphthalene. Up to the present time, zinc has been found to be the most effective coating, due to the electro-chemical action set up between the steel and zinc. A short history of the galvanizing industry was given, together with details of the improvements introduced from time to time. The author explained the best working conditions for electro-zincing, and gave a comparison of the actual and theoretical weight of zinc obtained for a given amount of electrical energy. He drew attention to cadmium and copper as protective coatings for iron and steel, and set forth their advantages and disadvantages compared with those of zinc.

#### The Transmission of Heat through Iron.

A curious example of the mysteriousness that often hangs about common phenomena, is described in a letter to "Nature" from Mr. John Stone Stone, of Boston, Mass. The writer states that about the year 1880 he had occasion to heat one end of an iron bar to a bright red, while holding the cooler end in his hand. Upon plunging the heated end into a bucket of water, the cooler end became suddenly so hot that he was obliged to drop it. The beginning of the experience in question is in the common way of blacksmith's work; but we cannot remember having seen the consequential circumstance noticed anywhere. The phenomenon of the heat of the iron being driven along the bar in this manner interested Mr. Stone very much; and eight years later, while working in the physical laboratory at Johns Hopkins University, he further investigated the matter. He arranged an iron or steel bar, to be heated at one end by a compound bunsen burner, which made the iron red hot. To the other end of the bar was soldered a thermo-electric couple, the circuit of which was closed through a sensitive reflecting galvanometer, with precautions against radiation and convection effects. The spot of light on the galvanometric scale was adjusted to a convenient point, when the state of steady flow of heat along the bar was established. Then the bunsen flame was removed, and water was immediately poured over the end of the bar. The spot of light on the galvanometer scale immediately moved off in the direction indicating a rise of temperature at the cooler end of the bar. The rapidity of the action was another source of surprise to the observer, as it far exceeded in velocity the propagation of heat along the bar by conduction. Later experiments with brass bars failed to show the same effect, from which Mr. Stone concluded that the effect was due to much the same cause as recalcination. It is remarkable that an effect which must so often have been produced and observed by workers in iron has not been discussed.

#### Practical Hints on Linseed Oil Paints.

The "Ironmonger," which has this year devoted much space to the discussion of paints and varnishes, speaks well of oxygenated linseed oil, as a modern improvement on the old plan of boiling the oil. Not much difference is made in the nature of linseed oil by boiling it, except that its viscosity is increased thereby; and this enables the medium to retain in a proper state of mixture the heavier pigments used for preservative painting. If instead of boiling the oil—which means subjecting it to a temperature of 300° C.—it is agitated with oxygen at ordinary steam heats, the operation of bringing it to the desired consistency is much expedited, the oil gains in weight instead of losing, does not darken much nor become appreciably fluorescent, and finally dries more rapidly. At first the oxygen process was open to some objections; but recent samples are credited with strong drying powers, and the production of an admirably tough and elastic film. Experience must dictate judgment on the behaviour of mixed paints under the brush and when drying. The drying of linseed oil paint is affected by a number of external circumstances. Cold and damp retard it greatly; want of light is just as detrimental. For these reasons, it is impractical to insist upon a paint drying in a certain number of hours. The actual speed of drying is of less importance than the character of the dried film. Many cheap paints, sold ready-mixed, drag strongly on the brush, showing that they are overloaded with driers; and they accordingly dry with great rapidity, yielding an excessively thin brittle skin, highly suggestive of rosin oil, while the body of the coat remains wet for a long time afterwards. One of the best and most severe tests for linseed oil is to apply it to a plate of glass or metal, allow it to dry, and then try the film with the finger. The same test is applicable to all paints and varnishes. As soon as the surface is no longer sticky to the touch, the finger should be dragged across the film. If it cracks instantly and a lot of apparently unaltered paint or varnish oozes out, the material should be rejected. If the skin is tough and requires some force to tear it, while the underneath portion appears to have already become nearly dry, it can safely be concluded that the sample is good and fit for any kind of employment. Another simple test is steaming. A slip of clean sheet iron is painted two coats, and laid paint downwards, after the coats have dried hard, over a pan of boiling water. It is kept in this position for several hours, and the film afterwards removed by soaking in aniline. If the iron has not rusted, the paint or varnish may be considered reasonably waterproof.

## TECHNICAL RECORD.

### MIDLAND ASSOCIATION OF GAS MANAGERS.

A HASTY conclusion drawn by the Committee of the above Association from altogether insufficient evidence was, as will be seen by the report below, responsible for the placing of Mr. W. S. McGregor, of Longton, and the "JOURNAL" in a false position before the members at their meeting last Thursday. The matter is referred to in our editorial columns to-day; but, in justice to Mr. McGregor, we consider it a duty to accord to it some fuller explanation in conjunction with the report of what transpired at the meeting. It appears that some months since Mr. McGregor promised to contribute to the proceedings of the Association a paper describing the new plant and improvements at the Longton Gas-Works. In the meantime, however, the Corporation Gas Committee resolved to have a formal inauguration of the new works, and to celebrate the occasion by a little festivity. The date chosen by the Gas Committee (not by Mr. McGregor) as the most convenient for the event was Oct. 20—just a week before the meeting of the Association at which Mr. McGregor was to read his paper. By invitation of the Chairman of the Gas Committee and one of the Contractors, a representative of the "JOURNAL" attended the function at Longton for the purpose of recording in these columns an account of what was being done there in the way of developing the concern. As is usual on such occasions, he, as well as the other visitors, was handed a printed pamphlet briefly describing the new plant; and by the aid of this, his own observations, and some notes he made, he prepared the article which, in the ordinary course of things, was published in our last Tuesday's issue. The pamphlet, by the way, was the production of one of the contractors. Therefore, how by any stretch of the imagination Mr. McGregor could be held accountable for the article passes comprehension. But (for reasons which will be obvious on reading the report of what took place at the meeting of the Association) we wish to emphasize these further points: At the time our representative left Longton on Friday, the 21st ult., Mr. McGregor had not written the paper for the meeting of the Association; on that day the article which appeared in the "JOURNAL" was written; it was put in type the next day; the "JOURNAL" containing it was printed during Monday night; and it was not until the following (Tuesday) morning that the manuscript for Mr. McGregor's paper was delivered at the "JOURNAL" office, in order that slips might be prepared for use at the meeting of the Association. Consequently, until Mr. McGregor received his copy of the "JOURNAL" on Wednesday morning last, he could not have had any knowledge of the line the writer of the article had taken; nor until after the "JOURNAL" was printed did the writer of the article know anything as to the character of Mr. McGregor's paper. After perusing the article, Mr. McGregor suggested in a letter to the Honorary Secretary (we believe in view of the proposed visit to the Saltley works) that the time of the meeting might be saved by taking his paper as read. The letter was laid before the Committee shortly before the ordinary meeting of the members on Thursday; and, without knowing the facts of the matter so far as the "JOURNAL" was concerned, and without having had an opportunity of making a comparison of the article and paper, the Committee decided to take the extreme course of rejecting the latter altogether. Later in the day, however—after the above facts had been brought to the notice of various members of the Committee—some reparation was made by the revocation of this decision, and the admission of the paper as part of the transactions of the Association. But the injury had then been inflicted.

The Autumn Meeting of the above-named Association was held last Thursday at the Grand Hotel, Birmingham, under the presidency of Mr. J. T. LEWIS, of Wellingborough. There were more than fifty members present; this being a record number for the past few years. The members generally observed with gratification that the President now looks none the worse for the accident which befel him during the visit of the Association to Wellingborough in May last.

#### CONFIRMATION OF MINUTES.

The HON. SECRETARY (Mr. Charles Meiklejohn, of Rugby) read the minutes of the meeting held at Wellingborough; and they were confirmed.

#### ELECTION OF OFFICE-BEARERS.

The PRESIDENT said it gave him great pleasure to propose, as President for next year, their esteemed friend, Mr. J. S. Reeves, of Bilston. He was one of the members who had done a great deal for the furtherance of the interests of the Association—as a member of the Committee, as an Auditor, and for some period as Honorary Secretary. He (the President) was sure that the nomination of Mr. Reeves for the highest office in the Association would meet with hearty approval, seeing that in him they had a man who was qualified in every way to preserve the traditions of the Association.

Mr. B. W. SMITH (Smethwick) had pleasure in seconding the



motion, and in endorsing the remarks made by the President. Mr. Reeves had been associated with them for many years; and he had been a steady-going, hard worker.

The motion having been unanimously adopted,

Mr. REEVES thanked the members for the honour they had done him. He trusted that, with the help the members were always willing to afford their President, he would be able to perform the duties of the office to their satisfaction.

Mr. P. SIMPSON (Rugby) said he had to introduce a name for the vice-presidency which he was certain would be received with the honour due to it. It was that of Mr. J. F. Bell, of Stafford. He was a man who had worked hard in the profession, and who had done much good.

Mr. T. BERRIDGE (Leamington) seconded the motion, which was unanimously passed.

Mr. BELL, in thanking the members for his election, promised to try to discharge the duties to their satisfaction. With Mr. Reeves as President, they would not require much aid from him (Mr. Bell); but he would be happy to give any assistance he could.

Mr. W. BELTON (Shrewsbury) said the proposition he had to make would be a popular one. It was the re-election of Mr. Peter Simpson as Treasurer. No one knew better than the members the valuable services Mr. Simpson had rendered to the Association from its foundation—in fact, he had rendered numerous services to the gas profession before then. He (Mr. Belton) believed he was one among the first few who founded the original parent Association.

Mr. C. TAYLOR (Derby) having seconded the motion, and endorsed the remarks of the proposer, it was agreed to.

Mr. SIMPSON thanked the members; remarking that there was nothing that gave him greater pleasure than to be able to do something for the Association and profession. He was one of the first who arranged meetings of gas managers. He felt the need of them then very much, not being far up the ladder, and wishing to be up. (Laughter.) He considered at that time, as he did now, that one of the best things for the profession was for friends to meet together to discuss matters that would be beneficial to them; and it gave him much pleasure to see the progress that had been made. He thanked the members for the honour they still paid him; and he hoped to see the finish of another year in their service as Treasurer.

Mr. T. GLOVER (West Bromwich) proposed that Mr. Meiklejohn be asked to continue in the office of Honorary Secretary. He believed Mr. Meiklejohn was willing to serve; and the members would be delighted to know this, because they had had a long experience now of the genial way in which he conducted the work of the office.

Mr. W. R. COOPER (Banbury) seconded the motion, which was heartily adopted.

Mr. MEIKLEJOHN briefly thanked the members for the confidence they showed in him by his re-election. Proceeding, he proposed that Mr. W. Winstanley (Newcastle-under-Lyme) and Mr. H. P. Maybury (Great Malvern) be appointed members of the Committee in the place of Messrs. Pariby and Meunier, who retired by rotation.

Mr. REEVES seconded the motion, which was passed.

The election of Mr. Maybury to the Committee rendered vacant his position as one of the Auditors; and Mr. Berridge was appointed to succeed him, to act in conjunction with Mr. P. Winstanley, of Nuneaton.

The next item on the agenda was a paper by Mr. W. S. M'GREGOR (Longton) on

#### THE RECONSTRUCTION OF THE LONGTON GAS-WORKS.

The HON. SECRETARY stated that the previous morning he received a letter from Mr. M'Gregor, suggesting that his paper should be taken as read, on account of the fact that it had been already to some extent, or largely, anticipated in the publication of an account of the opening of the new works at Longton. He (Mr. Meiklejohn) did not know what the feeling of the meeting might be on the matter; but he simply wished to say that this was the first intimation he had had that any of the information regarding the extensions that Mr. M'Gregor promised him some time ago for a paper would be published before being brought before the Association. It had placed him and the Committee in rather an awkward position.

The PRESIDENT said the Committee were much surprised to find that Mr. M'Gregor's paper\* was published in the "JOURNAL" the previous Tuesday—only two days before the meeting. It seemed strange that this publication should have taken place, because the paper was promised a considerable time since for this meeting. Consequently, the Committee felt that, because the paper was practically the same as the "paper" in the "JOURNAL," they could not accept it for publication in the transactions of the Association. The Committee regretted this; but it must be so. They felt most strongly that, if a paper was promised by a member, that promise should be held sacred. So far as the purport of the paper was concerned, nothing whatever should be published until the paper was read at a meeting

of the Association. It was open to the members to say if they were satisfied or not with the action of the Committee. He should be glad to hear any explanation Mr. M'Gregor had to offer.

Mr. J. F. BELL (Stafford) suggested that Mr. M'Gregor should offer an explanation before any discussion took place.

Mr. M'GREGOR said he was sorry this had occurred. The opening day for the works was not fixed by himself. It was originally intended that it should have been that day [the 27th]; but it so happened that the date was inconvenient. It did not occur to him that the "JOURNAL" would be able to get their article in type and published before the meeting. He was very sorry that this had offended the Committee. There had not been the slightest idea of anything of the kind on his part. He had no doubt the Committee were quite within their rights in the course they had taken; but he need not say more as that was pretty well the whole explanation.

Mr. BELL: Cannot Mr. M'Gregor give us some details that are not published in the "JOURNAL?"

The PRESIDENT: The brakes to convey the members to the Saltley Gas-Works have been ordered here earlier on account of the decision of the Committee.

The HON. SECRETARY said that, anticipating the paper would be taken as read, he had arranged for the char-a-bancs to be at the hotel at 2.30. If they had not left until three o'clock it would have given them only a short time at the works before darkness set in.

[Mr. M'Gregor did not accompany the members to Saltley; and, before leaving, we understand he intimated that, in consequence of what had happened, he should resign his membership of the Association.]

#### THE SALTLEY GAS-WORKS EXTENSIONS.

Mounting the conveyances, the members at once proceeded to the Saltley Gas-Works to view the extensions in progress in connection with the large extension scheme. They were received with the greatest cordiality by the Engineer (Mr. Henry Hack, M.Inst.C.E.), who, having conducted them into a temporary structure at the entrance to the new works, prefaced the inspection by explaining to them, in a general way, the character of the work in hand and that in prospect. Only a fortnight since, we described the scheme of extension at some length, to which account there is at present little to add. It might, however, be mentioned that the finishing work in connection with the enlargement of No. 5 holder is being rapidly advanced by Messrs. Westwood and Wrights; and Messrs. C. & W. Walker are also making tremendous strides in the construction of the 8½ million cubic feet holder, which, as we have already shown, contains several features of interest. It was seen that, in the past two or three weeks, the contractors have put into position nearly the whole of the inner lift, and one-half the first lengths of the standards; and almost the whole of the top curb is in segments on the ground ready for fixing. In this holder, Messrs. Walker have adopted a method of construction which greatly facilitates the progress of the work; and, indeed, we do not think it has ever been attempted before on such a large scale. The sides of the lifts are being delivered in large segments already riveted; and these have to be simply lowered in position, and riveted together. Each piece is about 7 feet wide, and the full depth of the holder, with the vertical guides and the stays inside and out riveted on.

Mr. Hack was assisted in guiding the members round the works by Mr. Morrison and other assistants. Having completed their survey of the storage extensions, and of the preparations which are being made for the carrying out of further sections of the scheme, and having also inspected the water-gas plant, the visitors were kindly invited by Mr. Hack to take tea in the temporary building in which they had previously been welcomed.

#### A RETRACTATION.

The members having finished tea,

The PRESIDENT said he desired to take this opportunity of making a few remarks with reference to the paper which Mr. M'Gregor had prepared for the meeting. Since the members left the Grand Hotel, he and several others had received an explanation which had put the matter in a different light. He was pleased to say this, because to him (the President) and to the Committee it was most distasteful to say or do anything that might seem to be in the slightest degree unjust to anybody. He found that the facts of the case were somewhat as follows: The representative of the "JOURNAL" was present at the opening of the new works at Longton by invitation; and while there he used his opportunities as a journalist—and rightly so—to get all the information he could about the works and the alterations that had been made. In preparing his article, he doubtless did not know the purport of the paper that was to be prepared by Mr. M'Gregor and given to the Association at their meeting that day, nor that the article would practically cover the description which the paper would give of the reconstruction of the Longton Gas-Works. If they had had these facts before them that afternoon, he thought that, at any rate, the members would have allowed the paper to be taken as read. He considered, in justice to Mr. M'Gregor and to the "JOURNAL," this explanation should be made; and, on behalf of the Committee, he begged to propose—"That the paper prepared by Mr. M'Gregor should become part of the transactions of the Association."

\* A comparison of the article that appeared in last Tuesday's issue with the paper prepared by Mr. M'Gregor will show that the President was utterly mistaken in describing the article as the "paper." It will be seen that at least two-thirds of the article consists of altogether different matter to anything appearing in the paper given on the opposite page.



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Occupies very little Space. The Flange diameter is about the greatest width.

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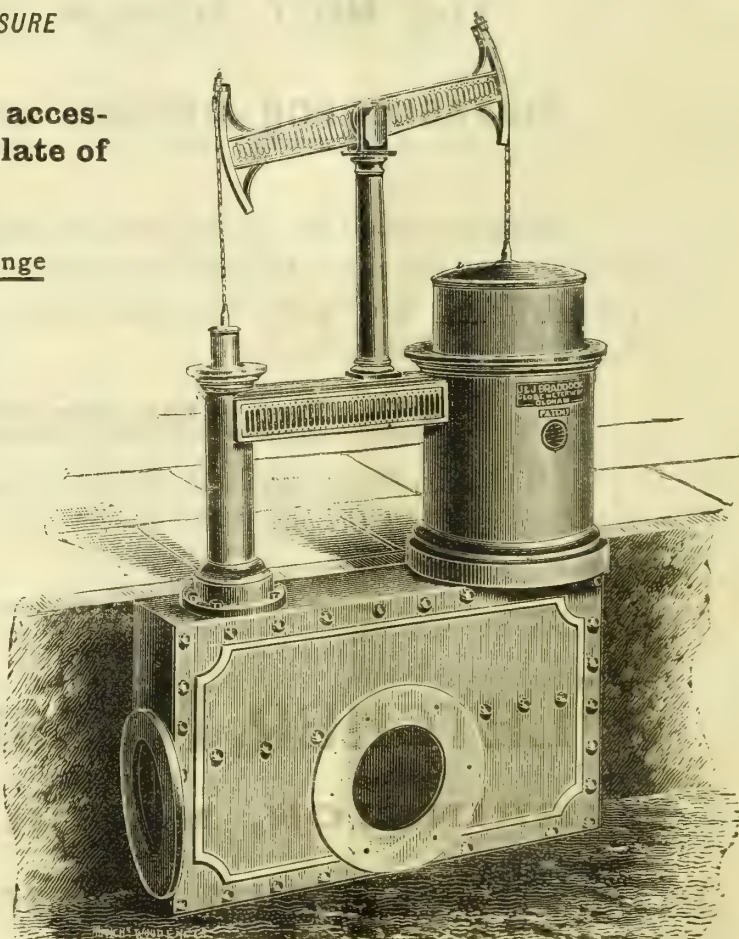
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No. 183.



Mr. J. S. REEVES (Bilston), in seconding the motion, said that, after the lucid remarks made by the President, he had little to add, excepting this: In deference to the wishes of his Committee Mr. M'Gregor prepared an illustrated statement setting forth the nature of the extensions for the use of his Committee and such persons as were interested in them at the opening of the new works, and this statement was to form the ground or basis of the paper he was to read. As Mr. M'Gregor explained at the meeting, he expected that the opening of the extensions would have taken place on that [last Thursday] or a subsequent day; and then the Association would have had the description before them previous to any portion of it being published. But it was thought desirable to begin working the new plant earlier; and, of course, Mr. M'Gregor had to consider his Committee before the Association. He (Mr. Reeves) thought it would appear to the members, under these circumstances, that they would be doing right in reversing the decision arrived at at the meeting. They did not wish to do an injustice to anyone; and after the explanation that had been given, they would be doing Mr. M'Gregor an injustice, and giving him pain, by not rescinding the previous resolution.

Without further remark, the motion was unanimously carried.

#### THANKS TO MR. HACK—THE DEVELOPMENT OF THE SALTLEY WORKS.

The PRESIDENT said his next duty was to propose, on behalf of the members, a vote of thanks to Mr. Hack for his great kindness to them that day. It was not the first time by many that they had had the privilege of looking over the works controlled by Mr. Hack. Many were the times that he (the President) remembered the members had been there, and had been shown whatever was to be seen in the way of extensions; and he need not point out how extremely valuable these opportunities were to them all. He was sure they had all been interested and instructed very much in looking over the tremendous extensions now in progress. They had indeed seen some fine examples of engineering skill and construction. He sincerely thanked Mr. Hack for showing them the new works, and for his generous hospitality.

Mr. HENRY WOODALL, in seconding, remarked that they had known Mr. Hack for a great many years; and he had always shown great kindness in assisting the Association. They one and all hoped that he would live long to be a light among them, to show them the way they should go. Whatever they wanted to see in the way of gas-works, they could see in its best form under Mr. Hack's engineering.

The motion was carried by acclamation.

Mr. HACK said he was much obliged to the members for the vote of thanks they had accorded him. It had been that day, as in the past, a great pleasure to do what he could to serve the interests of the Association. He was always glad to see his *confreres* in the profession at the Saltley works—whether he had anything in the way of extensive works in hand or at other times. He felt that he was only reciprocating the many kindnesses he had received when visiting other works. In visiting each other's works, they learnt some things at one place and some at another; and so often gained a useful wrinkle. What the members had seen that day, must have impressed them that the Corporation Gas Committee and their Engineers—Mr. Hunt and himself—had no misgivings as to the future of gas lighting. Notwithstanding that the Corporation had recently taken over the electric lighting works, the great progress of the gas undertaking had forced upon them these extensions. Although they had acquired the electricity supply, they did not foresee anything that was going to deter the progress of gas; and they believed it would continue to move forward as in the past. In order to show the great advancement that had been made, he might mention that the production of gas had increased by no less than 118 per cent. since the transfer of the works to the Corporation in 1875. The make of gas in that year was 2,327,596,000 cubic feet; while in the past financial year it was 5,074,865,000 feet. And this, notwithstanding that several of the out-districts—Oldbury, West Bromwich, Tipton, and Smethwick—had severed themselves from Birmingham. If they had not done so, the increase would have been a great deal more. Even since the electric light was started in the city in 1891-2, the increase in the make of gas had been to the tune of 25 per cent. In 1891-2, the make was 4,045,006,000 cubic feet; and in the past year, 5,074,865,000 cubic feet. In his opinion, both gas and electricity would run alongside for many years to come; and they need not fear that gas undertakings were in, or likely to fall into, a moribund condition. In connection with the present extensions of the gas-works, it might be interesting to the members to learn that, at the time of the transfer, the greatest daily make at Saltley was 4,817,000 cubic feet; while in the past financial year, it was 11,906,000 cubic feet. The present daily capacity was: Coal gas, 10,250,000 cubic feet; and water gas (with plant in reserve), 3,250,000 cubic feet—making a total of 13,500,000 cubic feet. Adding to this the capacity of the extensions on hand—coal gas 5,000,000 cubic feet, and water gas 2,000,000 cubic feet—made 20,500,000 feet. Then when the scheme was completed, a further 5,000,000 feet of coal gas would have been added—giving Saltley a daily capacity of 25,500,000 cubic feet. There was no doubt the gas industry would go on prospering; and certainly in the lifetime of those present they would not be able to call it a decaying industry.

The PRESIDENT also proposed a vote of thanks to Mr. Hack's assistants for their attention during the tour of the works.

Mr. B. W. SMITH (Smethwick) seconded the proposition; and it was unanimously passed.

Mr. MORRISON, in responding, said he was sure it had been a pleasure to him and the other assistants to show the members of the Association round the works; but, while they were giving them this vote of thanks, he should like to mention that the assistants rather felt they were not of them. Some years ago it was decided that assistants of large works such as these should not be admitted to membership of the Association—the Association would not have them. At the same time, he thanked them for the kind vote just passed.

Mr. HACK observed that he hoped at some future time, as the works progressed in connection with the retort-house and purifying plant, they would again have the pleasure of seeing the members of the Association at Saltley.

The PRESIDENT assured Mr. Hack that the members would be delighted to pay him another visit.

Shortly afterwards, the company returned by the brakes to the Grand Hotel, where they dispersed.

The following is the paper Mr. M'GREGOR had prepared for presentation to the meeting:—

#### RECONSTRUCTION OF THE LONGTON CORPORATION GAS-WORKS.

It may be stated at the outset that the design, manipulation, and control of all mechanical appliances introduced into gas-works, has now become a subject of the greatest economic importance; and the majority of gas engineers, in designing modern works, arrange for their introduction with a view to economy and less dependence upon skilled labour, besides the greater facilities obtained for handling material—objects to be all the more strongly borne in mind in view of the Workmen's Compensation Act, and its probable demands upon employers. Gas making has changed but little during the last fifty years—*i.e.*, the principle remains the same, although many improvements have been made for carrying on the process. Still, as it is the aim of every engineer to produce the greatest quantity of gas from a ton of coal at the smallest cost for wear and tear, fuel, and labour (due consideration, of course, being given to the quality of gas supplied), this principle has to a great extent guided the writer in designing and carrying out labour-saving appliances during the reconstruction of the Longton Corporation Gas-Works.

The new retort-house is 90 ft. 6 in. long by 70 ft. wide between walls, and 35 ft. 6 in. from ground level to wall-plate. It is a plain but substantial building of two floors—the basement and working floor—presenting a massive appearance, quite in keeping with the work for which it is designed. The basement or cellar floor is used for discharging and cooling the coke, and attending to the furnaces. From the basement floor, access is had to the underground engine-rooms, where a 10-horse power engine of the vertical type is used to drive the coal breaking, elevating, and conveying machinery. The walls are lined with white glazed bricks; and these, of course, give a cheerful and cleanly appearance to the engine-rooms.

The working floor is carried on heavy steel girders, supported on cast-iron columns and steel joists with brickwork arches. In fact, throughout the whole of the work steel has entered largely into the construction, owing to its superior qualities of lightness and strength. It is rather unusual to design a house of this size with two floors. The reason that this type of house was adopted was that a large drainage culvert passes directly across the site, about 4 feet below the yard level; and as this precluded the building of a cellar for the regenerator retort settings introduced, it was finally decided to build a stage-floor house, which, although somewhat more expensive in first cost, soon repays the outlay, owing to the greater facilities obtained thereby for handling the coke. The retort-house is spanned by a light steel roof, the main principals being 72 feet long, with a rise of 17 ft. 6 in. A ventilator 10 feet wide, running the whole length of the roof, provides ample space for the exit of smoke, steam, &c. The total weight of the steel used in building the roof is just under 31 tons; and it is noteworthy that not a single forging has been required in fixing the roof. The retort settings are arranged for the introduction of mechanical stoking (manual), and are also designed with all the latest modern improvements of hydraulic main, gas and tar valves, flushing apparatus, &c.

As space would not permit of the erection of coal-stores on each side of the retort-house—nor, indeed, would the capital invested pay for interest and sinking fund charges on stores, owing to the works being situated so close to the North Staffordshire coal-fields—it became a problem how to obtain the best results in "coal trimming," as a large portion of the saving is effected in this direction. It was finally decided to construct two elevator and coal-breaker pits directly underneath the railway lines running along each side of the retort-house; each pit to contain steam-engine, coal-breaker, and elevator, into which the coal is delivered by means of bottom doors in the railway trucks. The elevators each deliver into storage hoppers of 7 tons capacity, fixed in the retort-house; so that either elevator can feed both sides, thus minimizing the chance of a breakdown. The coal is shunted in from the railway sidings; the waggons being run directly over the receiving hoppers. As



all the trucks are provided with bottom doors, little difficulty is experienced in emptying the waggons; while with hopper-waggons, built specially for this traffic, hand labour is reduced to a minimum. The receiving hoppers over the coal-breakers are provided with adjustable doors, so that the supply of coal to the breakers can be regulated according to the size or quantity required. The breakers are driven by a separate steam-engine of the vertical type, which also drives the elevator and conveyor. The elevators consist of 12-inch steel buckets, spaced 18-inch centres, fitted to a strong detachable link chain of cast steel, provided with lugs for fastening bolts and sliding gear; and the buckets are guided by a latticed steel framing, bolted on H steel girders built into the retort-house walls. These elevators are driven by belt and chain gear combined. The belt drive is adopted for the purpose of preventing any damage being done should a piece of iron or other foreign material find its way into the coal-breaker; the belt having a tendency to slip immediately this occurs. After leaving the elevators, the coal is delivered into an overhead storage-hopper or conveyor, as required. The conveyor consists of a flat cotton band, kept taut by means of rollers; and it is so arranged that it can be driven by either elevator or overhead hoppers.

The drawing-machine is of the usual rake type, mounted on a triangular frame running on rails in front of the charging-machine, and parallel to the retort-bench. The charging-machine consists principally of a moveable hopper carrying about 3 tons of coal, and fixed on an upright frame running on rails in front of the bench, and, like the drawing-machine, parallel thereto. The charging-machine is provided with steel travelling wheels, cast malleable travelling gear, and rope hoisting gear for raising and lowering the adjustable hoppers to the three tiers of retorts.

For disposing of the coke, moveable wrought-iron plates are fitted in front of the retort-bench immediately over the coke-shoots, delivering the coke into side tip-waggons placed underneath. The coke-shoots are carried on brackets bolted to the buckstaves, and are made V shaped to allow of the men having free access to the clinkering doors. For conveying the coke to the yard, a narrow gauge tramway, 20-inch gauge, is laid down; and side tip-waggons of 25 cubic feet capacity are used. These waggons will ultimately be hauled out and in by means of an endless rope, although at present they are being worked by hand. For quenching the coke, water-pipes provided with a rose are placed one over each coke-shoot, and also a water-tank of 500 gallons capacity over each line of tram outside in the yard. It is intended that the coke, after being thoroughly cooled, should be tipped into the boot of a coke elevating and breaking machine, broken to size, elevated, screened, and delivered into trucks, or the smaller sizes washed for smiths' use.

The exhausting plant has been completely remodelled; a new engine and exhauster of 50,000 cubic feet per hour capacity having been fixed, and the two existing exhausters coupled up to one engine direct—thus doing away with belt driving. The new exhauster is of the four-blade type; and the engine is controlled by gas and steam governors. A new rotary washer-scrubber, driven by a horizontal steam-engine, has been erected, and is capable of removing the ammonia and other impurities from 1 million cubic feet of gas per 24 hours, and will certainly repay the outlay in the increased yield of residuals. A new station meter has been built, of 50,000 cubic feet per hour capacity, and is erected in an outwardly plain but substantial building, although some little taste has been displayed in the interior decorations, notably the roof, which is stained and varnished. A cabinet of scientific instruments for recording illuminating power and pressure, together with the regulator for controlling the supply of gas to the borough, and a petroleum enrichment plant, make this one of the most interesting places in the works. A new leading main has been laid from the works to the Town Hall, and a new trunk main joined thereon to increase the supply to Dresden and district.

Another very interesting feature in the works is a small electric light plant, with which the purifying-shed, the governor-house, engine-room, offices, and Manager's rooms are lighted. It is a continuous current dynamo run at 110 volts; and is capable of supplying sixty 16-candle power incandescent lamps, and has already proved itself eminently useful in enabling purifiers to be attended to at night, in case of breakdown.

The extensions have cost about £15,000; and the writer considers the money has been well and judiciously expended, and trusts his brief *resumé* may prove interesting to the members.

**Mr. H. Fowler on Calcium Carbide and Acetylene.**—At a meeting of the Great Western Railway Engineering Society on Monday evening last week, Mr. H. Fowler, Gas Manager at the Horwich works of the Lancashire and Yorkshire Railway Company, read a paper on "Calcium Carbide and Acetylene." The author described the various types of furnace used for producing carbide, and gave the yield as about 0.3 lb. per electrical horse-power-hour. The cost of the electrical horse-power-hour per annum (24 hours per day) was stated as £4 at Foyers and £1 9s. at Geneva, as contrasted with the figure given by Professor Kennedy, when coal and steam were used in place of water power—viz., £9. The burners most suitable for the economical combustion of acetylene were described, as were also the numerous types of portable generators.

## COMBUSTION IN RETORT FURNACES.

The following is an abstract translation of an article on the above subject in the "Journal für Gasbeleuchtung," by Dr. Otto Pfeiffer, of the Magdeburg Gas-Works.

The great advantage of gaseous firing of retort settings, &c., lies in the power it gives of securing combustion, which, according to theory, is approximately perfect. When perfect combustion takes place, the products contain neither an excess of atmospheric oxygen nor a remnant of unconsumed fuel gas. The heat which the fuel is capable of producing is thus set free in the smallest space in which the gases can be contained; and this again is consistent with the production of the highest possible temperature. The temperature attainable from the combustion may be expressed as the quotient of the heat of combustion of the fuel gas, divided by the specific heat of the products of combustion.

In gas manufacture the highest temperature is required; and therefore attention must be directed to the proper combustion of the fuel gas. That is to say, there should be neither deficiency nor excess of air, so that what may be termed "neutral combustion" takes place in the combustion chamber itself, and in any case is not extended far into the flues. The experienced man is able, from various indications, to draw conclusions as to the state and position of the combustion which is taking place. In the first place, the temperatures prevailing in the arch of the setting and in the flues are judged by the eye, and excess of air, which depresses the temperatures, is thus detected. Deficient combustion can also be traced from the blue flame of carbonic oxide and the great heat prevailing in the flues. Chemists have also the assistance of gas analysis to enable them to form a much more precise opinion on what is happening in the furnace; and a knowledge of the composition of the products of combustion further shows exactly to what extent the conditions deviate from those which afford neutral combustion. Observations of the temperature and draught are also valuable. It would, however, be wrong to assess the value of a setting, or to pronounce final judgment on its working from the results of one or even a couple of the methods of observation named, though this is very commonly done in gas-works, and a false opinion is thus frequently formed. Only on observation of what takes place in the setting throughout a protracted period of use can a reliable criticism be based; for the conditions frequently change from hour to hour, and at one time air, and a little later fuel gas, may be in excess. The extent of the mean deviation from the condition in which neutral combustion occurs is the only safe criterion of the working of a setting.

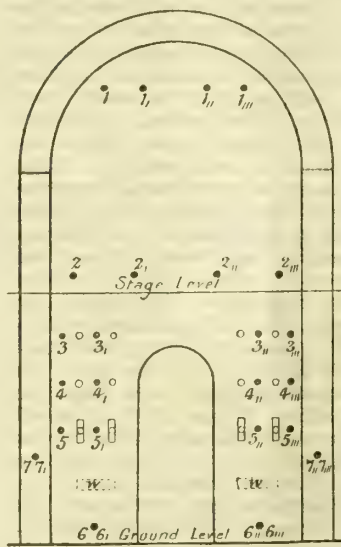


FIG. 1.

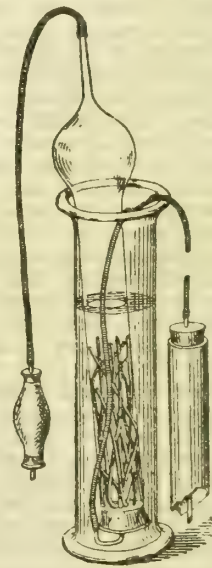


FIG. 2.

In the above diagram (fig. 1) is shown the back wall of a Klönne setting, furnished with test-holes for observing the course of the combustion in the setting throughout a period of 24 hours. Prior to the observations, of which the results are given below, the setting had been in use for about a year; but it was working normally at the time of the observations. The holes indicated by black marks (●) in the figure, open into the flues for the products of combustion. These flues run from top to bottom, as indicated by the numbers 1 to 7, 1<sub>1</sub> to 7<sub>1</sub>, &c. Each vertical series of numbers pertains to one stream of gases. Each horizontal series of similar numbers (1, 1<sub>1</sub>, 1<sub>11</sub>, 1<sub>111</sub>; 2, 2<sub>1</sub>, 2<sub>11</sub>, 2<sub>111</sub>, &c.) represents a zone in which the same phase of combustion is occurring in all the flues. In zones 5 to 3, commencing at the lowest, and lying between the flues, are the secondary air passages indicated by rings (○). The primary air enters above the water-pans (w). The furnace gases, on reaching zone 1 at the top of the arch of the setting, are forced back by a wall parallel to the back of the setting vertically downwards to zone 2, where they pass round the lower tier of retorts. The spent-gas flues proper commence at zone 3. They first traverse the whole depth of the setting from front to



back, but do not then follow the zig-zag course which is adopted in most other systems of regeneration. The flues which form one vertical series through zones 3, 4, and 5 communicate by three orifices, so that the spent gases pass directly downwards from zone 3. The two vertical series of flues on each side of the generator meet above the primary air passage, and follow a zig-zag curve at the back of the water-pan to the bottom zone 6, whence the gases ascend to the main flue 7. The secondary air passages, however, take a zig-zag course; each flue commencing in zone 5 at the back, passing to the front at zone 4, and again to the back at zone 3.

Observations were made at zone 2, where the gases passed from the combustion chamber to the flues. Samples of gas were taken at 2,; and the temperature was read on a Le Chatelier pyrometer at the corresponding hole 2,;. The carbonic oxide was estimated by absorption by cuprous chloride. From the following tabulated results of the observations during 24 hours, it appears that the working was tolerably uniform and good, except during a few hours about noon, when the percentage of carbonic oxide in the gases rose as high as 8.7. At this time, one-fourth to one-third of the producer gas was passing unconsumed into the flues, and a lowering of the temperature was apparent. The working of the setting, however, must be considered normal, as the combustion in the underlying flues of the small excess of carbonic oxide which passed out of the combustion chamber not only served to vaporize water in the pans between zones 5 and 6, but sufficiently maintained the heat of the spent gases which otherwise would have been unduly cooled through unavoidable leakages of cold air through the walls of the flues. The sudden increase in the amount of carbonic oxide in the spent gases above the small desirable amount, was due to an accumulation of clinker on the grate, which diminished the supply of primary air. The removal of the clinker caused the supply of primary air to be so great that more producer gas was formed during the ensuing hour than the fixed supply of secondary air was capable of consuming. After clinkering, the primary air should have been decreased or the secondary air increased, in order to attain the highest degree of economy; but such frequent regulation is impracticable in actual working of the furnace.

| Time of Day. | Temperature. | Analyses of the Gaseous Products<br>of Combustion.<br>(Volumes per Cent.) |                |                 |
|--------------|--------------|---------------------------------------------------------------------------|----------------|-----------------|
|              |              | Degrees<br>Centigrade.                                                    | Carbonic Acid. | Carbonic Oxide. | Oxygen. |
| 6.0 p.m.     | 1080         | 17.2                                                                      | 3.4            | Nil.            |
| 7.30 " " "   | 1085         | 18.4                                                                      | 2.0            | "               |
| 9.0 " " "    | 1090         | 18.6                                                                      | 1.7            | "               |
| 10.45 " " "  | 1070         | 18.4                                                                      | 2.0            | "               |
| 12.0 night   | 1075         | 18.2                                                                      | 2.6            | "               |
| 1.30 a.m.    | 1080         | 18.4                                                                      | 1.7            | "               |
| 3.0 " "      | 1070         | 18.5                                                                      | 1.9            | "               |
| 4.30 " "     | 1070         | 19.1                                                                      | 1.0            | "               |
| 6.0 " "      | 1080         | 19.6                                                                      | —              | "               |
| 7.30 " "     | 1070         | 16.6                                                                      | 1.9            | "               |
| 9.0 " "      | 1070         | 15.3                                                                      | 8.7            | "               |
| 10.30 " "    | 1070         | 17.0                                                                      | 5.2            | "               |
| 12.0 noon    | 1065         | 15.8                                                                      | 7.1            | "               |
| 1.30 p.m.    | 1055         | 16.4                                                                      | 5.1            | "               |
| 3.0 " "      | 1070         | 18.0                                                                      | 1.6            | "               |
| 4.30 " "     | 1060         | 17.7                                                                      | 3.7            | "               |
| 6.0 " "      | 1090         | 17.8                                                                      | 2.8            | "               |

The excess of carbonic oxide disappears as the gas passes on through the flues, and the condition of neutral combustion is sooner or later attained—the quicker, the less combustible gas was initially present. The neutral zone is thus sometimes higher, sometimes lower; but its position serves as a criterion of the working of the furnace at the moment, and, if continually watched, of the change of position of the point where combustion is completed. In order to ascertain the position of the zone of neutral combustion, samples of gas were taken at all the holes in one series of flues (1, to 7) approximately at the same time, and were analyzed. The combustible portion of the sample was analyzed by combustion over palladianized asbestos, after admixture with excess of air. An analysis of the producer gas conducted over mercury by this method showed the following percentages of components: Carbonic acid, 8.8; carbonic oxide, 24.3; hydrogen, 17.6; and nitrogen (by difference), 49.3. The percentage composition of the samples of gas taken at the different zones in one series of flues is shown in the following table, whence it will be seen that, in the case in question, the neutral zone was between zones 3 and 4:—

| Zone. | Carbonic Acid. | Carbonic Oxide. | Hydrogen. | Oxygen. |
|-------|----------------|-----------------|-----------|---------|
| 1     | 17.4           | 3.4             | ?         | nil     |
| 2     | 18.0           | 2.6             | 1.4       | "       |
| 3     | 18.0           | 2.9             | 1.6       | "       |
| 4     | 18.2           | nil             | nil       | 0.2     |
| 5     | 16.6           | "               | "         | 3.7     |
| 6     | 9.0            | "               | "         | 11.4    |
| 7     | 8.4            | "               | "         | 11.8    |

In order to locate the neutral zone, it is not necessary that a complete analysis of the samples of gas should be made. It is

sufficient to pass on from the upper to the lower zones until oxygen is detected in a sample; and the zone where this first occurs is just past the place of neutral combustion.

Such a qualitative examination of the samples of gas may be very simply and rapidly made by means of the apparatus shown in the preceding illustration (fig. 2). Within a drying tube about 12 inches in length, are placed sticks of yellow phosphorus, which extend about half way up the tube. The wide mouth of the tube is closed by a bung, through which one limb of a U-tube passes. The contracted end of the drying tube is connected with an enema pump. The tube is placed in a cylinder of water from which it is withdrawn in order to attach the free limb of the U-tube by flexible tubing to the porcelain tube by which the samples of gas are collected from the flues. The porcelain tube is first inserted in one of the upper holes, and the gas is aspirated through the apparatus by means of the pump. It is drawn in rapidly at first, in order to expel other gas from the apparatus; but subsequently it is drawn through slowly. No change will be observed so long as the unconsumed gases are in excess, except that a slight vapour, which soon disappears, forms when the aspiration is commenced. The zones are then examined in order from the topmost downwards by means of this apparatus. The time occupied in making each examination will not exceed two minutes. When the first zone in which an excess of oxygen is present is examined, the phosphorous will form a dense white cloud of phosphoric acid as soon as the gases come in contact with it. The zone of neutral combustion which was to be located lies between the zone at which this phenomenon is first observed and the one immediately above it.

The simple apparatus described not only permits of the zone of neutral combustion being rapidly located, but it also affords a means of shifting this zone to any desired position. Thus if combustion of the fuel gas is required to be completed in the combustion chamber itself, then the neutral zone should lie between 2 and 3. A sample of gas from hole 3 is drawn through the apparatus in the manner described above, while the secondary air inlet is gradually opened more and more until the cloud of phosphoric acid begins to appear. A movement of a few tenths of an inch in the position of the regulating slide of the air-inlet, causes the cloud to vanish or re-appear; and a movement of less than 4 inches will cause the position of neutral combustion to be transferred from one zone to the next. The test is sufficiently delicate to permit of an excess of 0.2 per cent. of oxygen in the gases being readily detected. In order to show the practical utility of the test, the position of the neutral zone, which, from the results of the analyses tabulated above, was between zones 3 and 4, was changed according to the indications of the phosphorus test until it was between zones 2 and 3. Samples of the gases were then withdrawn from the series of holes 1 to 7, and on examination showed the following percentages of the various components:—

| Zone. | Carbonic Acid. | Carbonic Oxide. | Hydrogen. | Oxygen. |
|-------|----------------|-----------------|-----------|---------|
| 1     | 18.5           | 2.7             | 1.4       | nil     |
| 2     | 19.4           | 0.6             | 0.3       | "       |
| 3     | 19.3           | nil             | nil       | 0.3     |
| 4     | 18.4           | "               | "         | 0.6     |
| 5     | 14.0           | "               | "         | 6.4     |
| 6     | 7.2            | "               | "         | 13.0    |
| 7     | 7.2            | "               | "         | 13.2    |

This quantitative analysis of the samples of gas, therefore, substantiated the correctness of the qualitative test with phosphorus.

To obtain exact results, it is desirable to repeat each test at the corresponding hole on the opposite side of the generator; but if the setting is carefully constructed, and the air-inlets on the two sides of the generator are opened precisely to the same extent, this precaution may be dispensed with. The change in position referred to above of the neutral zone from between 3 and 4 to between 2 and 3, should be attended by an increase in temperature of the setting and a decrease in temperature of the spent gases. Such changes of temperature were actually observed in the case in question. Thus, the temperature at 2, rose, subject to fluctuations, from 1100° C. (2012° Fahr.) to 1195° C. (2183° Fahr.); while the temperature in the main-flue fell from 700° C. (1292° Fahr.) to 620° C. (1148° Fahr.). At hole 1, the change was from 1180° C. (2156° Fahr.) to 1305° C. (2381° Fahr.). Nearly two days elapsed, however, before the full effect of the change of conditions was observed.

In conclusion, it may be remarked that the customary examination of retort furnaces by occasional testing of samples of the spent gases has a very restricted utility, as the composition of the gases varies considerably within a few hours. The observation that the chimney gases contain a certain percentage of carbonic acid tells us very little; the same percentage may be too low if the setting is new and the flues are comparatively sound, and too high if the combustion extends far into the flues and is only completed in them. Simultaneous observation of the temperature would elucidate the question, were it not that the origin of the entering air is unknown; for it may have come from the exterior of the furnace or merely from the hot air passages. The conditions under which combustion is actually taking place may, however, be ascertained, if the zone of neutral combustion is located. Speaking generally, neutral combustion should occur



at the entrance to the flues—that is to say, at the outlet from the combustion chamber or arch of the setting. It should not move far from this point in the course of a day's working. To locate it, it is unnecessary to examine the whole of a series of flues; but the qualitative test described above may simply be applied to the flues adjacent to the neutral zone. The same test affords also a means of varying the position of that zone according to requirements.

## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### Extension of Workmen's Breakfast Time.

SIR,—With regard to the recent alteration of the time allowed to our workmen for breakfast, to which reference was made in your last issue, will you permit me to say that the alteration has given very great satisfaction to our men?

It might have been supposed—indeed I thought so myself—that at Sydenham, where the majority of the men live close to the works, the additional quarter of an hour was unnecessary; but our experience proves that the extension of time is a great boon. It allows a number of men to breakfast at home who live just beyond the distance it was possible to go in the half hour; and it enables the others to get the meal in comfort, instead of bolting it in haste.

Another effect of the alteration is that there is far less disposition on the part of the men employed at the remoter end of the works, to get as near to the gate as they dare before the whistle is blown for breakfast. This, of course, is a saving to the Company—small perhaps in itself, but added to the satisfaction of the men and their physical improvement, it will go a good way to repay the cost of the concession.

Lower Sydenham, Oct. 29, 1898.

SYDNEY Y. SHOUBRIDGE.

### Intelligent v. Unskilled Labourers for Working Inclined Retorts.

SIR,—I am glad a gas engineer possessing the varied and successful experience of Mr. G. E. Stevenson, in the practical management of men in gas-works, has voiced the truth in the "JOURNAL" of Oct. 25 (p. 924), about the greater need than ever of intelligence among the men employed to operate mechanical appliances used in "up-to-date" retort-houses. I have been a life-long advocate of labour-saving machinery, but never from the standpoint that its wider adoption meant the degradation of intelligence among the working-classes, as appears to be the view of those who champion the advantages of "unskilled" labour in manipulating retort-charging machinery. The most important economic fact of our day is the constant increase of the amount of wealth that results from the work done by the same number of men. And the cause of this has not been the mere manual labour, but the gradual discovery of processes, the inventing of machines, or the more skilful directing of labour, all of which may be included in the word which Mr. Stevenson so happily uses—"intelligence." Our compulsory system of free education is rapidly raising this standard of intelligence; and in the face of this, our working-classes would, as Mr. Stevenson states, be quite justified in objecting to the use of machinery, if its adoption meant that there is to be no great difference in the future between the scales of remuneration of intelligent and ignorant labour. Besides, considering the high wages paid to workers in retort-houses, there is no need to employ labourers at work for which they are unfitted.

Managers of gas-works, of experience and ability, will utilize the machinery and appliances so that they will not degrade any portion of the community, or encourage a lower standard of intelligence; and I here wish to put on record that my experience has been that the managers (few in number, I admit) who have had any belief in "mere labourers" being the class to employ to operate the mechanical appliances used to charge inclined retorts, have been "penny wise and pound foolish." Apart from attending to the mechanical appliances, imagine your "mere labourer" charging and understanding the regenerative furnaces built on the scientific principles necessary to ensure effective heats for efficient carbonizing in inclined retorts. I do not say the employment of labourers has been the cause of "bad heats" and "pasty carbonizing;" but a manager employing raw labourers to attend to the charging machinery and the regenerative furnaces, can hardly be considered to possess the knowledge necessary to enable him to understand the many advantages of having men in a modern retort-house who have had some experience with machinery and furnaces. Next to the handy men of resource and aptitude, who do the work of assisting skilled engineers in engineering workshops, the most serviceable class in an inclined retort-house are men who have acted as attendants on engines and boilers; and I can remember that some colliers employed by Mr. Herring in the inclined retort-house at Huddersfield, exhibited considerable skill and care, and quickly became quite adept in handling the charging appliances.

It is not by belittling intelligence and skill, and unworthily praising ignorant and "unskilled" labourers, whose rural gaze is as dull as an ox, that the perfection we desire will be attained in retort-houses; and pandering to this sort of craze can only lead to disappointment on the part of those who are misled by it.

Smethwick, Oct. 27, 1898.

GILBERT LITTLE.

### Tramway Traction.

SIR,—In the triple capacity of a ratepayer, gas engineer (late head of the distribution department of The Gaslight and Coke Company), and interested party, I write, trusting you will afford space for insertion of my remarks in your columns, to urge that the above matter should be thoroughly ventilated before systems are decided upon and adopted at the public expense—less desirable perhaps than other systems not so well known, but nevertheless preferable from the standpoints of economy, efficiency, sightliness, and convenience. As a ratepayer, I have as much right to express my views as any other member of the public; and as an

interested party, I have equally as much right to direct public attention to the system in which I am interested as others whose communications from time to time (and especially at the present moment, when London through its County Council is possibly on the eve of adopting mechanical traction) appear in the public Press. On these two grounds, therefore, I rely upon your consideration and sense of justice in regard to the trespass on your space that acquiescence in my request for insertion would involve. In my third capacity, naturally my sympathies are with the product with which I have for many years been directly in contact—viz., ordinary coal gas—one of the most useful servants in existence, universally available, and as a motive power for tramcars (when properly adapted) more economical for the purpose in question than any other product yet on the market, and at the same time equally, if not more, efficient and safe.

Electrical traction, although adopted in every civilized country, and that very widely, has been employed in preference practically to animal traction alone, and not because it has been proved to possess advantages over all other systems of mechanical traction—merely, rather, owing to the fact that no other motive power has been until recent years available, or since being available, brought into prominence. Experience has fully demonstrated the superiority of electrical as compared with animal traction; and the only question that exercises the minds of municipal authorities or owners of private undertakings possessing tramways is (in proposing to resort to mechanical traction) that of deciding between the various methods of utilizing this particular power product. On this point, I think the vast majority of people, in this country at least, object to the trolley system on account of the inconvenience and unsightliness of the overhead wires, and yet fear to adopt the less-tried conduit system on account of its excessive capital cost—even compared to the known heavy cost in this respect of the trolley system.

I notice Mr. J. Allen Baker, in his report to the Highways Committee of the London County Council, recommends electrical in preference to any other mechanical traction, and especially, although admitting its heavier cost, the conduit system—a recommendation it is difficult to understand except on the bare ground of sightliness (as compared with the trolley system, and leaving out of the question the remaining electrical systems mentioned in his report), in view of the conclusions arrived at by such Corporations as Leeds, Belfast, Glasgow, Sheffield, Birkenhead, and Liverpool, which after thorough investigation all negatively this very system, as will be found upon examining the reports submitted to them. Assuming, however, that Mr. Baker's recommendation were widely endorsed, and the "conduit" established as the best electrical system, what are the advantages dwelt upon as evidence of superiority as compared with other motive powers? Mr. Baker enumerates six—

- 1.—Its great elasticity; the ease and speed with which the cars can be started and stopped.
- 2.—Going backwards and forwards at will.
- 3.—Greater cleanliness and absence of wear to the streets.
- 4.—Greater comfort.
- 5.—Greater average speed than can be obtained as compared to horse or other (sic) forms of mechanical traction.
- 6.—Trailer cars can be put on during the "rush" hours mornings and evenings, and on holidays.

All these advantages, with the single exception of No. 5, are at least equally applicable to the system of gas traction, the merits of which I have in view in addressing myself to you, and (I trust) through you the public. With regard to No. 5, I accept this, but in a qualified sense only—viz., that as regards "speed" electricity is doubtless superior, if excessive rates of travelling were required; but up to 25 miles an hour (for light railways), gas traction possesses equal claims in this respect.

There are three advantages, however, and most vital ones, that are not claimed by Mr. Baker for electricity—viz., economy, convenience, and safety—in which respects gas traction is undoubtedly the system that can justly claim superiority. With regard to economy, and taking as the heads of cost (1) capital expenditure, (2) labour, (3) energy per car mile, and (4) administration, and assuming the last-named equal, no matter the system, of the remaining three, in the case of gas traction (1) is practically confined to the cost of the cars, as any existing well-laid line can be utilized, and compressing stations, the latter representing a comparatively nominal outlay only; (2) would compare favourably; and (3) is not more than one-third, amounting to 0.92d., including compression, with gas at 2s. 4d. per 1000 cubic feet, as compared, for instance, with Dover (trolley system), where an electrical unit costs 3d., and where the energy absorbed per car mile is 0.95 of a unit, and costs therefore 2.85d. With regard to convenience, the cars propelled by gas are absolutely self-contained. They travel 14 miles with one charge, and are re-charged in less than two minutes. Being self-contained, in the event of accident or damage to engine or gearing, a car can be taken off without the slightest interruption to the traffic, as compared with the total interruption necessitated in the case of a breakdown or defect in the generating plant or circuit of either conduit or trolley system of electricity. And on the question of safety, without recalling recent or remote instances of the dangers of electrical traction, I will merely state that not a single person has been injured, much less killed, while operating or travelling by the gas-traction system.

If you are good enough to insert this letter, interest may be aroused, and the following questions may be asked:—

- 1.—What system is referred to?
- 2.—Who are the owners?
- 3.—Where is the system in use in this country?

The replies to these questions are as follows:—

- 1.—That patented by Carl Lubrig, of Dresden, and H. P. Holt (of Crossley Bros., Limited).
- 2.—The Gas Traction Company, Limited, of 22, Chancery Lane, who acquired the all-world patents and disposed of the British Patent to the British Gas Traction Company, Limited, of 22, Chancery Lane.
- 3.—At Blackpool, on the lines of the Blackpool, Lytham, and St. Anne's Tramway Company, Limited, where 14 cars have been running during the past season. The receipts have averaged 1s. 1d. per car mile. The system has carried, since its inception in 1896, 1,150,000 passengers; and the cars have run 250,000 miles. At Trafford Park, on the lines of the West Manchester Suburban Tramway Company.



In addition to this, the British Gas Traction Company are now constructing a line from Bideford to Westward Ho, to be worked as a light railway; and they have contracted to work the lines of the Neath (Wales) Municipality.

I trust the foregoing will be sufficient to warrant full consideration being given to the merits of this system; my excuse for dilating upon which being that I was instrumental in introducing it to this country, I am interested in the world rights, and firmly believe it to be the best in existence.

8, Regent Street, S.W., Oct. 27, 1898.

THOMAS C. HERSEY.

### The Origin of Gas Associations.

SIR,—I am pleased, as I am sure all the members of the Waverley Association will be pleased, to learn from Mr. Myers' letter in last week's "JOURNAL" that he has taken the trouble to obtain, and so frankly to publish in your last week's issue, the copy of the minute of the first meeting of the Fife and Kinross Association, and that he now expresses himself satisfied that the Waverley holds the field as the parent of all other Gas Associations.

Personally, I never had the slightest doubt on the subject; but it is also satisfactory to know from Mr. Myers that his doubts are now removed, and that the Waverley Association being the first, the Fife and Kinross Association—of which Mr. Myers was one of the original members—follows the Waverley Association as "a good second."

JAMES C. ADAMSON.

Airdrie, Oct. 28, 1898.

### Gas Testing in London.

SIR,—The last half-yearly Notification of the Metropolitan Gas Referees differs but little from those which have preceded it during the past thirty years, except in the trifling matter of brevity. Perhaps this can be accounted for by the fact that the Referees have been so much engaged with the Harcourt-cum-Dibdin 10-candle pentane standard, the table photometer, the reduced measure for testing meters, and other matters which I consider useless, that they could not find time for a more extended Notification. They have therefore fallen back upon the diffuse one of 1897 and 1898, and have notified the Gas Examiners thus: "These regulations are to come into operation at each testing-place as soon as the prescribed apparatus has been provided by the Gas Companies."

I remember that at the last meeting of the Institution of Gas Engineers Mr. Frank Livesey told the assembled engineers that they all ought "to feel grateful to Mr. Harcourt for the time and attention he had expended on the new standard of light." I must confess I thought at the time Mr. Livesey was joking. But, at any rate, Mr. Harcourt must have taken the remark in earnest; and this doubtless accounts for the brevity of the Notification.

The statement, "as soon as the prescribed apparatus has been provided by the Gas Companies"—or, in other words, the gas consumers—makes one wonder whether the question of gas testing will ever reach the stage of finality in the hands of the Gas Referees. No sooner is one form of photometer prescribed than it is replaced by another, and generally for the worse.

It was about the year 1869 that the first official testing-place was set up at Arundell Street, Haymarket, by Mr. William Sugg, after the design of Mr. F. J. Evans, the then Chief Engineer to The Gaslight and Coke Company, who had been appointed one of the first Gas Referees; Mr. R. Hogarth Patterson, a journalist, and Mr. J. S. Pierce, a Volunteer major, being the two others. The appointment of the two last was a political job, as neither of them knew anything about the business; and to enable them to carry out the elementary chemical arrangements, they were obliged to obtain the services of Mr. Thompson, a young but able chemist, to help them out of their ignorance. They also engaged a Secretary to attend to the clerical work, at the same time securing large and expensive premises in Spring Gardens; for all of which the unfortunate gas consumers had to pay.

Mr. Evans not unnaturally selected a form of photometer designed by himself, and known as the "Evans;" and the rest of the apparatus, including the ingenious and accurate clock meter, was the invention of Mr. Sugg. It may safely be said that no better apparatus for testing gas at fixed stations could have been devised; and for many years it was the regulation apparatus.

After Mr. Evans had acted as the practical Referee for a few years, the anomalous position he occupied as Chief Engineer to The Gaslight and Coke Company and a Gas Referee being called in question, he at once resigned; and the Board of Trade at the same time refused to re-appoint Mr. Patterson and "Major" Pierce. Those who wish to know the whole of the facts will find them faithfully recorded in the "JOURNAL" about the years 1872 and 1873.

After this little episode, new Referees were appointed, one of whom was the late Professor Tyndall, who did nothing—except regularly draw his salary. Had all the Referees confined themselves to this pleasant mode of proceeding, but little fault could have been found; but they did not.

During this time Mr. T. W. Keates was the Superintending Gas Examiner to the Metropolitan Board of Works; and he wisely and considerably did his work. At his death, Mr. W. J. Dibdin was appointed in his place; and from this time matters commenced to rapidly change. Mr. Dibdin apparently became dissatisfied with the Evans photometer, and commenced to "tinker" with it by removing the top, knocking holes in the sides, and otherwise maltreating it; thus destroying all resemblance to the original Evans, and making it useless for either elegance or accuracy.

The Referees, probably feeling that their functions were being usurped, and goaded on by the activity of Mr. Dibdin, now commenced a regular crusade against the Evans photometer; and in rapid succession it was superseded by the Letheby, the improved Letheby, the Westminster Model Letheby, the Edinburgh Model Letheby, the Imperial Evans, the Gas Referees', Sugg's Imperial Standard, and other photometers.

It is quite safe to aver that, though every one of these instruments was the perfection of workmanship, not one of them was in any way more accurate than the old Evans. These changes have cost the gas consumers

thousands of pounds without reason at all; and now we are told by the Gas Referees that they must all be discarded, and a table photometer set up in all the testing-stations—thus involving the unfortunate gas consumers in another huge expenditure.

It seems to me to be high time that the Gas Referees were called upon to "justify their existence." Manchester, Liverpool, Birmingham, and other places, get on very well without Referees; and London can do the same. During their lengthened tenure of office a sum of nearly £500,000 has been expended in connection therewith, more than £150,000 of which has been for salaries alone; while the 23 gas-testing stations have never furnished any protection to the public.

London, Oct. 15, 1898.

VINCENT TAYLOR.

### Faulty Syphon Pumps.

SIR,—When looking through the "JOURNAL" of yesterday's date, I noticed the paragraph on "The Recent Failure of the Gas Supply at Bournemouth." Having many years ago been nearly caught myself by a faulty syphon pump, I adopted a plan which I have continued ever since, and which will, I think, help anyone who does not at present use it. It is simply to sound the drips before and after pumping. Sounding before often saves the fixing of the pump, as we find no depth of water worth pumping. Where pumps are fixtures, means of sounding should be provided. I use an iron rod about 5 feet long, and a line long enough to reach the bottom of the deepest drip-box.

Montrose, Oct. 26, 1898.

T. DOUGLAS HALL.

### A Curious Property of Filtered Water.

SIR,—I have lately been troubled with a disagreeable taste and smell in the water supplied by some works of which I have the control. The water is taken from a stream in which there is no pollution, is filtered through sand and gravel, and is pumped thence into iron mains for the supply of the inhabitants. The taste, which can be detected in the stream for some miles above the intake, somewhat resembles cucumber; and though it can scarcely be distinguished as the water leaves the filter-beds, it becomes very marked when it is in the mains, and is subjected to pressure. The works have been constructed about forty years, and last autumn this curious feature for the first time appeared in the water.

I should be glad to know if any other managers have been troubled with this peculiarity, or if they can suggest the cause and its removal, as the analysis fails to give any information, and it cannot be discovered that any new weed or vegetation has been introduced into the stream during the last few years.

Oct. 24, 1898.

PUZZLED.

### Extension of Works on Land not Scheduled.

SIR,—For the information of the correspondent whose question on the above subject appeared last week, I may say that the Abergavenny District Council extended their gas-works about three years ago on land not originally scheduled, and without leave in writing from anyone. The process adopted was to send out printed notices of our intentions to owners, occupiers, &c., within 300 yards of the proposed new works; mentioning also that an Inspector from the Local Government Board would, on a given date, hold a public inquiry to take evidence on the matter. This was held, and in due time we received our order to proceed. This proves, I think, that leave in writing from owners, &c., is not required.

Abergavenny, Oct. 29, 1898.

S. CROSS, Manager.

SIR,—In answer to your correspondent's question, there is a Special Act of Parliament applicable to Scotland—an Act to Amend the Burghs Gas Supply (Scotland) Act, 1876—which was passed in 1893. I know of only one instance in which the Act has been put in force—viz., at Gourcock, in the spring of 1894. A report of the proceedings appeared in the "JOURNAL" at the time. The Police Commissioners there applied to the Sheriff of the County of Renfrew for permission to erect a gas-holder without obtaining the consent of all the householders within 300 yards. The Sheriff held a public inquiry, and gave the power asked; and there is now a holder upon the ground. If your correspondent resides in Scotland, he will find the Act of Parliament mentioned, and the case of Gourcock, to meet his requirements.

Oct. 29, 1898.

J. P.

**Dover Public Lighting.**—The Dover Town Council have accepted the offer of the Gas Company to enter upon a new three years' contract for street lighting as from the 31st prox. The terms are the same as those of the existing contract, but with a reduction of 5s. on each lamp. This will mean a saving of about £200 a year. There are 800 incandescent gas-lamps in the town.

**Cape Town and District Water Company, Limited.**—The tenth ordinary general meeting of this Company was held at the Cannon Street Hotel last Thursday—Mr. J. S. Prince in the chair. In moving the adoption of the report, the Chairman stated the revenue during the past financial year amounted to £19,215, as compared with £14,914 in 1896-7; being an increase of £4271. The net revenue from water supplied showed an increase of £2652 from the ordinary and regular business of the Company, without any exceptional supply to outside authorities. There had been an expenditure on capital account of £2189 for new mains, water-headings, meters, &c., during the year. The number of houses supplied had been 3615, as compared with 2952 for the previous year—being an increase of 663; and this in addition to the 1878 houses in Woodstock, which Municipality was supplied in bulk. The yield from the springs continued satisfactory. The quantity of water pumped had been 235 million gallons. All the works, engines, water-headings, and the property generally, had been maintained in thoroughly efficient working order and repair. According to the concession granted to the Company by the Claremont and Woodstock Municipalities, it was provided that they should have the right in ten years of acquiring the undertaking either at a price to be agreed upon, or to be settled by arbitration; and they had decided to avail themselves of the right conferred upon them. Negotiations had been opened with the local Directors with the view of the Municipalities taking over the concern as from Jan. 1 next. The report was adopted, and a dividend at the rate of 10 per cent. per annum was declared.



## LEGAL INTELLIGENCE.

### 'Claim under the Employers' Liability Act.

At the Colchester County Court, before his Honour Judge Paterson, last Wednesday, Henry Broom, labourer, sued the Colchester Gas Company, under the Employers' Liability Act, for damages due to an accident while unloading oil barrels on the 12th of January last. On the previous day, a barge laden with barrels of oil came up to the gas-works quay, but could not be discharged owing to the unloading of some coal barges. The Gas Company's Manager (Mr. H. S. Pike) suggested that the captain of the oil barge should fix up some gear to enable him to get out the oil. This was done; and it was subsequently arranged that plaintiff and another man named Francis should have 1½d. per barrel for unloading the oil. Mr. Pike sent down two chains and four hooks. While the work was going on, the wire rope snapped, and the two casks attached to it fell into the hold. The plaintiff fell with them, breaking both his legs, fracturing his ankle, and being injured in various parts of the body; and he had not been able to do any work since. The rope was examined, and found not to have one bright strand in it, but to be rusted right through. Plaintiff was called, and, in cross-examination, said Mr. Pike did not call out to him: "Broom, you have no right to put two casks on that rope; it is only strong enough for one." If he did so, witness did not hear him. The captain of the barge did not tell him on three occasions that the rope was not strong enough to bear two barrels. He suggested that one barrel at a time would be easier to wind up. He did not hear anyone say the rope was not strong enough for two barrels. Simon Wyatt, a quay labourer, deposed that they had not been told the rope was only strong enough to hoist one barrel at a time. Mr. Wild, for the defence, submitted that, whoever was owner of the gear, the plaintiff and Francis made a distinct sub-contract with the defendants, and under this the latter retained no kind of control over the work. The relation of employer and workman therefore did not exist. Mr. Jones, on the contrary, submitted that there was evidence that plaintiff was a workman employed by defendants. It was not necessary to show that the rope was the property of the defendants, but sufficient to prove that it was used in their business; and it was unquestionably their business to unload the barge. A large number of other legal points were raised, and cases of a highly technical nature quoted. After a good deal of argument, his Honour decided that there was no evidence on which the Jury could have acted, and gave judgment for the defendants. He said he did so because he was satisfied that the plaintiff and Francis contracted to do the job of hoisting the barrels on to the quay, where they were to be further dealt with by the servants of the Company, and plaintiff had failed to show that he had suffered injury owing to the defect of any plant belonging to the defendants.

### A Gas Stealing Case at Bristol—"A Deliberate and Clever Fraud."

Edwin Langford, a nautical instrument maker, of 53, Broad Quay, Bristol, was summoned, at the Bristol Police Court last Wednesday, on the complaint of the Bristol Gas Company, who alleged that during the months of July to October he fraudulently stole 9000 cubic feet of gas, worth 21s., their property. Mr. F. E. Weatherly prosecuted; and the defendant was represented by Mr. T. D. Sibly. Mr. Weatherly, before stating the facts of the case, asked leave to amend the charge by reducing the amount of gas alleged to have been stolen to 4000 cubic feet, worth 9s. 4d. Permission having been granted, Mr. Weatherly proceeded to say that the circumstances were so serious that the prosecutors felt it was one in which the charge of larceny should be preferred. Beneath defendant's shop there was a cellar; and on the right-hand side as one entered, the wall had been bricked up about 4 or 5 feet, no doubt with the idea of supporting the older foundations. It was the fact of the wall being bricked up that rendered it possible for the offence to be carried out. On an examination of the defendant's September quarter's account, it was found that the quantity of gas consumed showed a strange falling off; being about 9000 cubic feet less than it was for the corresponding quarter of the preceding year. Consequently an Inspector was sent to examine the premises. He went into the cellar and discovered a tap close to the street near the service pipe. About 10 to 16 feet along the wall was the meter, and also another tap. The position of the meter was irregular, for it should be fixed as close to the service-pipe as possible. The Inspector reported the result of his visit, which took place on Oct. 8. Four days later he called again, and made an examination with the aid of a spirit-lamp. Looking along the top of the wall underneath the joists from the meter, he was able to see not only the inlet-pipe from the service-pipe, but he also saw, about half-way, a pipe passing up into the shop. This connection obviously was on the service side of the meter; and the gas ascending the pipe did not pass through the meter. In consequence of this discovery, the Inspector went into the shop, and had the eleven burners he found there lighted. Then he turned off the gas at the meter; but instead of all of them going out, four were left burning—thus making it perfectly clear that the gas consumed by these four did not pass through the meter. Information of all this was sent to the head office of the Company; and Mr. Phillips, the Secretary, went without delay to defendant's shop. He found the door locked; and, looking through the glass, the defendant was observed behind the counter apparently hammering upon the flooring boards. Subsequently the door was opened; and on Mr. Phillips and the Inspector going behind the counter they found a loose board, underneath which was discovered the connection. Defendant at once said he had mistaken the inlet-pipe for the outlet-pipe. He admitted that he had been using this connection for the past three months all through this mistake; and it would be for the Court to say whether this was a sufficient answer. Defendant was a man not only expert in his own particular trade, but he did his own gas-fitting as well; and it would be simply idle to suppose that anyone was going to accept the explanation tendered. This was not the case of a hungry man stealing a loaf of bread, but a deliberate and clever fraud. Confirmatory evidence having been given, Mr. Sibly, on behalf of the defendant, said he must admit the charge, though the quantity of gas abstracted was not so large as alleged. He contended

that the case could be properly dealt with, not under the present charge of larceny, but by means of a penalty. Defendant had already been heavily punished. He had been in business over 45 years, and was known as a respectable, hard-working tradesman. If the Court exercised the powers they undoubtedly possessed, and treated the case as one of larceny, the man would not only be disgraced, but ruined as well. He seriously asked the Court to believe that defendant had made a mistake, and did not wilfully steal the gas. The Magistrates, after a brief consultation, said they must deal with the case as one of larceny, and they fined the defendant £10, with £5 costs, or six weeks' imprisonment.

### The Liability of Water Consumers for the Repair of Service-Pipes.

At the Cambridge County Court, last Wednesday, before Judge Bagshawe, the Cambridge University and Town Water Company sued Robert Farren for 11s. 3d., the cost of repairing a service-pipe leading from the main to his house in Trumpington Street. Dr. Cooper, in opening the case for the Company, said the amount involved was small, but the point raised was important; and he should have to draw his Honour's attention to the Company's Acts of Parliament. He then read excerpts from those Acts, in which it was set forth that the cost of any repairs to a service-pipe should be charged to the occupier of the house. Defendant said he was not the tenant of the house, nor was he a householder in the town at all. He had paid the water-rates—at least, he had signed cheques for his daughter who was the tenant. He simply acted as her agent. In reply to his Honour, he said he would accept the responsibility, but still disputed the debt. Dr. Cooper pointed out that the Company's Act of 1853 governed the General Act of 1847. It appeared that on Saturday, Nov. 28, 1896, a leak was discovered in Trumpington Street, and one of the Company's men found it in the service-pipe leading to the defendant's house. Water was escaping. The leak was undoubtedly caused by the contractors for the sewerage, and the Water Company had no power to sue the Corporation. His Honour said he was of opinion that unless the leak was caused by the Water Company themselves, the defendant was liable. If it was caused by a third person, the defendant had his remedy against that person. Dr. Cooper said the defendant's contention was, first, that the pipe was not his; and, secondly, that the Company should go to the Corporation for the money. A plumber named Taylor, in the service of the Company, was called, and said he repaired the leak, and the cost was 11s. 3d. The defendant was then informed by his Honour that, by the Company's Acts, if any pipe leading from the main was damaged, the Company were entitled to charge the occupier of the house with the cost of the repair. Not merely could they do this if the damage was caused by the tenant's negligence, but also if it was caused by a third person. The occupier could then say to that person, "You have smashed my pipe. I have had to pay the Water Company, and you must pay me." If the Corporation had done this damage, they ought to pay. The pipe was leaking, and was repaired by the Company. He expressed the opinion that the charge was reasonable, and gave judgment for the plaintiffs.

**Gas Workers' Wages.**—A meeting of stokers employed by the West Ham Gas Company was held at Stratford on Wednesday night, and a resolution was passed to petition the Directors for 15 per cent. increase of wages. Mr. W. Thorne, the General Secretary of the Gas Workers' Union, who attended and spoke, said there was an upheaval in the ranks of men employed in gas-works throughout the United Kingdom, and in his view no gas worker should have less than 30s. a week.

**The Conversion of the Scarborough Gas Company's Capital.**—In pursuance of section 4 of the Scarborough Gas Act, 1895, the £20,000 of ordinary 10 per cent. stock, the £30,000 of ordinary 7½ per cent. stock, and the £72,657 of ordinary 7 per cent. stock, created by the Company's Acts of 1851, 1859, 1867, and 1873—amounting in all to £122,657—were converted on the 1st ult. into £186,719 16s. of consolidated ordinary stock, bearing a uniform dividend of 5 per cent. per annum. The Company have also £27,343 of 5 per cent. preference capital, and £16,830 of 5 per cent. ordinary capital (raised under the Act of 1895) which has produced a premium of £4219 5s. The Company have now £38,950 of ordinary capital unissued.

**Additional Capital for the Manchester Corporation Gas Undertaking.**—At a special meeting of the Manchester City Council held last Wednesday, the Lord Mayor (the Right Hon. Alderman Gibson) moved the adoption of a recommendation to apply to the Local Government Board for a Provisional Order to alter and amend the Acts of 1875, 1880, 1884, and 1893, so as to enable the Corporation to borrow such further sums, not exceeding in the whole £500,000, as may from time to time be necessary for the purposes of the gas undertaking. His Lordship said that five years ago the Committee asked for power to borrow £500,000. This they obtained, and had exercised it; and with the exception of about £30,000, they had spent the money. The result had been very satisfactory—a considerable profit accruing to the city. He believed it would be the same with the money they now proposed to borrow. The resolution was passed.

**Gas and Electric Lighting in Brussels.**—When the Municipality of Brussels, a few years ago, proposed to light public places, such as railway stations, parks, &c., by electricity, and to supply current the same as gas, a great outcry was raised, and protestations were made against the innovation; it being urged that it would ruin the gas undertaking and injuriously affect the communal exchequer. Recent statistics show that during the past year not only has the use of electricity increased, but that the profit from the sale of gas is considerably in excess of that of previous years—being £8896. The most important installation of the electric light recently made in Brussels is in the King's palace. When the work is finally completed, there will be 7500 lamps, of which a large number will be of 5-candle power, employed in the chandeliers illuminating the ball and reception rooms. According to the United States Consul at Brussels, there are about 47,391 lamps reduced to the unit of 16 candles in the city system, averaging 117 lamps per 100 metres of cabled streets. This number includes 770 arc lamps and 28 electric motors; the latter varying from 0.1 to 10 horse power, with a total of 105-horse power.



## MISCELLANEOUS NEWS.

### GAS COMPANIES' PROTECTION ASSOCIATION.

The First Annual General Meeting of this Association was held on Thursday last, at the Westminster Palace Hotel—Mr. GEORGE LIVESY in the chair.

The gentlemen present were: Mr. Thornton Andrews (Swansea), Mr. G. Clarry (Cardiff), Mr. W. F. Cotton (Dublin), Mr. H. Hart (Canterbury), Mr. J. W. Helps (Croydon), Mr. H. E. Jones (Commercial Gas Company), Mr. William King (Liverpool), Mr. W. R. Phillips (Hitchin), Mr. R. O. Paterson (Cheltenham), Mr. C. Sellers (York), Mr. S. Y. Shoubridge (Crystal Palace District Gas Company), Mr. C. C. Smith (Southampton), Mr. Hanbury Thomas (Sheffield), Mr. C. E. Botley (Hastings), Mr. A. G. Snelgrove (West Ham Gas Company), Mr. H. B. Chamberlain (British Gaslight Company), Mr. James Pye (Chester), Mr. E. G. Burton (Brighton), Mr. G. B. Irons (Gosport), Mr. H. H. Jones (Wandsworth and Putney Gas Company), Mr. C. M. Ohren (Crystal Palace District Gas Company), Mr. W. W. Box (Pinner), and Mr. Benjamin Green (Mitcham).

The CHAIRMAN, in opening the proceedings, said it was not a large meeting, but it would no doubt be large enough; and he thought they might assume that the bulk of those who had given their adhesion were satisfied to leave the business to those who cared to attend. He would first ask the Secretary to read the minutes of the previous meeting, and then the list of the Gas Companies who had joined.

The SECRETARY (Mr. F. E. Cooper) then read the minutes of the meeting held on June 7. He also reported that he had letters from three gentlemen regretting their inability to be present—viz., Mr. Phillips (Luton), Mr. Holliday (Scarborough), and Mr. Berridge (Leamington Priors). The total number of Gas Companies who had joined was 56, two of whom had joined during the present week. He feared there was some little misapprehension among some of the smaller Companies as to their being eligible, as several who had sent subscriptions had done so through a larger Company, and others said that they were informed by a larger Company that they were ineligible. The total amount of subscriptions received was £284 11s., in addition to which the Liverpool Gas Company, though not at present joining, had sent a contribution of £10 10s. towards the preliminary expenses; making a total of £295 1s. The Provisional Committee had paid an honorarium of fifty guineas to the Secretary for the work he and his clerks had done, and also his out-of-pocket expenses to the amount of £24 15s. 7d.—making a sum of £77 5s. 7d. This left a balance in hand of £218 5s. 5d.

The following is the list of Gas Companies who have joined the Association:—

|                         |                      |                     |
|-------------------------|----------------------|---------------------|
| Gaslight and Coke       | Faversham            | Preston             |
| South Metropolitan      | Gosport              | Reading             |
| Commercial              | Grantham             | Rugby               |
|                         | Gravesend and Milton | Scarborough         |
| Alliance and Dublin     | Hartlepool (Gas and  | Sheffield United    |
| Consumers'              | Water)               | Southampton         |
| Banbury                 | Hastings and St.     | Southend            |
| Barking                 | Leonards             | Sunderland          |
| Barnet District         | Hitchin              | Swansea             |
| Barnsley                | Hornsey              | Torquay             |
| Bath                    | Kettering            | Tottenham and Ed-   |
| Brentford               | Leamington Priors    | monton              |
| Brierley Hill District  | Lewes                | Ventnor (Gas and    |
| Brighton and Hove       | Lichfield            | Water)              |
| British                 | Llanelly             | Walker and Wallsend |
| Canterbury              | Luton                | Wandsworth and Put- |
| Cardiff                 | Maidstone            | ney                 |
| Cheltenham              | Malton               | West Ham            |
| Chester United          | Mitcham and Wimble-  | West Kent           |
| Crystal Palace District | don                  | York United         |
| Devonport               | Newmarket            |                     |
| Dudley                  | Pinner               |                     |

The CHAIRMAN then said the Secretary had put the position of affairs very clearly. He had been requested by Colonel Makins to express his regret that he could not be present; but he had to sit on the Bench on an important rating case. He had told the Secretary that whenever any work was required of him, particularly in connection with members of Parliament, he should always be ready to do all that he could. This was very satisfactory, because Colonel Makins was a man of great influence in Parliament; having been a member for so many years, and knowing so many members. The Provisional Committee was appointed at a general meeting on June 7; and the main duty which devolved upon them was to draft a set of rules in order that Gas Companies might be invited to join, because, of course, if applications were made to Companies without sending out the rules, it would have been very natural for them to ask what were the objects of the Association. Consequently the Provisional Committee had formulated a set of rules; and the Secretary had sent out copies to Gas Companies all over the kingdom.

The SECRETARY stated that the rules were sent to Companies having a capital of £30,000 and over.

The CHAIRMAN said he thought this was a mistake. It was perfectly clear that the notification of the formation of the Association ought to be given to all Gas Companies eligible.

The SECRETARY pointed out that there was a minute of the Sub-Committee to the effect that they should be sent to Companies with £30,000 capital and upwards.

The CHAIRMAN said it was really a mistake.

The SECRETARY believed the impression of the Sub-Committee was that they should not send the circular to Gas Companies indiscriminately in the first place, but that it would be better to start by obtaining the adhesion of some of the largest Companies; and therefore the circulars were only sent to those having a fixed amount of capital.

The CHAIRMAN did not suppose anyone on the Committee had any idea of limiting it ultimately; and after the present meeting the rules should be sent to all Gas Companies, with an invitation to them to join. He would now submit the rules to the meeting for approval—that being the first general meeting of subscribers which had been held. The Company which Mr. King represented had raised the question whether the powers contained were not rather too wide. Their idea, which he believed

accorded with the general idea of the Association, was that it should be a watching Association—that they were not to assume that they had a commission to do everything and anything connected with Gas Companies whenever their interests might be effected, but to watch all attacks, especially what went on in Parliament, which might be injurious to their interests, to promptly report it to the members, and then it would rest with the Committee to take such action as might be considered necessary. In Rule 3, which stated the objects of the Association, it had been already agreed to strike out the word "revenues" which occurred in the draft rules, and it would then run thus: "The objects of the Association are to protect the property, rights, powers, and privileges of Gas Companies, and to take all such proceedings, and to secure such joint action, as may be considered necessary for effecting all or any of such objects, and generally to inform the members of all proceedings in Parliament or elsewhere affecting Gas Companies." Their friends at Liverpool rather took objection to the wideness of thus empowering the Association to take all such proceedings, and securing such joint action as might be necessary. But the Association could only do this through their Committee; and in Rule 13 the duties of the Committee were set forth. If the Association elected a fairly representative Committee, he thought it would be necessary to trust them with a certain discretion, to act promptly on an emergency if necessary. Rule 13 gave them tolerably large powers; but there was a very effective limitation, because they could only deal with funds at their disposal, and their only funds would be the subscriptions of the members. If the Committee were an ambitious body, and wanted to engage Counsel and spend money on all sorts of things, they would have to look at ways and means. He did not think there was any fear that they would go into unreasonable or unjustifiable expense, because if they did they would be personally responsible. On the other hand, if it should be found necessary on an emergency to take some definite action, and their funds were exhausted, he thought the Committee would probably act at once, and trust to the members indemnifying them when they explained the necessity of the course which they had taken. If anyone considered any alteration necessary, he would be at liberty to propose it, because at present the rules were not binding. After they were passed at this meeting, however, they would be binding, and could only be altered, according to Rule 22, by proper notice and a special resolution. The only other point which gave rise to difficulty was fixing the amounts of contributions, which, after a deal of discussion, were settled as shown in Rule 6. There was a suggestion to make one step between three and five guineas; but the Committee, by a large majority, agreed to the scale now submitted. He would, therefore, move that the rules, with the alteration he had suggested, be adopted. Mr. King who was present said he was not a member; but his Company had subscribed ten guineas towards the preliminary expenses, and he was sure they would like to hear anything he had to say.

Mr. W. KING (Liverpool) said the point alluded to by the Chairman was the one which his Company rather took exception to. They thought the action of the Association should be rather passive than active—that it should act as a sort of watch dog, very much as the old Gas Companies' Association did, to watch any proposed legislation, and at once issue a warning-note to all Gas Companies calling attention to it, and leaving them to take action in the matter. This was the only point to which he wished attention to be drawn.

Mr. H. E. JONES (Commercial Gas Company) said he should like to second the motion of the Chairman, with a slight amendment of Rule 3, which he thought would meet the views of Mr. King and his friends. He then proposed that the rule should run as follows: "The objects of the Association are to inform the members of all proceedings in Parliament or elsewhere which affect the rights, powers, privileges, and property of Gas Companies, and to take such proceedings as may be necessary to secure joint action for the protection of the same."

Mr. C. E. BOTLEY (Hastings) said he thought this fully expressed the meaning of the Association. Many of them, in bringing the matter before their Boards, simply said it was intended to revive the old Gas Companies' Association, and put a little more vigour into it.

The CHAIRMAN then put Rule 3, as amended, to the meeting, which was agreed to. He then put the whole of the Rules *en bloc*; and they were adopted.

The CHAIRMAN then said the Provisional Committee had now to retire; but before doing so, he must ask the meeting to authorize what had been done in the shape of paying expenses up to the present time. These included certain printing expenses, a little over £20, and also the vote made to the Secretary of fifty guineas for his services, and the aid of his clerical staff.

Mr. E. L. BURTON (Brighton and Hove) moved that the proceedings of the Provisional Committee be approved and confirmed, and the expenses incurred paid, including the honorarium of fifty guineas paid to the Secretary.

This was seconded and carried unanimously.

The CHAIRMAN said it now only remained to appoint a permanent Committee.

The following gentlemen were thereupon appointed:

Mr. George Livesey (South Metropolitan Gas Company), *Chairman*.  
 Mr. Thornton Andrews (Swansea Gaslight Company).  
 Mr. G. Clarry (Cardiff Gaslight and Coke Company).  
 Mr. W. F. Cotton (Alliance and Dublin Consumers' Gas Company).  
 Mr. H. Hart (Canterbury Gas and Water Company).  
 Mr. J. W. Helps (Croydon Commercial Gas and Coke Company).  
 Mr. H. E. Jones (Commercial Gas Company).  
 Mr. William King (Liverpool United Gas Company).  
 Col. Makins (Gaslight and Coke Company).  
 Mr. W. R. Phillips (Hitchin Gas Company).  
 Mr. R. O. Paterson (Cheltenham Gaslight and Coke Company).  
 Mr. C. Sellers (York United Gas Company).  
 Mr. S. Y. Shoubridge (Crystal Palace District Gas Company).  
 Mr. C. C. Smith (Southampton Gaslight and Coke Company).  
 Mr. Hanbury Thomas (Sheffield United Gas Company).  
 Mr. C. E. Botley (Hastings and St. Leonards Gas Company).  
 Mr. A. G. Snelgrove (West Ham Gas Company).  
 Mr. H. B. Chamberlain (British Gaslight Company).

The CHAIRMAN said this concluded the business; and he might add



that the Secretary would at once send circulars to all Gas Companies throughout the kingdom.

Mr. C. C. SMITH (Southampton) proposed a vote of thanks to the Chairman, which was seconded by Mr. Jones, and carried unanimously.

The CHAIRMAN thanked the meeting, and the proceedings terminated.

### EXTENSIONS AT THE ST. HELENS GAS-WORKS.

Last Thursday, the members and officials of the St. Helens Corporation accepted the invitation of the Chairman of the Gas Committee (Mr. Alderman T. Cook) to inspect the gas-works, which have recently been considerably extended under the supervision of Mr. S. Glover, the Gas Engineer to the Corporation. The visitors were received at the works by the above-named gentlemen, the latter of whom conducted them through the establishment, and explained in a concise and interesting manner the processes connected with the manufacture and purification of gas.

Before referring to the extensions, it may be of interest to trace briefly the development of the undertaking. The works were originally established, under the provisions of an Act of Parliament obtained in 1832, by the St. Helens Gas Company; and they were, of course, on a very modest scale. In 1869, however, the Corporation obtained power, by the St. Helens Improvement Act, to purchase the undertaking; and it was acquired as from June 30, 1875, at the price of £131,600. In the year 1880, the production of gas was 110 million cubic feet, and the price 4s. per 1000 cubic feet net—meter-rents being charged. Since then the works have been entirely reconstructed. Previous to the present extensions, the make for the year ending 1897 was 256 million cubic feet. The retort-house, which was then working to its full capacity, was 180 feet long, containing 210 retorts and one set of West's charging and drawing machines and coal-elevating machinery. The extension just completed adds 100 feet to the length of the retort-house, and a bench consisting of nine arches containing 126 retorts. These will be worked by a duplicate set of West's machinery and elevators, and a coal-conveyor across the retort-house. The house will now be capable of producing 2 million cubic feet of gas per day. The present storage capacity is equal to 1½ millions. The quantity of gas unaccounted for is now less than 5 per cent., which is very low for a mining district. Previous to the Corporation taking the management of the works, however, it was upwards of 13 per cent. Oil gas and cannel gas are used as enrichers. The works are equipped with plant for the manufacture of sulphate of ammonia and the distillation of tar. The area of the works is 5½ acres at the Warrington Old Road, in addition to which there are 9½ acres at Eccleston, part of which is used as a gasholder station. The area of supply, including the township of Haydock, is 14,006½ acres; and there have been 56 miles of mains laid within this area. The number of consumers' meters at the present time is 6468 (for which no meter-rent is charged), consisting of 3573 ordinary and 2895 prepayment meters. It should be mentioned that St. Helens was one of the first towns to adopt the latter method of selling gas. The number of street lamps is 1580; and there are more than 2323 cooking and heating stoves in use—St. Helens being the first, we believe, to lend these appliances free of charge to gas consumers. The production of gas for the year ending March 31, 1898, was 270 million cubic feet, and the average price received was 2s. 4d. per 1000 cubic feet of gas sold, including all classes of consumers. The Gas Department has contributed to the borough fund account since 1880 the sum of £41,030, in addition to capital charges paid out of surplus profits, amounting to £23,370; and the capital account of the works now stands at £179,600. A fact that should not be overlooked in connection with the gas-works is that they have had at their head, as Chairman of the Gas Committee, since the Corporation took over the undertaking, a capable Engineer in the person of Alderman Cook, who has spared no effort to bring the works to the highest state of perfection; while Mr. Glover, who was appointed on the death of Mr. Hall in 1886, has since conducted the works with great skill.

The party were first conducted into that part of the works in which all the trains of coal-waggons are received. The total weight of material handled is about 40,000 tons per annum. The retort-house was next visited. This building, with its recent extension, and the coal-store running parallel with it on both sides throughout its entire length, presented a fine appearance, and was well equipped for the purpose to which it is devoted. The process of making gas at St. Helens, which has been described by Mr. Glover, was fully explained. The small retort-house in which the oil gas is made was next visited. The material used is Scotch shale oil; and the gas made is of a very high enriching value. The course of the main volume of gas was now followed as it left the retort-house to be purified, measured, and stored. The works for the distillation of tar and the treatment of ammoniacal liquor were next inspected; and a visit was subsequently paid to the electricity generating station. After the inspection, the party took luncheon at the Town Hall—the Mayor (Alderman R. Pilkington) presiding. Complimentary toasts were duly honoured, and responded to by Alderman Cook, Mr. Beecham (Deputy-Chairman of the Gas Committee), and Mr. Glover—the last-named gentleman stating that he had been associated with the works for the long period of 28 years. The day's proceedings were brought to a close by Alderman Cook thanking the councillors for accepting his invitation.

**New Joint-Stock Companies.**—The Crowborough District Gas Company, Limited, has been registered with a capital of £25,000, in £1 shares, to acquire and carry on the undertaking of the Provincial Gas Works (Crowborough), Limited, registered in 1897, carried on in Crowborough and Rotherfield, Sussex, and to enter into an agreement with E. O. Preston. The General Water Power, Limited, has been formed with a capital of £21,500, in £1 shares (of which 1500 are deferred), to produce electricity by means of water power or otherwise, and to carry on the business of electricians and suppliers of electricity. The Catrine Gas Company was registered in Edinburgh last week with a capital of £1225, divided into 700 shares of £1 15s. each, to acquire, by purchase, the undertaking of the present Company.

### ROTHERHAM CORPORATION GAS SUPPLY.

#### Additional Borrowing Powers—The Dispute at the Gas-Works.

At the Meeting of the Rotherham Town Council last Wednesday—the Mayor (Alderman Neill) in the chair—the subjects of the additional capital required for extending the gas-works and the dispute which has arisen with the stokers were brought forward.

The TOWN CLERK (Mr. H. H. Hickmott), referring to the subject of the additional capital, said it would be remembered that some time ago the Council decided to make application to the Local Government Board for further borrowing powers with respect to the extensions and additions to the gas-works. He had gone into the matter, and it appeared to him to be doubtful whether the Board could, under the powers of the Public Health Act, sanction borrowing powers with respect to gas-works extensions. He had seen the officials in London, and gone into the question, and had since received a letter to the effect that the Board would not be prepared to entertain any application for their sanction to a loan for such purpose under the provisions of the Public Health Act; but that it would probably be necessary for the Council to obtain further borrowing powers by an amendment of their Act. Under their Act of 1896, the Corporation obtained power to borrow £20,000 for gas-works extensions. This had been exhausted, and as the Corporation contemplated further contracts, he suggested that the matter should be deferred until the Finance Committee's minutes were dealt with. The Chairman of that Committee would move a resolution to alter section 27 of the Corporation Act of 1896, so that the powers to borrow £20,000 should read £60,000, and also such further money as the Local Government Board might sanction from time to time. This would mean that in future they would not have to apply for a Provisional Order to meet their further requirements for the gas-works.

At a subsequent stage of the proceedings, a resolution to the above effect was passed.

Mr. GUMMER then submitted the recommendations of the Gas-Works Committee. In doing so, he referred at some length to the dispute at the gas-works. He said negotiations had been entered into with the men who were dissatisfied with their work; and it would perhaps be of interest to the Corporation and the public, who had had the men's statement (see *ante*, p. 925), that he should review the position. In the first place, on the 8th of September four stokers, named Richmond, Doncaster, Black, and Crowther, waited upon him with a view to discuss the wages that were paid in the new house fitted with inclined retorts. He made certain proposals, which had been before the Committee, and which had been supported since. The first was that the men should go on at the amount proposed—viz., 5s. per shift of eight hours—until the Committee met, and let the Committee decide the price to be paid; and that whatever was the price, it should date from the time the men commenced. The men, however, declined to accede. He then suggested that the men in the old retort-house should continue at work on the present arrangement until the Committee met, with no alteration in the wages. The men again declined, and said that, unless something was done in regard to the wages of the men working the horizontal retorts, they would hand in their notices. He suggested, further, that the men should commence work at the old rate (and a good deal had been made about the old rate at the men's meeting)—viz., 5s. 7½d. per shift—and that this should hold good until the decision of the Sub-Committee, which should be regarded as final; and such men as did not agree thereto should be at liberty to cease work in 14 days. This agreement was signed by himself on behalf of the Committee, and on behalf of the men by Amos Black; so that the alteration they made about the 5s. 7½d. per shift was only a temporary arrangement until the Committee had time to decide on the course to be adopted. There was a further meeting afterwards between the deputation of the stokers and the Sub-Committee on account of the decision of the Committee to support a proposal to pay 5s. per shift. After a long interview, the men said they preferred to work at the old retorts, as they, or part of them, were likely to be in use another twelve months. They were told that all the old stokers could do so if they wished, and could take their places there in preference to any of the new men; and when the old house was let down, the old men should have the opportunity of returning to the new house on the terms settled and fixed by the Committee (though other men should be then in such new house). The men intimated that they accepted this offer; and the matter was then left in the hands of the Engineer (Mr. F. A. Winstanley) to arrange accordingly. An agreement was decided to be entered into in future with the stokers on the new retorts. The three men appeared before the Sub-Committee, and it was agreed that the price should be 5s. per man per shift of eight hours per 3 tons 10 cwt. of coal carbonized, and 1d. for every hundred-weight over and above 3 tons 10 cwt. per eight-hour shift. The only stipulation was that the men should go to the horizontal retorts if they wished to do so. This gave dissatisfaction to the men set to work at the old retorts, and the result was that they asked the Sub-Committee to meet them again. The meeting took place on the 13th of October, when the Sub-Committee received two representatives from the stokers, who stated that the men in the horizontal house under notice had not had a chance of going into the new retort-house, and that the Engineer had engaged other men to go there. The Committee pointed out that the men had had the chance, and had refused to avail themselves of it, and that a notice had afterwards been posted up to the effect that if any man wished to work on the inclined retorts he was to make application on or before the 11th of October to the Engineer; and as such men had not applied by the specified time, others had been engaged. In addition to the notice, the foreman had personally waited upon each man who was working at the new retorts, and asked if he was desirous of engaging himself upon the new terms. Every one refused; and their position was that they were compelled to make arrangements to have new men to carry on the undertaking. He further explained that the stokers had wished that some of them should be set on as labourers in the yard. This would mean a displacement of the labourers with whom they had no quarrel. The men were told that if they did not care to carry out the work the Sub-Committee suggested they would have to leave. He then proceeded to refer to the statements made at the public meeting, where Mr. Swallow had said that the Engineer had put extra work on the men in the short space of time, that they had twelve more retorts to draw, and that he wanted to know where the system was going to end. He (Mr. Gummer)



denied the statement that they were continually adding work, and pointed out that the men had furnished no statistical proof. At the men's meeting, a resolution was passed expressing an earnest desire that the Gas Committee would at once meet a deputation of the stokers, and try to come to an amicable settlement, and a copy of it had been forwarded. In reply, the Town Clerk wrote on the 24th of October to the effect that it was not in the power of the Chairman to consent for a deputation to meet the whole of the Committee. At the same time he reminded the men that the Committee had met several deputations of the stokers, and done everything possible to avoid dispute, and at one of the meetings a deputation agreed to terms and conditions of work in the new retort-house. These were not being carried out; and no attempt had been made to make any alteration in the old house, or interfere with Mr. C. E. Rhodes's award of 1897. The speaker then proceeded to show the position of the Rotherham stokers as compared with those of other towns. The average price was 4s. 8d. per day of eight hours. At Brentford, 5s. 8d. was paid for carbonizing 8 tons of coal; in Rotherham, 5s. for 3½ tons. He also quoted figures relating to Burnley, Coventry, Huddersfield, Leigh, Middlesbrough, Newcastle, Rochdale, and Salford. In addition, he said he had sought the advice of the Consulting Engineer, who, after comparing the two systems of carbonizing coal, recommended that they should pay their men 5s. per shift of eight hours, that a basis of 3 tons per man should be taken, and that three men per shift should work the three settings—doing everything necessary. Mr. Gummer further commented on the work done in other towns; showing that while the hours and the demands upon the men at Rotherham were less, their wages were higher than those of other places. He asked the Council to support the Committee in their action. A good deal of feeling had been engendered owing to a probable strike. He did not know who had done it, but someone on the previous night was responsible for having tampered with the plant of the new retort-house. He was not laying the blame anywhere, but the whole of the water-valves were closed, with the result that if the thing had gone on very much longer all the furnaces would have collapsed, for they were at white heat. It was not the first difficulty they had had to put up with; and whatever might be decided upon that day, he thought that the plant of the Corporation should be protected, and that no one should be foolish enough to attempt to damage it.

Mr. COPLEY seconded the motion, and urged that the men should give the proposals of the Sub-Committee a fair trial.

The Mayor expressed the opinion that the time had arrived when the men who had given in their notices should be dealt with, and should not be reinstated. It would be unfair to cast aside the new men under the circumstances.

Mr. GUMMER, in reply to questions, denied that the new men were being paid a higher rate of wages than the old ones, for less labour.

The recommendations were passed.

In accordance with the notices sent in, 24 of the stokers left their work on Thursday. An open-air meeting was held on Sunday morning in the College Yard, Rotherham, when addresses were delivered setting forth the position of the men, for whom a collection was made.

### RETTFORD CORPORATION GAS AND WATER SUPPLY.

The annual reports of the Retford Corporation Gas and Water Departments were issued last Friday. In the first place, the Gas Committee report that the amount over-expended on capital account to the end of June last is £418; and further outlay is contemplated. It is proposed to rebuild a retort-bench on the regenerator system, with settings of seven retorts in each bed, instead of five, as at present. This will enable the works to meet the increasing demand for gas, and will lead to a considerable economy in the working. It will, however, cost something like £1500, of which two-sevenths will be charged to the capital account, and the remaining five-sevenths, being renewals, will be charged to the profit and loss account. To meet the amount already expended on capital account and this further expenditure, it is proposed to transfer £1500 from profit and loss to capital account. The gross profit for the year is £3109, as against £2968 for the preceding year. The net profit is £1632; and after adding to this £2610 brought forward from preceding years, and deducting the £1000 paid to the Corporation, the sum of £3292 is left at the credit of profit and loss account. The Committee have carefully considered the question of reducing the price of gas. A considerable portion of the profit made by the undertaking is attributable to the fact that, by charging upon the rates the capital borrowed for the undertaking, it has been raised at a rate fully 1 per cent. less than it could otherwise have been borrowed at, and has so effected a saving of £300 a year. The ratepayers who found this security have since received a little over £4000, or about £200 a year. Since the undertaking has been in possession of the Corporation, the price of gas has been reduced from 4s. 5d. to 3s. 4d. per 1000 cubic feet, with a discount in each case, which is equal to a saving to the gas consumers of £2250 per annum. The Committee recommend a reduction of 2d., which, with the discount, will bring down the price to 3s. per 1000 cubic feet. The Committee also recommend that the maximum price per public lamp be £3 per annum, instead of £3 10s. With the exception of the retort-bed, the plant is in good order; and the Committee pay a high tribute to their Gas Manager (Mr. J. B. Fenwick), to whom they recommend a grant of 50 guineas as a gratuity.

The Water Committee report that the water-rents of the year amount to £2481, as compared with £2231 for the preceding year. The net surplus revenue, after paying all interest and instalments on account of principal, is £485; and the amount standing to the credit of the profit and loss account is £2012, which, when transferred, will reduce the capital account to £512.

**Lambeth Water Company.**—The Directors of this Company have decided, subject to audit, to transfer £5000 to the contingency fund, and to recommend the payment of a dividend for the past half year at the maximum rates, and of 5s. per cent. (being at the rate of ½ per cent. per annum) on account of arrears of dividends; leaving a balance of £6000 to be carried forward after making provision for the payment to the sinking fund.

### REIGATE CORPORATION AND THE LOCAL GAS COMPANIES.

#### A Purchase Bill to be Promoted.

A Special Meeting of the Reigate Town Council was held on Monday last week—the Mayor (Mr. F. E. Barnes) in the chair—for the purpose of considering the propriety of promoting a Bill in the next session of Parliament for the following purposes: "For acquiring the undertaking of the Reigate Gas Company, Limited; also for acquiring the undertaking of the Redhill Gas Company, and the lands, buildings, and plant of the said respective Companies; and for other purposes relating thereto."

The Mayor proposed a resolution sanctioning the promotion of a Bill to authorize the Corporation to acquire the two undertakings above referred to; the costs to be paid out of the borough or district fund, or such other fund as Parliament might determine. In doing so, he reviewed at some length the proceedings of the Council in connection with the Bills promoted by the two Gas Companies last year, and the results thereof. He reminded the Council that the House of Lords Committee decided that the Bill of the Redhill Gas Company could not proceed unless two clauses were inserted—one being that the Council should this year have power to promote a Bill for compulsory purchase; and the other that the standard price should be reduced. He thought no more conclusive decision could have been given; and he expected that the Company would immediately lower their price. But they had not done so. The Council had therefore to consider whether they would go on with their Bill or withdraw. They decided to go on; and a Parliamentary Committee was formed to take the necessary steps. The Companies had been invited to meet the Corporation in a friendly manner; but they had declined. There were two courses open to them. They might have said that, as the Council and ratepayers seemed intent upon this matter, a scheme should be arranged which would be fair and satisfactory to all concerned; but they had not done so. Or they might have made overtures to the Council as to the price that should be charged. If the Companies had come to them and said: "If you will withdraw your opposition to our Bill, we will guarantee that the price shall not exceed what is charged in neighbouring districts and municipalities," the Council might have dropped the matter. They might be sure that if they did not proceed at once the Companies would do so. He would state to them, as carefully as he could, what would be the results of going to Parliament. He was afraid it was out of the question to promote a friendly Bill with the Companies; therefore they would have to go to Parliament themselves, and assert their rights. Parliament would give them what they asked for; and the purchase price would be settled by arbitration. The question then came: What was the award of the arbitrator likely to be? The Reigate Gas Company had no parliamentary powers at all. It was a limited Company, with a nominal capital of £20,000, of which £18,105 had been spent on works, land, &c., leaving £1900 as working capital. The expenditure in the year before the present for alterations and renewals, rates, taxes, wages, &c., amounted to £5440; and after this they had a profit of £3520, or 17½ per cent. on the total capital of the Company. Besides this, they possessed at that time a reserve fund of £9000, which had been accumulated out of the profits, and which brought that year £314 in interest. As the Company had no statutory powers, he was advised that the Parliamentary Committee would say to them: "If you have been making over 10 per cent. profit, you ought to reduce the price to the consumer." He therefore took it that they would not recognize any profit over 10 per cent. on the capital. Now, 10 per cent. per annum on a capital of £20,000 was £2000 a year; and if 23 years' purchase were granted, it would mean £46,000 for the undertaking. The Redhill Company had parliamentary powers. Their capital was £62,500, on which 10 per cent. profit could be realized before any reduction need be made to the consumers. Of this, £8500 was still unissued. The Company was reported to be badly managed. Whether this was so or not he did not know; but it seemed strange that with two Companies in the same borough, one should make 17½ per cent. while the other had to resort to their reserve fund in order to make up the dividend of 10 per cent. He could not help thinking that if the same skilful treatment had been applied to the Redhill Company as had been bestowed upon the Reigate Company, and for which they were to be congratulated, the result would have been very different to the shareholders. He would take it that the Redhill Company would be awarded £5000 per annum net profits; and estimating the time allowed for purchase at 23 years, the price would come to £115,000. He might remark that the Company had been apparently economical in dismissing their Engineer in order to advance the profits. Taking the amount for the Redhill Company at £115,000, and that for the Reigate at £45,000, they had £160,000 as the purchase-money of the two undertakings. This money could be borrowed by the Corporation at 2½ per cent., and the sinking fund would come to 1½ per cent.—altogether, it was just over 4 per cent. for the two, or £6600. Allowing £1000 for working capital, the amount payable yearly would be £7000. He had taken the Reigate profit at £3500, and the Redhill profit at £5000—making together £8500. Then there would be £1000 per annum saved in Directors' fees, and amalgamation of the staffs; making £2500 per annum profit to the Corporation. As the business developed, the profits would increase, and could be devoted either to the reduction of local taxation or the price of gas. Then he came to the strongest point of all. It was acknowledged by all the greatest authorities that private companies could not compete with corporations. These were the plain facts of the case. The advantages of having the gas undertakings under their own control could be summed up thus: They would get a better illuminant than at present, and a certain reduction in price; while the acquisition of the monopoly would result in benefit to the ratepayers.

The Ex-Mayor seconded the motion.

Alderman MARKHAM contended that the Mayor had not put the cost high enough, and pointed out that there were now other projected schemes in the borough amounting to £325,050, which, at 3½ per cent. spread over 30 years, meant a yearly charge of £17,671 17s. 6d. He urged that it should be left for the ratepayers to decide the matter.

After some further remarks,

The Mayor briefly replied on the debate, and then put the resolution, which was carried with one dissentient.

It was decided to authorize the Parliamentary Committee to take the necessary steps to promote the Bill.



## THE PROPOSED PURCHASE OF THE FALMOUTH GAS AND WATER WORKS.

### A Lively Statutory Meeting.

A Statutory Meeting of the owners and ratepayers of Falmouth was held on Monday last week, to consider the proposal of the Corporation to purchase the undertakings of the Gas and Water Companies. The Mayor (Mr. C. Deeble) presided over a large audience.

The Mayor, in moving a resolution authorizing the promotion of a Bill, said the Corporation were nearly unanimous over the scheme. The doubts thrown on the purity of the water supply did a lot of harm to the reputation of Falmouth; besides which there was the question of the ability of the Water Company to maintain the supply. The Gas and Water Committee felt that they would be wanting in their duty to the ratepayers if they did not place this matter before them in its most serious aspect. As to the gas-works, the ten years during which the town had the privilege of acquiring the works under the Falmouth Gas Act were about to expire; and they felt it their duty to give the ratepayers an opportunity of deciding at such an important stage. The determination of the Gas Company to manufacture and supply carburetted water gas was to be deplored, because of the dangerous results which frequently followed, and because it was felt that the action of the Company would injure the reputation of the locality, and deprive them of visitors. They also advised the ratepayers to support the purchase scheme as a first step towards the relief of the rates. There were 200 places in which surplus profits from gas and water works were being applied in this way; and personally he was convinced that the acquisition of these works would be a good stroke of business. His Worship concluded by reading letters from various persons approving of the scheme; among them being one from his Honour Judge Granger, who expressed the opinion that every municipality ought to own its water supply, even if it caused an increase in the rates, while as regards the gas-works it seemed clear that even if there was no profit there would be no loss.

Dr. HARRIS seconded the motion, and said that if the scheme of Mr. Silverthorne (see *ante*, p. 929) would bear investigation—which he did not doubt—they would be standing in their own light and obstructing the future of the town if they failed to avail themselves of this opportunity.

Mr. J. GROSE, Chairman of the Gas and Water Committee, rose to support the resolution. Up to this point the meeting had been orderly, except for the interjection of remarks and comments on the speeches. Mr. Grose was, however, subjected to a great deal of interruption; and at times the proceedings became uproarious. At one stage the Mayor directed the police to remove one of the opponents of the scheme who had made himself conspicuous by his interruptions; but they took no notice. In the course of his remarks, Mr. Grose said it was noticeable that combined Gas and Water Bills stood the best chance in Parliament. In this case there was no question about a Gas Bill passing, and they thought it best to associate the water with it. If they took advantage of the local Gas Act, the ratepayers would be relieved of immediate payment of the costs, which would be met by a short loan spread over ten years. [Mr. J. BURTON: And throw us into bankruptcy.] The prospect of being able to relieve the rates by £600 or £700 a year was worth attention. If the gas-works were in the possession of the ratepayers, they would be able to effect a considerable reduction in the cost of lighting, cleaning, extinguishing, and repairing the public lamps. They would all agree that the decision to introduce carburetted water gas without even consulting the Corporation was a very improper step. [Mr. BURTON: It is their own property.] He was informed that water gas was poisonous; and he believed the real motive of the Company in introducing it was to obviate the necessity of removing the works, which were nearly approaching the limits of their normal production. He hoped there would be a strong majority in favour of the scheme, in order that the best terms might be obtained. The ratepayers would never again have the opportunity they now had. [A VOICE: We don't want it.] There could not be a more favourable time for purchase than the present, when they could avail themselves of the provisions of the Gas Act, and the Water Company were in the position of having paid no dividend on the ordinary stock for two years.

Mr. PHILLIPS, another member of the Corporation, was about to continue the discussion as an opponent of the scheme, when the noise and confusion, which had increased during the latter part of Mr. Grose's speech, became still louder.

The Mayor appealed for order; but there was no cessation in the clamour. At last he announced his intention to put the resolution, which he forthwith did. Few hands were held up either for or against it; but the Mayor declared it carried.

A scene of disorder ensued, in the midst of which the Mayor left the chair and the platform; having first intimated that a poll had been demanded and would take place.

Mr. BURTON afterwards took the chair.

Mr. PHILLIPS spoke against the scheme, which he declared would mean an expenditure of £100,000, while they only had 4000 burgesses, of whom but 2000 paid rates.

Mr. BURTON and other speakers denounced the scheme.

Mr. J. W. BUCKLEY, the Engineer and Manager of the gas-works, referring to the attacks which had been made on the Company because of the introduction of water gas, said there were upwards of 60 works in Great Britain which were manufacturing water gas, and engineers had proved it to be one of the most successful and advanced systems of gas making.

Another vote was taken, with the result that only a few held up their hands for the resolution, and a very large number against it.

**The Water Scheme for the Midlands.**—An Association of District Councils has been formed in Derbyshire for purposes of water supply; the Provisional Committee consisting of representatives of Alvaston, Belper, Chapel-en-le-Frith, Ilkeston, Shardlow, Darley Dale, Bakewell, and Matlock. It is proposed to ask the promoters of the Derwent scheme to insert clauses in their Bill to enable District Councils, either separately or in combination, to be supplied, where practicable, from the main, on terms to be agreed upon.

## CEARA GAS COMPANY, LIMITED.

The Annual Meeting of this Company was held last Friday, at the London Offices, No. 9, Queen Street Place, E.C.—Mr. HORATIO BROTHERS in the chair.

The SECRETARY (Mr. T. Guyatt) read the notice convening the meeting, after which it was agreed to take as read the report and accounts, which were summarized in last week's issue.

The CHAIRMAN, in moving their adoption, said that, in going through the latter, he found that the expenditure during the past year, omitting the expenses of the London office, depreciation, debenture interest, and discounts, was £1653 more than for the previous year; but against this must be put the increase of £1716 in the gas-rental, and of upwards of £1000 on the bye-products and gas-fittings. Had it not been for the increase of £702 in the cost of the coal used, and the increase of £845 in the item of exchange, the balance-sheet would have been a very satisfactory one. But as it was, the net profit was £115 more than in the preceding year. The rate of exchange had improved somewhat of late, the cost of coal delivered had advanced by 4s. 3½d. per ton, and the price in the future was not likely to be any less. The production of gas per ton of coal carbonized during the year was a trifle lower than in 1897; but this, it was hoped, would be remedied by the adoption of improved means of carbonizing, which the Directors had sanctioned, and which they trusted would shortly be in operation. The increase in the consumption of gas both by the public lamps and by private consumers was very satisfactory, being about 10 per cent. The increase in the private consumption especially was very gratifying, and would be still more so if the payment was not in currency, or 8½d. per mile of the nominal value of 27d. It was hoped, however, that the attempt of the incoming President to place the finances of Brazil on a sound basis would increase the value of the milrei as a factor in the item of exchange, and thereby render the private consumption of gas more profitable to the Company. In addition to their misfortune as to the low value of the milrei, by which they were paid by the private consumers, the Government, ignoring the Company's rights under the concession, persisted in increasing their taxation and otherwise adding to their burdens—disregarding all the remonstrances of the Directors as to their injustice. But they did not intend to let the matter rest, but would endeavour to bring the authorities to a sense of right and justice. But whether the Board would be successful in their endeavours remained to be seen. There had been an outlay of £1529 on capital account during the year. The total capital expenditure, less the amounts written off for depreciation, was £52,354. The total capital called up on the ordinary and preference shares was £44,710, and of debentures issued £7500—making in all £52,210, and leaving a balance for working capital of £144, which was practically of no use for such a purpose. The consequence was that the reserve fund of £5000 had been used instead of calling up further capital; but even this aid was now insufficient considering the large and expensive stocks of coal and other material the Directors were compelled to keep, in order to guard against any failure in the supply of gas. So that the money market on this side was often very tight. There was a balance of £4710 due on the 942 second preference shares; and it was very likely that some of it would have to be called up during the year, as the increasing consumption of gas necessitated further outlay. The Company had had the misfortune to lose the services of their Manager (Mr. T. M'Making), who had been with the Company for thirteen years. He retired on June 30 last, at his own wish, for domestic reasons. The Directors had appointed as his successor his assistant (Mr. Reid), who had been in the Company's service for eight years, and who had a good knowledge of the language and the people. In conclusion, the Chairman said that, looking to the prospects of the Company as a whole, he anticipated that, when the Directors again came before the shareholders at the next meeting, they would be able to give them a better dividend.

Mr. A. J. KING seconded the motion, which was unanimously adopted.

A dividend of 5 per cent. on the preference shares, less income-tax, and 4 per cent. on the ordinary shares, tax free, having been declared,

On the motion of the CHAIRMAN, seconded by Mr. F. A. WALLROTH, the retiring Directors (Messrs. J. Darell Blount and F. W. Brothers) were re-elected to their seats at the Board; and on the proposition of Mr. SKAIFE, seconded by the Rev. CHARLES TABOR ACKLAND, Mr. Magnus Ohren was re-appointed to the auditorship.

The customary votes of thanks were passed to the Chairman and Directors, to the Secretary, and to the late and present Managers. Mr. M'Making was present, and acknowledged the references which had been made to his services.

## GAS V. ELECTRICITY FOR ASYLUM LIGHTING.

The Governors of the Cork District Lunatic Asylum have lately been considering the advisability of making a change in the lighting of the institution; and on Monday last week a meeting of a Special Committee of the Board was held to consider reports on the subject. It must be acknowledged that the Governors were desirous of being thoroughly well informed on this important matter; and the information laid before the Committee was full to a degree. The Resident Medical Superintendent (Dr. Oscar Woods) communicated with the superintending officials of thirty asylums in the United Kingdom, and put the following questions: (1) Is your asylum lighted with gas or electricity? (2) If by electricity, do you generate it on the asylum grounds or rent it from a company? If the former, (3) Do you use steam or gas as motive power for engines? (4) What is the number of lights in use and of units consumed annually? (5) What horse power of engine is required? (6) What is the cost per unit? (7) If you use gas, have you adopted incandescent burners; and, if so, are they a success? (8) Which light do you recommend for asylum purposes? (9) Do you use fans for ventilating purposes; if so, what do you use as motive power? These questions were answered by nearly all the officials to whom they were addressed; and Dr. Woods tabulated the replies. They showed that, in England, electricity is in use at Chester, Claybury, Dorset, and Hereford; and it is about to be introduced at Whittingham. Gas is used in all the other English asylums from which reports were



received. The Superintendent of the Kent Asylum alone preferred gas to electricity. Three Superintendents were silent on the subject; and all the others more or less strongly advocated electricity as being much safer, healthier, cleaner, and, in some instances, cheaper than gas. Incandescent burners are, on the whole, condemned for general use as being too fragile, only two Superintendents recommending them. Dr. Woods believed that two other asylums approved of incandescent burners; but the Superintendents had not replied to his circular. In Scotland, gas alone is used in the Argyle, the Murray (Perth), and the Fife Asylums; gas and electricity, at Aberdeen and Edinburgh; electricity, at Dumfries, Lanark, and Perth; and it is to be introduced in the Inverness and Midlothian Asylums. In Ireland, gas and electricity are in use in the Armagh Asylum; electricity is employed in the Killarney, Maryborough, and Mullingar Asylums, and it is about to be introduced in the Richmond Asylum. Of the remaining Irish asylums, all are lit by gas; but all the Superintendents save two recommend electric light, and all except two who had used incandescent burners said they were satisfactory.

The Governors decided to get estimates from the Cork Gas Consumers' Company and the Cork Electric Lighting Company. Dr. Woods accordingly prepared a series of questions which were sent to these Companies; and on the answers being received they were forwarded to Mr. Edmundson, of Dublin, the expert recommended by the Board of Control, who had previously reported to the Governors on the subject. Though his firm are engaged in the supply of both gas and electric light, making him specially qualified to speak on the merits of either, they were precluded from competing because he had undertaken to assist the Board. He was in attendance at the meeting, and presented his report, which was discussed paragraph by paragraph. The following total costs were arrived at: Gas by ordinary burners, £1528; gas by incandescent burners, £1439; electric light supplied by the Cork Company, £1740; electric light supplied by the Board's own plant, £1703. At the close of the discussion, the Chairman (Mr. J. W. Clery) remarked that, having made the inquiry, they were all of opinion that it was inexpedient at present to alter the lighting of the asylum. If they passed a resolution to this effect, it did not bind them in the future. The following resolution was passed: "That, having carefully examined into the relative cost of lighting and providing motive power at the asylum by gas and by electricity, and finding that it amounts, as estimated, in the case of electricity to £1740, in the case of gas for ordinary burners to £1528, and for incandescent burners to £1439, showing a difference in annual cost between the latter and electric light of £300, this Committee consider that, under the circumstances, it was inexpedient, at all events at present, to discontinue the lighting of the asylum by gas; and the Committee so recommend to the Board. The Committee further recommend that incandescent burners be introduced on trial to an extent to be decided by the House Committee and the Resident Medical Superintendent." In another resolution, the Committee expressed their pleasure at hearing the exhaustive and interesting report of Mr. Edmundson, and accorded him a vote of thanks for the material assistance he had rendered.

#### THE ELECTRIC LIGHTING SCHEME FOR ADELAIDE.

We have recently alluded to the electric lighting scheme for Adelaide, South Australia. As it presents some peculiar features, it may be of interest to give some particulars as to the positions of electric and gas lighting in the city.

In 1891, the Parliament of South Australia passed an Act authorizing local authorities to supply gas and electricity. For some considerable time the City Council of Adelaide sought to establish municipal electric light works; and in December, 1894, a poll of the ratepayers was taken, when 2255 voted for the scheme, and 3382 against it. In 1897, the South Australian Electric Light Company obtained an Act empowering them to carry on business; and clause 39 sets forth that, "except as to the Municipality of Port Adelaide, this Act shall only apply within the limits of such municipalities and districts the Councils of which shall by public notice notify that, as the result of a poll, the ratepayers have affirmed a resolution that it is desirable that this Act shall so apply." As the South Australian Gas Company supply gas in about twenty municipalities and councils' boundaries a good many polls may be required.

On September 17 a poll of the ratepayers of Adelaide was taken as to whether it was desirable that the Electric Light Company's Act should apply within the city. There are 10,756 ratepayers' names on the roll, but only 2761 (about one-fourth) voted. Of these, 1775 were in favour of the proposition, 959 against it, and 27 papers were informal. Less than one-sixth of the ratepayers voted for the proposition. Many of those who did vote were doubtless led to believe that competition in the supply of light would be to their advantage and so forth, as is usual in such contests.

The Adelaide Corporation have entered into a contract with the Electric Light Company as follows: The Corporation will not within ten years exercise their powers under the Corporation Electric Light Act of 1891. The Electric Light Company are to provide, erect, light, and maintain every night in the year, from sunset to sunrise, 30 arc lamps of 2000-candle power, for five years, for the sum of *one shilling per lamp per annum*, which is said to be a gift to the Corporation of £6500. The Company have to deposit £2000 with the Corporation and £5000 with the Treasurer of the province—together, £7000; and they pay the expense of the poll, which is rather a heavy item. They also pay to the Corporation all damages sustained by the failure or inability of the Company to carry out the contract, and pay the Corporation for each lamp not lit and kept lighted *ten shillings for each lamp each night*.

The scheme appears to be to light a two-chain street,  $2\frac{1}{2}$  miles long, by 30 arc lamps, each of 2000 nominal-candle power. As in London some arc lamps are 38 yards, and in other cities 70 and 80 yards, apart, in streets less than two chains wide, one may fairly wonder what the electric street lighting in Adelaide will be like. No provision appears to have been made as to the 30 arc lamps during the second five years, nor as to the removal or purchase of the Electric Light Company's plant, wires, &c., at the end of the ten years.

The following particulars with respect to the Company were filed in the Supreme Court of South Australia in April last: Capital, £20,000, in

1000 shares of £20 each; number taken up, 1000; calls made, £13,875; calls received, £13,655. The number of shareholders is 16—viz., Johnson and Phillips (London), engineers; Brookman's Gold Exploration and Finance Association of West Australia; W. W. Brawford, electrical engineer, Sydney; E. M. Grant, electrical engineer, Adelaide; F. C., Howard, Manager of the Electric Light Company, Adelaide; four of the Messrs. Brookman, and seven other shareholders.

Mr. Howard, in his evidence before the Select Committee on the Company's Bill in October, 1897, said: "We are at present negotiating in London for an increase of capital, which will be absolutely necessary." We should think it would; and it remains to be seen whether capitalists will be found in London to risk their money in such a venture, especially when local people will not have anything to do with it. In Melbourne, which is a much more promising field for the electricians, the electric light companies have not succeeded; and we believe there are few, if any, successful electric ventures of any importance in Australia.

With regard to the supplies of the other illuminant, the South Australian Gas Company are in a very strong position. From the local papers we learn that they have more than 300 shareholders, nearly all resident in the colony. Not only do they supply gas to the city of Adelaide and its suburbs, but they also have gas-works at six other towns in the colony. They have spent on plant and works at their seven stations £320,000; and they have reserve funds of £64,000, besides a balance of £14,553 carried forward in June last. The Company have, as remarked in a previous article on this subject, secured a contract to light the streets of Adelaide for five years from Sept. 1, 1897, to Sept. 1, 1902; and they now light about 900 lamps under its provisions. This contract, it will be observed, still has nearly four years to run.

Adelaide is a particularly difficult city to light cheaply, on account of the many miles of terraces, squares, and park lands, and also because of the very limited population, early closing of shops, long days, and short nights. In the city and suburbs, most of the shops and dwellings are small one-storey places, and the houses are many of them, especially in the suburbs, very scattered. A number of them have large blocks of land attached, and there is a considerable quantity of vacant land.

The Electric Light Company advertise that they are a local Company with £100,000 to spend. They are beginning in a way that appears to spell ruin to their shareholders, as the free lighting they start with will handicap them. The loss they thus make will have to be borne by their other customers, which will certainly not conduce to cheap electricity.

#### ELECTRIC LIGHTING NOTES.

For the purpose of extending the electrical cables into the residential part of the borough, and adding to the generating plant, the Dewsbury Town Council have decided to apply to the Local Government Board for sanction to the borrowing of £9060.

The Winsford District Council are considering the question of adopting an electric lighting scheme, the first installation of which is estimated to cost £7700. Notice has been given that at the next meeting a resolution will be moved authorizing an application to the Board of Trade for a Provisional Order.

The St. Anne's District Council have decided to retain possession of their Electric Lighting Order, and to call in an expert to advise them on the question of carrying out the powers which it confers. It is stated that £700 a year is paid for public lighting by gas; and with this sum £20,000 could be borrowed at 3 per cent.

An application by the Barnsley Town Council for power to borrow £25,000 for an installation of the electric light was under the consideration of Colonel W. Langton Coke, of the Local Government Board, at a public inquiry last Friday. It was stated that, at the outset, a plant would be laid down capable of supplying 6000 8-candle power lamps, and would be so arranged that its capacity could be doubled by the expenditure of £2500 in additional plant and buildings.

Yesterday week the formal opening took place of the new electric lighting station erected in Sculcoates Lane, Hull, to supply a large portion of the city west of the River Hull and outside the old town. The cost of the new station has been about £40,000; and there are nine miles of new mains. To generate the electricity four steam dynamos of 760-horse power have been provided; and these will supply current at 2000 to 2500 volts. The Mayor (Alderman P. T. Crook) presided at the opening ceremony, and presented a gold key to Mr. Skinner (the Chairman of the Electric Lighting Committee), who opened the door of the premises.

A statement of the accounts of the unfortunate Morecambe Electric Light and Power Company (which is in liquidation) has just been issued to the shareholders. It shows that the receipts since the extraordinary meeting in February, 1896, amount to £3423; the principal item being £2718 from the District Council for the plant and undertaking. The expenditure amounts to £3422; leaving a balance of 17s. 9d. The holders of "A" debenture bonds will be paid in full, absorbing £2052; and the holders of "B" debenture bonds will receive 3s. 5½d. in the pound. There are no assets available for either unsecured creditors or ordinary shareholders.

Dealing with the subject of electric lighting losses in Switzerland, the correspondent of the "Financial News" at Zurich last Thursday sent to our contemporary the following particulars: "The Compagnie de l'Industrie Electrique de Geneva, which was founded originally with a capital of 2,500,000 frs., closes its working year 1897-8 with a profit of 1038 frs., against 18,060 frs. in the previous year. This unsatisfactory result is due to the Genoa branch establishment, which shows losses to a total amount of 112,028 frs., against a profit of 17,631 frs. in 1896. Consequently, the Directors, authorized by the shareholders, have decided upon the winding up of the Genoa branch, in order to prevent the recurrence of such misfortunes in the future working of the Company."

About 7.30 p.m. on Saturday, the 22nd ult., there was a failure in the supply of electricity at Wolverhampton. The private consumers were without the light until 9.10 p.m.; but it was 10.30 p.m. before the public thoroughfares were re-lit. The cause of the breakdown as given by Mr. Shawfield, the Electrical Engineer to the Corporation, was "the failure of two generator armatures at the main station." The local correspondent of the "Electrical Review" says this is the third or fourth breakdown



of the kind that has occurred, but happily there is not much chance of another similar collapse; a new scheme recently foreshadowed by the Lighting Committee of the Corporation having been specially designed to obviate the risk of any such breakdown as this.

A good deal of inconvenience was experienced in Cambridge, on the evening of Saturday, the 22nd ult., through the partial failure of the electric light. On one circuit there was a complete breakdown for upwards of an hour. Several large firms were consequently deprived of light at the busiest time of the day; and the loss of business must have been rather serious. Fortunately in the case of the theatre the mishap occurred some time before the rising of the curtain, but the audience assembled when the building was lighted with oil-lamps and gas. The unexpected stoppage of the illuminant also interfered with the services in one or two college chapels; and some fun was caused when it suddenly went out in the dining-halls. The light in the Central Library (supplied through another circuit) flickered for a time, but did not go out.

Very important developments in connection with the electric undertaking are projected at Bolton, principal among which is the application of electricity as the motive power for the tramcars. This, of course, will involve some considerable extensions at the Corporation electric lighting station, the present capacity of which is 32,000 8-candle power lamps. The consumers at present number 446; and they have an equivalent of 34,437 8-candle power lamps fixed. Several other premises are also nearly ready for connection. To provide for the extensions of light and the motive power for the tramcars, new plant is required. To accommodate this, the engine-room and boiler-house will have to be extended by 86 feet. The new plant to be laid down is as follows: Two engines of 1000-horse power each, driving 600 kilowatt dynamos, and two of 500-horse power each, driving 300 kilowatt dynamos; four boilers, a battery of economizers, and the necessary pumps. The system of propulsion for the electric tramcars, for which 1000-horse power will be needed, will be the overhead trolley system; and seventy cars are to be put in operation. The total cost of the various undertakings included in the scheme will be above £200,000.

At a special meeting held last Tuesday, the Walker District Council had before them the question of electric lighting. The Rev. F. H. Berry moved—"That application be made to the Board of Trade for a Provisional Order under the Electric Lighting Acts, 1882 and 1888, to authorize the Urban District Council to supply electricity for public and private purposes, as defined by the Electric Lighting Acts, within the urban district of Walker." He explained that the matter arose out of an application of the Gas Company to promote a Bill to empower them to provide electric energy for the district. The Board thought, however, that it would be better not to have the two competing interests of gas and electricity in the hands of one Company; and therefore they considered it would be better to put themselves in the position of being able to command terms from any authority that would undertake to provide electricity. Colonel Crawford, in opposing the resolution, said the action of the Council in this matter was unnecessary and unfriendly. It was unnecessary because the question of the electric lighting of that district had been under the consideration of local gentlemen for some years. Action had been taken by the Gas Company, with which he himself was connected—a Company who from his experience had for years met the wants of the district in a way that very few companies of a similar character had succeeded in doing. Independently of supplying the wants of the various private consumers large and small, they had at present some 2450 slot-meters to meet the wants of the smaller consumers. Thus, it could not be said that the Company were in any way neglectful of the requirements of the district. The Council's action was unnecessary, because they still had the power to make terms with the Company. He maintained that until the Company applied to the Council for sanction to a Provisional Order, the Council had taken no action in the matter. They could not, therefore, claim credit to themselves for having initiated the scheme. The resolution was carried with one dissentient—Colonel Crawford. Thereupon this gentleman said he must sever his connection with the Council; but subsequently, at the request of the members, he agreed to take time to consider the matter.

We recorded last week the accident which plunged Brighton into darkness on the night of Thursday, the 20th ult. As the machinery and plant at the electric light works are all of the latest type, such a catastrophe should have been impossible. The following is the explanation given of the cause of the occurrence: The cessation of the light was caused by the heating and ignition of an armature, coupled with the failure of the automatic cut-out to perform its task of throwing the damaged dynamo out of the circuit; the dynamo in question being one of the exceedingly powerful machines put down between two and three years ago. At the time of the breakdown, six dynamos were at work, and the cut-out should not only have automatically separated the one concerned from the others as soon as it ceased to supply current, but should also have announced by a loud click the fact that a mishap had occurred. These instruments are practically tested every day when the dynamos are shut down; and any failure on their part to act could not possibly escape notice. As, therefore, it must be assumed that the cut-out was efficient up to the moment before the breakdown, the failure can only be attributed to the sudden enormous pressure of current, and the consequent burning of the metal (which was very evident on examination) preventing the free working of the mechanism. At the time of the breakdown, Mr. Arthur Wright, the Corporation Electrical Engineer, was close to the works; and he was very soon on the spot investigating the cause of the failure. But, unfortunately, it was for some time impossible to trace it. In the works themselves, no gas lights are in use; and there was utter darkness, except for the glow of the furnaces. Moreover, when the fault had been located, and the injured generator put out of circuit, the remaining dynamos failed for some minutes to respond to the enormous demand made upon them, and had, so to speak, to be coaxed with lighter loads before they would perform their work. Everything possible was done to limit the period of inconvenience. The advantage of retaining a supply of gas with an electric light installation was evident at several of the places of amusement. At the Empire, very little difficulty was caused; gas lights being available for both auditorium and footlights. The same remark applies to the Alhambra. At the Eden Theatre also the inconvenience experienced was very slight. Gas as well as electric light is utilized for illuminating the theatre; and both were in use when the electric current failed. The curtain had just been lowered at the close

of an act; and though the supply of gas only dimly lighted the building, it was not found necessary to prolong the usual interval.

Mr. F. H. Tullock lately held an inquiry on behalf of the Local Government Board into the proposal of the Hastings Corporation to borrow £58,000 for the purpose of acquiring the undertaking of the Electric Light Company. Mr. Macmorran, Q.C., and Mr. Pritchard appeared in support of the application; Mr. Freeman, Q.C., and Mr. S. G. Lushington opposed on behalf of the ratepayers; while Mr. J. Macer Wright, Mr. Botley, jun., and Mr. Bailey also gave notice of opposition. Mr. Macmorran said the Company, which was incorporated in 1882 with a capital of £50,000, were not anxious to dispose of their undertaking. This was in consequence of their having had a good year, and also on account of there being every prospect of continued prosperity. The question really appeared to be whether the £58,000 asked was an exorbitant sum. The Town Clerk (Mr. B. F. Meadows), cross-examined by Mr. Freeman, said he believed the authorized capital of the Company was £50,000. He was not sure, but he was under the impression that £27,220 of share capital had been subscribed. The Council sought the advice of Professor Robinson, whose opinion was that the undertaking was worth £40,000. Dr. Allfrey and Mr. Burrell, two members of the Corporation, were decidedly of opinion that in acquiring the undertaking the Council would get a remunerative concern. Mr. L. Andrews, the Manager at the electric light works, said the whole of the plant, with the exception of a few pumps, had been put in since 1890, and was in as good condition now as it was then. Mr. W. Hammond said he valued the concern at a much higher rate than Professor Robinson. He considered the price at Hastings a very fair one; and he could prophesy good results to the Corporation. Mr. Freeman, speaking on behalf of the Gas Company as ratepayers, said that if the electric light undertaking could be purchased on reasonable conditions, all objections would be immediately withdrawn; but the bargain made was a reckless one, and not for the good of the town. He held that the Corporation might wait until the Company's Order lapsed, at the end of the 42 years for which it was granted, when it would be in their power to purchase the works as a going concern, without any allowance for goodwill, profits, and compulsory sale. The Corporation would have to compete with the Gas Company; and it appeared to him that the whole basis upon which they had gone was radically wrong, and the bargain would not be for the benefit of the ratepayers. If £40,000 was a fair price, why should the Corporation throw away £14,000 or £15,000 merely that they might have one more undertaking under their control? He did not object to a fair price, but he did say that it was unreasonable to the ratepayers that the thing should have been rushed through in the way it had been. Mr. Macer Wright objected to the acquisition of the works at an exorbitant price. Mr. Macmorran, in reply, held that Professor Robinson in his report had not said a word to the effect that the plant was in any way weak or inefficient. It was in good working order, and was capable of turning out all the work required, which was increasing. Because the electric light business was flourishing, it was no reason why the Company should be asked to sell at a valuation. The Corporation wished to buy because they saw the Company had got their heads above water, and were doing an increasing business. He urged that the loan should extend over 25 years. The inquiry then closed.

An inquiry of considerable importance in connection with the Manchester Corporation electric lighting undertaking was held by Major-General H. D. Crozier yesterday week. It referred to an application by the Council for sanction to borrow an additional £200,000 for the purposes of the department. The case for the Corporation was stated by the Deputy Town Clerk (Mr. Hudson). He said that although the electrical undertaking had only been in existence a little over five years, there were 214,946 eight-candle lamps connected; and there were 31,760 lamps waiting for connection. The Corporation would not be able to take on the latter until plant which had been authorized by the Local Government Board, and was now being constructed, had come into operation. The charges for electrical current were 5d. per unit, fixed charge; and for long-hours consumers 1½d. per unit, and £7 per annum per kilowatt. These prices compared very favourably with those of any other undertaking in the United Kingdom. During the time that had elapsed from the initiation of the undertaking until March last, the Electricity Committee had placed to reserve and renewal funds £34,245, and had handed over to the city fund £26,694; making a total of £60,939, which for the period over which it extended was equal to a rate of rather more than a penny in the pound. This indicated that the undertaking had been a marked success—a success which had not resulted in any sense in damage to the gas undertaking. In connection with the gas-works, the Corporation had been able to hand over to the ratepayers yearly sums of money which had been equivalent to a rate of more than 4d. in the pound. This had been done at a time when the price of gas had also been reduced. The price of gas was at present 2s. 3d. per 1000 cubic feet within the city and 2s. 6d. outside. In regard to the water and gas supply and other matters, there was a community of interest between the city and the surrounding urban districts; and there was a demand that Manchester should supply those districts with current for lighting and also for tram traction. The Corporation had made definite arrangements for supplying electrical current, under the powers they possessed, to Levenshulme, Moss Side, Withington, and Heaton Norris; but as the last-named place had not yet obtained an Order, it was not possible to take any immediate action so far as that township was concerned. Meanwhile the main purpose of the application now made had reference to the supply of electricity to Levenshulme, Moss Side, and Withington. The price in the outside districts would be precisely the same as that charged in the city. Of the £200,000, it was estimated that £116,558 would be required within the city, £52,332 in the Withington district, £16,002 in Moss Side, and £9400 in Levenshulme. Alderman Higginbottom, the Chairman of the Electricity Committee, in support of the application, stated that, in accordance with the terms of the agreements entered into with Moss Side, Levenshulme, and Withington, the compulsory streets mentioned in their Orders had to be lighted by the Corporation within a term of two years from Aug. 6, 1897. It was absolutely necessary, therefore, that the works should be at once proceeded with. The Council had also instructed the Committee to light up a large number of the principal thoroughfares in the city with arc lamps, if possible during this winter. The expenditure on this item would be £11,500; and this was included in the application. The posts

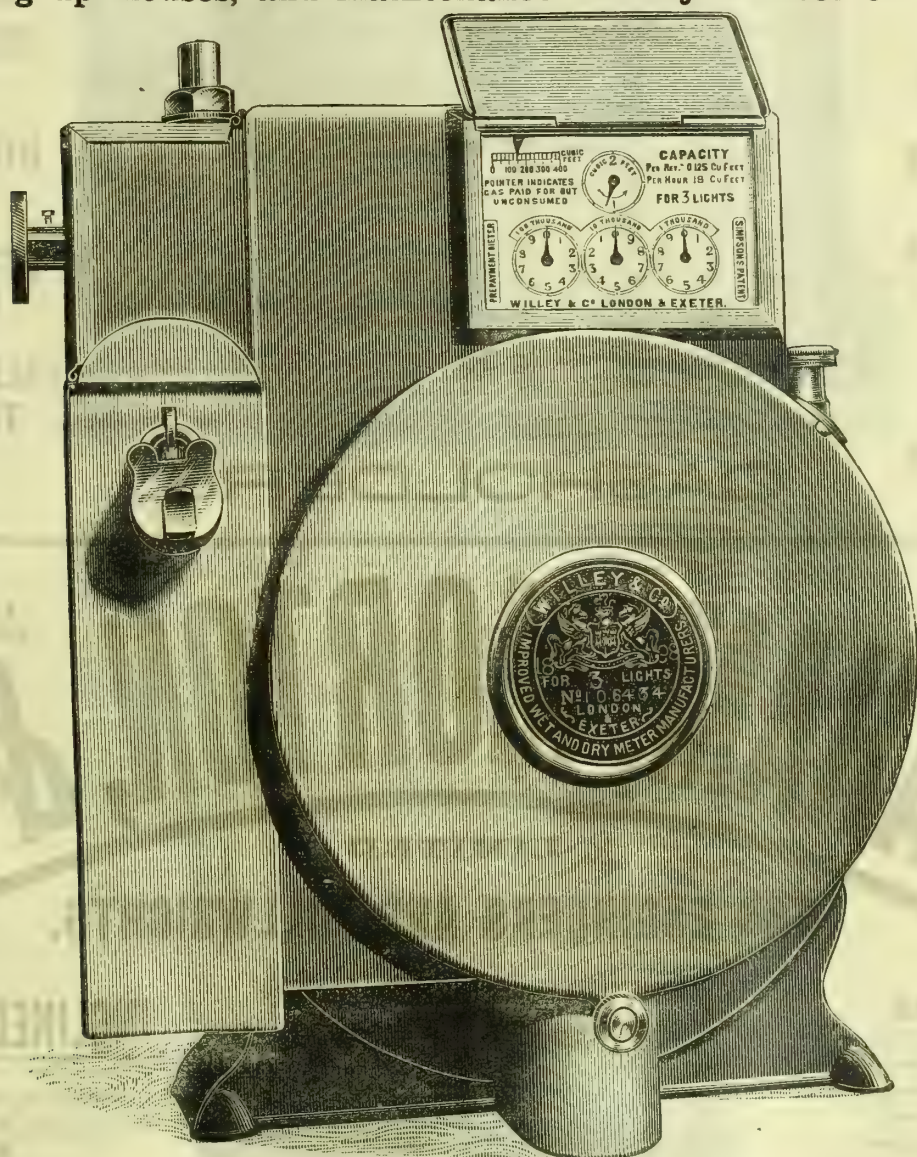


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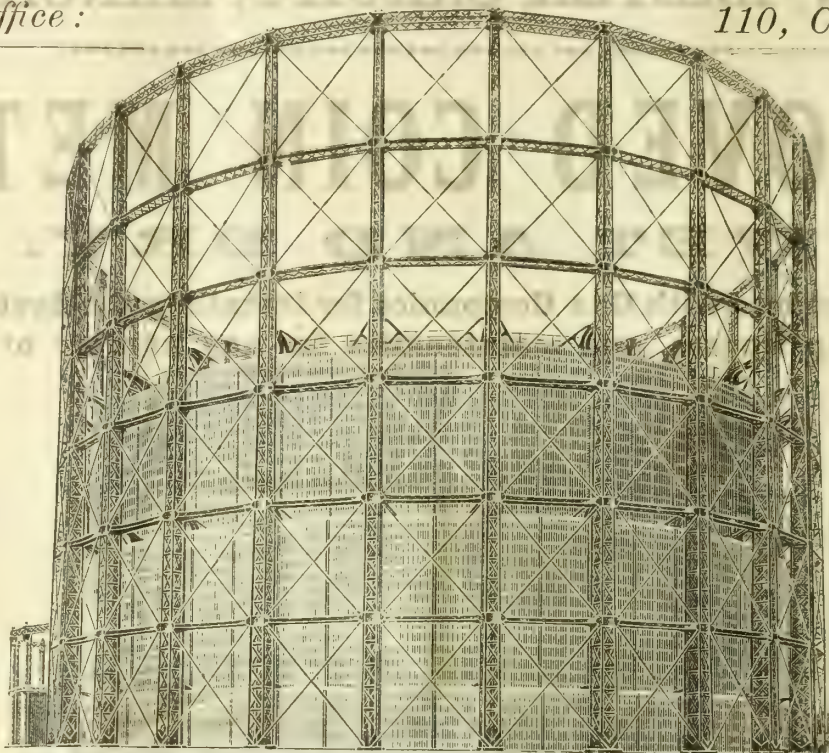
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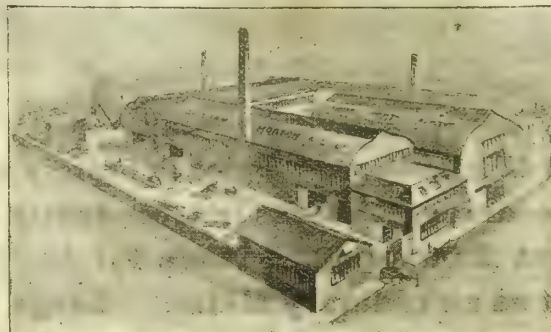
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carrying the arc lamps would be about 43 yards apart, placed alternately on opposite sides of the streets. The Corporation, having obtained power to work the tramways by electricity, had decided that they should be equipped and ready for running in April, 1901; and it was probable that the overhead system of traction would be employed. The capital expenditure incurred to the end of March last was £357,617. In December, 1893, there were 289 consumers, using the equivalent of 32,716 eight-candle lamps; while on Oct. 20 this year, there were 2281 consumers, using 214,946 lamps. When the applicants now waiting for a supply had been dealt with, the total number of consumers would be 2411; and the number of lamps would be 246,706. Mr. C. H. Wordingham submitted a long report on the subject of the extensions; and this concluded the evidence.

## THE LONDON COUNTY COUNCIL AND THE WATER QUESTION.

### The Water Committee's Report.

In the "JOURNAL" last week we gave the recommendations of the Water Committee of the London County Council in regard to the acquisition of the undertakings of the eight Water Companies and to the provision of an additional supply of water for the Metropolis. As then stated, they formed the conclusions of a report to be considered by the Council at their meeting to-day. The full text of the document is as follows:—

#### *Proposals for Legislation in 1899.*

It will be remembered that in May last we brought up a report to the Council stating that, owing to the continuance of the sitting of the Royal Commission on London Water Supply, we did not deem it advisable at that moment to make any proposals for legislation on the subject of water, but that in our opinion it would be well for the Council to suspend its Standing Orders so as to leave us free after the summer recess to make any recommendations that might appear to be necessary. The Council, therefore, has now to consider whether it will continue to wait for the report of the Royal Commission before taking any action in the direction of legislation, or whether it will at once formulate its proposals and lay them before Parliament in the coming session.

In considering this question, it must be borne in mind that if no action is taken by the Council now, it will be unable to promote any legislation before the year 1900. On the other hand, there seems to be no reason why the Royal Commission should not make its report early in 1899, so that it may be in the hands of Parliament before legislating on the subject. In any event, in view of the very serious state of affairs that has been shown to exist during the last few months, we believe that it is the duty of the Council to take every possible step to enable the Legislature to have before it, in the coming session, specific proposals for solving the problem of the London Water Supply upon the lines of the Council's policy.

There are two main facts appearing from the experience of the last twelve months, and these affect the question as to what legislation is necessary in two different manners. First, there is the fact that one-quarter of the population of London has recently been subjected to a series of water famines by reason of the default of the East London Water Company; and, secondly, there is the fact that the drought of the present year has reduced the flow of the Rivers Thames and Lea to so low a state as to make it certain that these rivers cannot, in a dry year, yield the supply which the Royal Commission, presided over by Lord Balfour of Burleigh, relied upon in making their report. These two matters, although closely connected, may, for the purposes of discussion, be kept distinct, because it is possible by temporary measures to satisfy the needs of East London immediately, whereas it will take ten or fifteen years to carry out the necessary works for providing for the permanent requirements of London generally.

#### *Immediate Remedies.*

We believe that the only really satisfactory means of immediately remedying the state of affairs in East London lies in pressing forward the old policy of the Council—namely, the acquisition of the eight Metropolitan Water Companies. If the Council's Bills of 1895 had become law, there would have been no water famine in East London in the present year. The Council would have come into possession of all the undertakings in 1896, and would have been able with little difficulty to utilize for East London the water generally available for the Metropolis, of which there has been sufficient even during the present drought. Any scheme which contemplates the continuance of the individual Companies is open to the objection that each Company possessing a margin of available water will naturally desire to retain such margin for the possible needs of its own consumers. It is only by uniform management that the whole of the water available for the Metropolis can be efficiently made use of for all parts of the area. Although schemes of amalgamation or of combination of the Companies have been put forward as capable of effecting this object, they are attended by so many difficulties, and are open to so great objections, that we are convinced that the only satisfactory system of uniform management lies in a public authority possessing the entire supply. We propose, therefore, legislation upon the lines of the Council's Purchase Bills, subject to the following observations.

The Council's Bills have always provided for the immediate transfer of the Companies' undertakings, with subsequent arbitration as to price. This proposal has been the subject of some criticism; but we believe it to be indispensable under the pressing circumstances of the case, and quite capable of justification when accompanied, as it has been, by provisions assuring the shareholders against loss of income during the interval between the transfer and the payment of the purchase-money. The actual vesting of the undertakings in the Council cannot prejudice the shareholders, nor do we wish it to prejudice the question of the future position of the outside areas; and we therefore propose a resolution which makes this clear.

A question arises as to whether the Council should on this occasion promote eight separate Bills or one Bill. The plan of proceeding by separate Bills was adopted formerly for reasons of parliamentary expediency; but the consideration which the subject underwent in 1895 should operate so as to shorten the period of discussion in the coming

session, and make it possible on this occasion to unite the proposals for purchase in one Bill. This course will have the additional advantage of placing it beyond all doubt that the Council's scheme is one for unification of supply, and therefore capable of providing for the immediate necessities of East London. We propose that the Council shall proceed by one Bill for the purchase of all the Companies.

In order to make the Council's proposal a complete and immediate protection against further famines in East London or elsewhere, we suggest that the Bill should contain clauses enabling the Council to take in hand forthwith the work of consolidating the several systems, and connecting and laying mains, &c., so that the whole may be at the earliest possible moment adapted to meet the needs of all parts of the Metropolis. The power of constructing such works would be similar to that under which the Council construct sewers.

The precise form of the arbitration clause may be left to be considered by the Parliamentary Committee; and we suggest that the Council should at the present moment only pass a general resolution on the subject. But for this purpose it may be well to remind the Council of the facts connected with the arbitration clause in former Bills. The clause as originally presented in 1895 to Parliament rendered it obligatory upon the arbitrator to have regard to various specified matters—such as, for instance, the condition of the works, the adequacy of the supply, the necessity for new sources of supply, &c.; and it further enacted that no allowance was to be made for any claim to make up back-dividends for more than six years, or in respect of compulsory sale.

When this clause came before Mr. Plunket's Committee, it appeared clear that it was impossible to expect Parliament to enter into the numerous technical questions involved in so detailed a proposal; and, acting upon a suggestion of that Committee, the Council substituted what has since been known as the Plunket clause, the practical operation of which would have been to place the arbitrator in the position of the Committee of Parliament, and so enable the Council to urge before him all the contentions which it was at that time prepared to submit to the Committee.

The Council's Bills having been rejected in 1896, were reintroduced in 1897; but the arbitration clause was slightly altered. It was based on the Plunket clause; but the obligation upon the arbitrator was not quite so clearly defined as before. It contained, however, an absolute prohibition against any allowance being made in respect of compulsory sale, except in so far as would cover the cost of re-investment.

The views of the Council throughout have been that, while prepared to pay the fair and reasonable value of the water undertakings, such value ought only to be decided with due regard to many important matters. One of these matters was the contention then put forward by the Council that the Companies were rapidly nearing the end of their resources, and would shortly come face to face with a very large expenditure, necessary for procuring an additional supply. The experience since gained has entirely borne out this view. In the last three years, all the Companies, except the Kent Company, have been to Parliament for additional powers; and the default of the East London Company is a matter of notoriety. The Council's action in this respect therefore appears to have been fully justified with respect to one of its contentions, and it can, we think, fairly maintain its demand for a special arbitration clause.

Our present proposal is that the arbitration clause shall be drafted in such form that it shall be certain that under it, in fixing the price to be paid for the undertakings, the arbitrator will, in the case of each Company, have regard to all such circumstances as may be brought before him—such as, for instance, in the case of the East London Company, its inability to provide for its population, and the necessity of its obtaining other supplies. The clause should also provide specifically that no addition shall be made in respect of compulsory sale, except so far as to meet the cost of reinvestment (if any).

The question of dealing with the outside areas is naturally one of difficulty; but the Council has already on other occasions agreed to the principle of according to the outside authorities the same freedom of administering their own supply as the Council claims for itself. This, however, is a matter which concerns the outside authorities more than the Council; and so far as the Council is concerned, we think the Bill might be drafted on the lines of the Bills of 1895, the effect of which would be that the Council would take over all the responsibilities of the Companies as regards obtaining water necessary for the entire area, and would transfer to the outside authorities, if they so desired, all the works and powers of distribution in their respective districts. The further question, as regards the separation of sources, may be left over for negotiation with the outside authorities, especially as this question is one of those on which the Royal Commission will undoubtedly report, and with which Parliament may possibly deal separately at a later period.

There remains one more question—that of the Council's agreement with the City to give one-eighth of the seats on the Council's future Water Committee to nominees of the Corporation. We are not sure how far the Corporation have abandoned their views in favour of purchase; the evidence put forward by them before the Royal Commission being somewhat uncertain. If, however, they still support the principle of purchase, we think the Council is bound to adhere to its arrangement; and we suggest that the Corporation should be asked at once whether they will assist the Council on the lines of the old agreement.

#### *Future Supply of London.*

We have stated that the question of the East London Company and that of the future supply of the Metropolis may be kept distinct; but at the same time the peculiar circumstances of this year have affected the larger question to so great an extent, that it seems impossible for the Council to avoid laying before Parliament in the coming session its proposals with reference to this matter also.

It will be remembered that the conclusion arrived at by Lord Balfour's Commission, that sufficient water to satisfy the requirements of London up to the year 1931 could be obtained from the valleys of the Thames and the Lea, was based upon the view that these valleys could be relied upon to yield at least an average daily supply of 300 million gallons and 92½ million gallons respectively. Although from the outset entertaining grave doubts as to the correctness of this view, we have hitherto accepted it, and devoted our attention specially to the question of the cost of a storage system necessary for giving such supply, as compared with the cost of bringing water from Wales; and having become convinced that



the storage scheme would prove in the end the most costly and least satisfactory of the two, we tendered evidence before the present Royal Commission, to show that reservoirs at Staines capable of supplying 300 million gallons a day, without depletion of the Thames in dry years, must be very large and very costly. The present year has been drier than any previous year in recent times; and it is evident now that a reservoir system capable of meeting the needs of a year such as 1898 must be of such magnitude as practically puts all storage schemes out of the question.

But, beyond this, the experience gained in connection with the flow of the Rivers Lea and Thames during the present season has entirely confirmed us in our belief that Lord Balfour's Commission were misled into erroneous views as to the quantity of water obtainable in dry years. The report of the Commission with regard to the Lea was undoubtedly based to a great extent upon the evidence given on behalf of the East London and the New River Companies. This evidence was that between them they could supply over 110 million gallons a day, and that this quantity could be largely increased by storage reservoirs in the Lea Valley. Since then the New River Company have admitted that they can obtain from their wells only 24 million gallons a day instead of 34 million gallons as stated to Lord Balfour's Commission; and the East London Company, though they have doubled the capacity of their storage reservoirs, have nevertheless made default. The fact is that during the whole of the present year the entire volume of the River Lea has been used, and yet there has been a famine. Moreover, the average flow in September last over Field's Weir was only 8½ million gallons a day (of which it is believed a large proportion was water contributed by the New River Company); whereas the information before Lord Balfour's Commission was to the effect that the minimum known flow of the river for any month at that spot was 17½ million gallons. With regard to the Thames, the information before the Commission showed that its minimum total flow in one month was 308 million gallons a day. Last August the flow was only 272 million gallons; and in September it dropped to about 200 million gallons, out of which the Thames Companies had the right to abstract 150½ million gallons, and did, in fact, in August draw 129,900,000 gallons. These facts have convinced us that it is impossible to depend in a very dry year upon the quantity of water the Commissioners reported as being obtainable; and, if this is so, their report affords no solution of the problem of Metropolitan Water Supply.

The evidence of the present year therefore seems to justify conclusively the views hitherto held by the Council as to the necessity of immediately proceeding with some scheme for the future supply of the Metropolis on lines other than those suggested by Lord Balfour's Commission. The Council has already decided that, in its opinion, the solution lies in having resort to the Welsh mountains to obtain the necessary supplementary supply; and the time has now arrived for giving effect to this resolution. Our report upon this subject, discussed at the Council on Feb. 25 and April 21, 1896, gave a detailed statement of our entire proposals; and thereupon the Council resolved that the requisite augmentation of the supplies of water should be derived from some other source than the Thames and Lea; that the valleys of the Usk, the Wye, and the Towy would furnish a suitable area from which supplies might be derived; and that the Usk section should be undertaken in the first instance. After passing these resolutions, however, delay was incurred by reason of the Council desiring further advice from Sir B. Baker and Mr. Deacon; and although in 1897 these Engineers reported in favour of the Welsh scheme as compared with that of storage in the Thames Valley, by that time the present Royal Commission had been appointed by the Government, and thus we again felt ourselves unable to recommend the Council to take parliamentary action. We proceeded nevertheless with the plans and sections; and these have all been completed for both portions of the Welsh scheme. The work that remains to be done in order to lay complete proposals before Parliament will take about three months to execute. But the referencing for the portion of land taken for the reservoirs, &c., can be completed in proper time; and it should not be impossible, if the referencing for the conduits is finished before Parliament meets, to obtain a suspension of Standing Orders so as to enable Parliament to have the scheme properly before it.

We therefore propose that the Council should deposit a Bill for obtaining water from Wales; but in doing so we advise the Council to make an alteration in its former resolution. The Welsh scheme, as approved in 1896, was divided into two parts—namely, the Usk section and the Wye section. We then advised the Council to take up the Usk section in the first instance; but since that date Sir B. Baker and Mr. Deacon have expressed a preference in favour of the Wye section. The reasons which actuated us in recommending the former were purely reasons of policy; and as the Engineer himself has throughout preferred to put forward the Wye section first, and recommends it now strongly as being the better and the cheaper of the two, we think the Council would do well to rescind its former resolution, and order a Bill to be promoted for obtaining water from the valleys of the Wye and Towy, upon the lines set out in our former report with reference to that portion of the Engineer's scheme. The estimate of cost in our former report has been slightly reduced, the total amount necessary for providing a daily supply of 200 million gallons being £16,546,000; and this will probably be expended in three instalments. We recommend—

- 1.—That a Bill be promoted in the coming session of Parliament for the purchase by the Council of the undertakings of the eight Metropolitan Water Companies, by agreement, or failing agreement by compulsion.
- 2.—That, subject to such provision as may be made by Parliament as to the ultimate relationship between London and the outside authorities, provision be made for the undertakings of the Companies vesting in the Council at a date not later than six months after the passing of the Act.
- 3.—That the Bill contain provisions authorizing the Council to proceed forthwith with the connecting and laying of mains and other works necessary in order to enable it to protect any part of the Metropolis from want of water.
- 4.—That the arbitration clause be so framed as to render it certain that in the case of each Company the arbitrator will have regard to all such circumstances as may be brought before him, and that no allowance shall be made in respect of compulsory sale except for cost of reinvestment (if any).
- 5.—That, subject to further negotiation thereon with the Local Authori-

ties, the clauses with respect to the supply of outside areas should follow the principle of the Bills promoted by the Council in 1895.

6.—That the understanding with the Corporation of the City of London, with regard to their representation on the Water Committee, be adhered to, if they so desire.

7.—That a Bill (or Bills) be promoted in the coming session of Parliament for the purpose of empowering the Council to bring an additional supply of water to London from the watersheds of the Wye and Towy on the general lines of the report of the Water Committee approved by the Council, April 21, 1896, in so far as it applies to the Wye section of the Engineer's scheme.

8.—That it be referred to the Parliamentary Committee to prepare and present to the Council the necessary Bills for carrying out the above resolutions.

With a view of affording the Council every information on the subject of the Welsh scheme, we have directed copies of our report, dated Jan. 31, 1896, with the proceedings thereon, to be circulated to the Council, together with the report of Sir B. Baker and Mr. Deacon on the Chief Engineer's report with respect to the Welsh sources of supply.\*

When the above report comes on for consideration to-day, Lord Onslow will move the following amendments: "That recommendation 1 be referred back to the Committee, inasmuch as Parliament cannot be expected to deal with the whole question of the London Water Supply pending a report of the Royal Commission which has been appointed to consider the subject, and only useless expense will be incurred by the promotion of any Bill framed without due consideration of the recommendations of that Commission; but that, as it is a matter of great urgency that provision should be made at the earliest possible moment against a recurrence of the scarcity of water in one part of London while in other parts there is more than a sufficiency, the Council do promote a Bill providing that any Metropolitan Water Company be required, in case of emergency, to supply water to any other such Company whose supply may be deficient, and providing for the connection of the reservoirs and mains of the several Companies for facilitating arrangements for this purpose. That, in view of the urgency of the matter, application be made to Parliament for the suspension, if necessary, of Standing Orders, so as to admit of the introduction of the Bill, as was done in the case of the Southwark and Vauxhall Water Company's Bill of 1897. That, therefore, the preparation of a Bill for the purchase of the Water Companies' undertakings be deferred until it can be seen how far the Council can harmonize its policy with the views of the Royal Commission; and that it be an instruction to the Committee to take that report into consideration as soon as issued, and advise the Council, without delay, what steps should then be taken to deal with the supply of water to London."

At the Meeting of the Council last Tuesday, it was resolved—"That it be an instruction to the Water Committee to consider and report as to the best means of compelling the London Water Companies to bear the cost of conveying the water from their mains to the houses, buildings, &c., of the consumers."

## THE PROJECTED WELSH WATER SUPPLY SCHEME FOR LONDON.

The Report of Sir B. Baker and Mr. G. F. Deacon.

(Continued from p. 877.)

In the third part of their report, the Engineers deal with the supply of water from the Thames, and discuss at some length the scheme of storage reservoirs at Staines, which was commenced in the spring of the present year, under the provisions of the Staines Reservoirs Act, 1896. The Engineers were requested to report as to the practicability and cost of carrying out schemes of storage for providing 200, 300, and 400 million gallons of water per day from the Thames, on the lines of the suggestion contained in the report of the Royal Commission of 1893. As laid before that body, the above-named project was limited to 300 million gallons a day; and the main conclusion drawn by the Commissioners was as follows: "We think that regulations could be framed under which the quantity we suggest could be taken, not only without reducing the flow of the river on the rare occasions of exceptional drought to the present minimum, but in such a way as to secure that the volume of water left in the river at these times would be substantially greater than it is under existing conditions." The Engineers made themselves familiar with the areas of the proposed reservoirs, which, as regards their physical features, they consider to be entirely suitable; and they divided their inquiry and observations as follows: "(1) Concerning the sufficiency or otherwise of the works included in the project as laid before the Royal Commission, to yield stored water to the extent and at the times intended by the projectors up to 300 million gallons a day, and the application of the same conditions to the supply of 400 million gallons a day. (2) Concerning the extent to which, when the several expenditures have been incurred, the scheme will be efficient (a) as regards the condition of the supply at those times when the water would be sent to the filters direct from the Thames, and (b) as regards the influence of the project upon the flow of the Thames." Dealing first with the question of sufficiency, the Engineers report as follows:—

The intention of the scheme as laid before the Royal Commission was to provide storage reservoirs near Staines, and "the complete scheme," to use the words of the Royal Commission, "is intended to provide for the taking of 300 million gallons a day for supply, and still to leave 200 millions to flow over Teddington Weir." It is to be observed that the Royal Commission came to the conclusion that the gaugings at Teddington Weir were inaccurate. With this we agree; but we fear they do not afford any trustworthy data for an adjustment, which can only be effected by the adoption of material changes in the mode of gauging. Moreover, we know what the nominal 200 or 300 millions at Teddington means in other parts of the river; and all our remarks will apply to whatever actual figures those nominal quantities are in future found to represent.

\* Portions of this report have already appeared in the "JOURNAL" (ante, pp. 828, 876); and a further instalment is given to-day.



It is further stated in the report of the Commission, that "it is proposed that no water shall be taken from the river during the first 15 days of any flood; and the pumping charges have been made out on the assumption that four of such floods may occur in a year, and that the water drawn from store during the 15 days shall be replaced again by pumping in 20 days." On reference to the statement of Messrs. Hunter and Fraser, we find that the definition of a *flood* is a flow of 2300 million gallons a day at Teddington Weir.

The conditions, therefore, as laid before the Royal Commission, may be shortly summarized as follows: A volume of 300 million gallons a day to be drawn for filtration and supply (a) direct from the river, except during the first 15 days of a flood exceeding 2300 million gallons a day at Teddington, and to such an extent only as will not reduce the flow of the river below 200 million gallons a day; and (b) at all times not available for drawing wholly or partly from the river under (a), the whole or necessary portion of the water to be drawn from storage reservoirs, 40 feet deep, the lower 10 feet to be charged from the river by gravitation, the upper 30 feet by pumping, the pumping power being sufficient to return to the reservoirs in 20 days the volume provided to be drawn from them during the first 15 days of any flood.

It is desirable in the first instance to test the scheme by assuming it to be in operation during a year of low rainfall, and then to ascertain whether the storage so determined will suffice for years in which great floods occur. The year 1893, in which the report of the Commission was made, was a year of drought, and may be conveniently used for the first purpose. The supplies dealt with by the projectors are 184, 235, and 300 million gallons per day respectively, and for these supplies the total storage given is 6000, 10,000, and 18,000 million gallons. On the same basis, for a supply of 200 millions, a storage of 7000 to 8000 millions would be required. But we find that if the excess of the dry-summer supply over the mean for the year, which amounts during the period of pumping from stock to 5·6 per cent., be added, and if a proper allowance be made for unavailable bottom water, and a proper reserve for cleansing and repairs, a total reservoir capacity of at least 10,000 million gallons

would have been necessary during the drought of 1893. In order to provide an average supply during the same year of 300 million gallons a day, 311·8 millions per day would have to be supplied during the period of pumping from the reservoirs in the dry season. On the method of the projectors, the total reservoir capacity provided to supply this quantity would only be 20,000 million gallons; whereas we are satisfied that not less than 28,000 millions would be necessary.

The chief object of the reservoirs is to act as settling-tanks in which the suspended impurities contained in the water—largely derived from the river, as will be shown later on, in a turbid state—will be deposited, and not conveyed to the filters. It is clearly necessary, therefore, that a space towards the bottom of each reservoir should be reserved for the collection of solid matter, and for the preservation undisturbed of the lower water, which always contains an abnormal proportion of suspended matter derived from the water above, and which, when such reservoirs are low, contains also an abnormal proportion of life. For this purpose we have provided one-eighth of the total depth, though we have considerable doubt whether this would prove to be sufficient. Even in ordinary impounding reservoirs it is well known that the quality of water drawn from below is inferior to that drawn from near the surface; and that the impurity increases as the surface is lowered. In depositing reservoirs, the necessity for avoiding water near the bottom is imperative. In order, moreover, that periodical cleansing and repairs may take place, reserve reservoirs will be required.

These considerations involve increase in the constructional capacity as compared with the available capacity of the storage reservoirs. We find that to ensure the supplies during the summer of 1893 corresponding with 200, 300, and 400 million gallons a day respectively on the average of the whole year, and adopting approximately the same size for each reservoir as in the scheme laid before the Royal Commission, the numbers of reservoirs and capacities shown by roman type in the following table would be required. For the sake of comparison, the numbers and capacities given in the project as laid before the Royal Commission, with the increases we consider necessary, have been shown in italics.

| Average Daily Supply to London during the Year. | Number of Consecutive Days during which any Water would be supplied from the Reservoirs. | Average Daily Supply to London from River and Reservoirs during the Periods in Column 2. | RESERVOIRS IN USE.                                                                                                 |                                                                       |         |                                  | RESERVOIRS IN RESERVE FOR CLEANING, ETC. |                                  | Total Constructional Capacity of Reservoirs. |
|-------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|---------|----------------------------------|------------------------------------------|----------------------------------|----------------------------------------------|
|                                                 |                                                                                          |                                                                                          | Available Contents required for Storage of Water for Filtration and Supply to London during Dry Period and Floods. | Constructional Capacity allowing for Evaporation and Bottom Impurity. | Number. | Constructional Capacity of Each. | Number                                   | Constructional Capacity of Each. |                                              |
| (1)                                             | (2)                                                                                      | (3)                                                                                      | (4)                                                                                                                | (5)                                                                   | (6)     | (7)                              | (8)                                      | (9)                              | (10)                                         |
| 174·5                                           | 97                                                                                       | 184·0                                                                                    | 5,116                                                                                                              | 6,000                                                                 | 3       | 2000                             | <i>Nil</i>                               | <i>Nil</i>                       | 6,000                                        |
| 200·0                                           | 114                                                                                      | 211·2                                                                                    | 6,282                                                                                                              | 8,000                                                                 | 4       | 2000                             | 1                                        | 2000                             | 10,000                                       |
| 222·1                                           | 119                                                                                      | 235·0                                                                                    | 8,609                                                                                                              | 10,000                                                                | 5       | 2000                             | <i>Nil</i>                               | <i>Nil</i>                       | 10,000                                       |
| 288·7                                           | 165                                                                                      | 300·0                                                                                    | 17,526                                                                                                             | 18,000                                                                | 9       | 2000                             | <i>Nil</i>                               | <i>Nil</i>                       | 18,000                                       |
| 300·0                                           | 167                                                                                      | 311·8                                                                                    | 19,726                                                                                                             | 24,000                                                                | 12      | 2000                             | 2                                        | 2000                             | 28,000                                       |
| 400·0                                           | 217                                                                                      | 412·1                                                                                    | 37,740                                                                                                             | 46,000                                                                | 23      | 2000                             | 3                                        | 2000                             | 52,000                                       |

Note.—The figures in columns 1, 3, 4, 5, 7, 9, and 10 represent millions of gallons.

It is to be observed that, for some reason at present unexplained, the excess of the summer supply over the average for the year was unusually small in 1893; and that in most dry years column 3 would therefore show a larger excess over column 1 than in the above table.

We find further that the storage so determined as necessary during dry weather would have been sufficient throughout the last 14 years to provide the required supply from stock during the first 15 days of any flood or floods discharging on each of those days more than 2300 million gallons at Teddington. Subject, therefore, to the doubt we have already expressed as to the sufficiency of our allowance of one-eighth of the depth of the

| Particulars.                                                                                                                                                                                                                                                                                                                                                                   | SUPPLY OF 200 MILLION GALLONS A DAY.    |               | SUPPLY OF 300 MILLION GALLONS A DAY.     |               | SUPPLY OF 400 MILLION GALLONS A DAY.     |               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|---------------|------------------------------------------|---------------|------------------------------------------|---------------|
|                                                                                                                                                                                                                                                                                                                                                                                | Remarks.                                | Capital Cost. | Remarks.                                 | Capital Cost. | Remarks.                                 | Capital Cost. |
| (1)                                                                                                                                                                                                                                                                                                                                                                            | (2)                                     | (3)           | (4)                                      | (5)           | (6)                                      | (7)           |
| (1) Land, easements, storage reservoirs, aqueducts, and incidental expenses at projectors' price—viz., £228·06 per million gallons stored—plus 10 per cent. contingencies                                                                                                                                                                                                      | 10,000,000,000                          | £2,508,660    | 28,000,000,000                           | £7,024,248    | 52,000,000,000                           | £13,045,032   |
| (2) Pumping-engines and buildings to pump water from river to reservoirs, at £45 per horse power, plus 10 per cent. for contingencies, calculated on the rate of pumping being as 15 days' duration of flood is to 20 days' duration of pumping, or three-fourths of the rate of supply lifted 30 feet, with the addition of reserve pumping power of 25, 17, and 13 per cent. | Horse Power, including Reserve<br>1,184 | 58,603        | Horse Power, including Reserve.<br>1,661 | 82,220        | Horse Power, including Reserve.<br>2,137 | 105,782       |
| (3) Pumping-engines and buildings to deliver water from filters into districts at £45 per horse power, plus 10 per cent. for contingencies. (Apparently a reserve of pumping power of 42 per cent. has been allowed in excess of the average power required)                                                                                                                   | 17,959                                  | 888,970       | 26,940                                   | 1,333,530     | 35,918                                   | 1,777,941     |
|                                                                                                                                                                                                                                                                                                                                                                                |                                         | £3,456,238    |                                          | £8,439,998    |                                          | £14,928,755   |
| The above sums include 10 per cent. for contingencies, but nothing for filters and connection with existing pipes, which items collectively would probably not differ in cost materially from the corresponding items in the Welsh project.                                                                                                                                    |                                         |               |                                          |               |                                          |               |
| ANNUAL PUMPING CHARGES.                                                                                                                                                                                                                                                                                                                                                        |                                         |               |                                          |               |                                          |               |
| (4) Pumping from the river to the reservoirs, at 5s. per million gallons                                                                                                                                                                                                                                                                                                       | ..                                      | £4,570        | ..                                       | £9,431        | ..                                       | £15,435       |
| Pumping to the town districts, at 50s. per million gallons                                                                                                                                                                                                                                                                                                                     | ..                                      | 182,500       | ..                                       | 273,750       | ..                                       | 365,000       |
|                                                                                                                                                                                                                                                                                                                                                                                |                                         | £187,070      |                                          | £283,181      |                                          | £380,435      |



reservoirs for unavailable bottom water, the roman type figures in the last column of the above table may be taken as the constructional capacity of the reservoirs necessary to fulfil the conditions laid down by the projectors of the scheme presented to the Royal Commission. It will thus be seen that the scheme as laid before the Royal Commission would fail—by reason of insufficient reservoir capacity—to ensure the yield of clarified water to the extent and at the time apparently assumed by the projectors. Concerning this there can hardly be any doubt, though there may be differences of opinion as to the extent of the deficiency.

There is another point connected with the construction of these reservoirs to which attention should be drawn. It has already been stated that the projectors in their scheme as laid before the Royal Commission gave to the reservoirs a depth of 40 feet, the lower 10 feet of which would be filled from the river without pumping. No provision seems to have been made for pumping back to the river the unsuitable water in the bottom of the reservoirs. The promoters of the Staines, &c., Reservoirs Bill, 1896, on their deposited plans show reservoirs to hold 2500 million gallons, with a depth of 30 feet instead of 40 feet; the bottom level being above the level of the Thames. In this case the average cost of pumping from the river must, of course, be greater than it would be if one-fourth of the depth were below the level of the river; and the area occupied by reservoirs of a given capacity must be about one-third greater.

The greater area of reservoirs required at a depth of 40 feet would involve the acquisition for the 300 million gallons scheme of about 40 per cent. more land than was contemplated by the projectors of the scheme laid before the Royal Commission; and if the reservoirs were reduced to 30 feet in depth, the additional land required for both changes would be about 86 per cent. In respect of land, therefore, as well as reservoir capacity, we are of opinion that the provision made in the scheme laid before the Royal Commission is inadequate.

Apart altogether from the merits or demerits of the Staines project for the supply of any specific quantity of water, it is important to observe the very high ratio in which the necessary storage increases with the supply. Thus, for an increase of daily supply from 200 to 300 million gallons—an increase of only 50 per cent.—the increase in the storage must exceed 180 per cent.; and for an increase of daily supply of from 200 to 400 million gallons—an increase of only 100 per cent.—the increase in the storage must be 420 per cent.

Assuming that the rates in the projectors' estimates of expense are sufficient, but adding 10 per cent. for contingencies, as we have done in the case of the Welsh project, the cost of the works and the annual charges for pumping would be as shown in the statement given at the foot of p. 987.

In the figures in the table there is no charge for pumping foul water back to the river from portions of the reservoirs below the river level, nor any for the periodical digging out and cleansing always necessary. We have accepted the rates for pumping brought before the Royal Commission, although those for pumping to the town districts are below the present actual cost as set forth in the official returns. In any comparison of the Staines project with the Welsh project, so much of the annual pumping charges as would be avoided by the latter must obviously be capitalized on a proper basis.

The Engineers next consider (1) how far the proposed expenditure would make the scheme efficient as regards the condition of the supply at those times when the water would be sent to the filters direct from the Thames; and (2) the influence of the project upon the flow of the Thames.

Under the first head, they state their conviction that the scheme as laid before the Royal Commission was based upon a misconception of the condition of the Thames water when the volume at Teddington is less than 2300 million gallons a day, as compared with its condition when the flow is more than 2300 million gallons daily. The limit of 2300 million gallons is, they believe, entirely arbitrary; but it represents approximately, for a large portion of the river above Reading, the top bank-level, or the level at which the low-lying lands about the Thames begin to be flooded. Above this level, the discharging power of the river in relation to its sectional area increases more slowly, and the mean velocity may even decrease. They remark that the process of deposition of impurities, known as "sedimentation," occurs simultaneously with the scour; and the excess of one over the other is determined by the actual velocity and by the rate of change of velocity. They say they may reasonably expect, therefore, to find that the impurities in the raw river waters are often as great when the discharge is below as when it is above 2300 million gallons a day; and, further, that very bad conditions occur during small freshets following upon comparatively steady flows, even though such freshets amount to only a small fraction of 2300 million gallons a day.

They then proceed to ascertain how far these views are borne out by actual observation; their remarks on this point being as follows: So far as we are aware, the only independent observations of the raw Thames water, as distinguished from the water after filtration, of sufficient frequency to answer the purpose, are those made by Dr. [now Sir Edward] Frankland for the Local Government Board, and reported each month by the Water Examiner appointed under the Metropolis Water Act, 1871. Since May, 1892, Dr. Frankland has examined every month a sample of water collected from the Thames at Hampton, and has reported the number of microbes per cubic centimetre contained in such water. Whatever differences of opinion there may be as to the specific effect of the Thames microbes, it will be generally conceded that their numbers at different times form a good criterion of the relative condition of the water at those times, and of its suitability or otherwise for filtration without previous storage. A critical examination of these returns appears to us to support in a very significant manner the conclusions to which *a priori* reasoning on hydraulic principles would lead. It leaves no doubt that if the storage of Thames water is needed, in any condition of the river, before filtration, that storage should be applied when the river is discharging very much less than 2300 million gallons a day at Teddington, and it shows further that no conclusions as to the necessity for storage at any particular time based merely upon the discharge at Teddington at that time are trustworthy.

The Engineers examine in detail the observations referred to—55 in number—made between May, 1892, and October, 1896, and say: It appears that out of the whole number of observations, only five represent water which would be avoided by the scheme. In these cases the water

contained on an average 32,077 microbes per cubic centimetre; while in another set of five the water would have passed to the filters direct, though it contained an average of 32,982 microbes per cubic centimetre. Under these circumstances we are of opinion that Dr. Frankland's independent observations justify the view at which we have arrived on hydraulic considerations, that the impurities in the raw river water are often as great when the discharge is below as when it is above 2300 millions a day; and they undoubtedly indicate that if, for example, the project as laid before the Royal Commission had been in operation during the last five years, foul river water would have been supplied to the filters direct in about the same number of cases in which equally foul river water would have been avoided.

It has been very generally supposed that by the report of the Royal Commission the project for the construction and working of storage reservoirs as laid down by the projectors, and which we have thus criticized, was found to be sufficient; but the Commissioners have carefully guarded themselves against the consequences of any such misconception. Paragraph 134 of their report is as follows: "These being the facts, we are of opinion that by the construction in the neighbourhood of Staines of reservoirs of adequate capacity into which water shall be pumped and stored in times of excess to be used in times of deficiency, at least 300 million gallons a day may be obtained for the supply of London. We believe this can be done without taking in the more turbid of the flood waters and without injuriously diminishing the volume of the river below the point of abstraction. To ensure the best results in both these respects, the taking of the water should be subject to strict regulations laid down by Parliament." With the conclusions thus expressed we agree, except as to the words "without injuriously diminishing the volume of the river below the point of abstraction;" but, as we have shown, a satisfactory condition of the water cannot be secured by the scheme as projected, if the water to be avoided is limited to the first 15 days of a flood exceeding 2300 million gallons a day. That regulations for the taking of water could be laid down by Parliament, which if strictly observed would secure the use of Thames water in its better conditions only, is quite true; but such regulations would involve the construction of much larger and more costly reservoirs than those we have referred to as necessary to fulfil the conditions laid down by the projectors of the scheme, but to which conditions the Royal Commissioners did not commit themselves.

(To be continued.)

#### ARBITRATION UNDER THE STAINES RESERVOIRS ACT.

(Before Sir G. B. BRUCE, M.Inst.C.E.)

At the Royal Courts of Justice last Wednesday, Sir G. B. BRUCE sat as Arbitrator in regard to a claim for compensation of an exceptional character under the Staines Reservoirs Joint Committee Act of 1896.

MR. CRIPPS, Q.C., M.P., and MR. HARPER appeared for the claimants and Sir EDWARD CLARKE, Q.C., M.P., for the Joint Committee.

MR. CRIPPS, in opening the case, said that the Ramie Syndicate was formed in 1895, for the purpose of carrying on a special textile manufacture; and they bought the Hythe End Mills and 12½ acres of ground, situate above Staines on the Colne Brook, and spent about £10,000 in machinery. In the same year, the Syndicate received notice of the application of the Joint Committee to go to Parliament for powers to abstract 100 million gallons a day from the Colne Brook. The Syndicate had a Hercules turbine of 50-horse power and a wheel of 10-horse power; and they had additional water power sufficient to work another turbine of from 30 to 40 horse power. A small portion of their property had been taken for laying down a conduit communication between the head-water of their mills and the new reservoir being constructed at Staines, which would take away the whole of their water power. The average flow of water was between 70 and 80 million gallons per day. The question was what was the value of this water power of which his clients had been deprived.

MR. Urban Smith, who was the first witness, said he had gauged the River Colne for seven months, from May to November, and the average flow was 72½ million gallons per day. If the water supply was taken away, they would have to substitute steam power equal to 82-horse power; and he estimated the total damage to the Syndicate at £26,282—that was to say, it would cost this amount to reproduce the power they could get from the Colne.

MR. E. K. Bursall estimated the compensation to place the Syndicate in the same position as they would have been with the use of the whole of the water of the Colne at £29,653.

MR. T. Fenwick put his valuation at £33,000, and added 10 per cent. for compulsorily taking away the water.

MR. CRIPPS observed that he did not claim this 10 per cent. in addition. Sir E. CLARKE: He is claiming compensation as though we were taking the whole 12½ acres, instead of a single pole as an easement.

MR. H. Roje's estimate of the damage was £29,238.

Sir E. CLARKE said that this was the most remarkable claim he had ever heard. The owners of the property bought 12½ acres of land for £4250 in 1895; and in a short time notice to treat was given. Then they made a claim for £25,000; and Mr. Fenwick had asked for no less than £36,000. They had bought the land partly for the area on which they could carry on their works, and partly because they had water power to help them; and now they asked £36,000 as compensation for the water power. He admitted that the water power might be taken away; but there was an ingenious attempt to get more than a trade claim under the guise of making no trade claim at all. If this were a trade claim, and a question of re-installment, no one would contend that £36,000 would be required to be spent to put the Syndicate into a position of as great advantage somewhere else. The whole case was a hypothetical one. To take away the water rights from this piece of land could not involve the payment of a sum nine times as great as the value of the whole land and water rights. The real question was: How much was this 12½ acres worth before the Joint Committee came, and how much less after they came? The market value in 1895 was £4250; and what the Committee would have to pay would be the difference between the market value with and without the water—or about £2000.

Sir J. Whittaker Ellis thought the mill was not fit for manufacturing



purposes; it had no water or railway carriage. Its present value was £4000. The gross rating was £186; and rating was generally a fair guide to value.

Mr. E. H. Bousfield said he considered the fair rental £200 a year, and the capital value £4000. The premises were practically for experimental purposes, and were wholly unsuitable for carrying on a business at a profit.

Mr. T. Horn corroborated the last witness.

Sir E. CLARKE and Mr. CRIPPS having spoken for their clients,

Sir G. B. BRUCE intimated that he would visit the locality before making his award.

### LIVERPOOL CORPORATION WATER SUPPLY.

#### The Rivington Reservoirs Threatened with Contamination.

The Manchester and Chorlton Joint Asylums Committee have applied to the Local Government Board for permission to purchase land and premises known as the Anderton Hall and Park Estate for the purpose of providing an asylum for imbeciles and epileptics; but the scheme is strongly opposed by the Liverpool Corporation, mainly on the ground that it would tend to contaminate the water in their Rivington reservoirs. On behalf of the Board, Major-General Crozier and Dr. Theodore Thompson sat last week at the Manchester Town Hall to hear the evidence of both parties. Mr. Cripps, Q.C., on behalf of the Liverpool Corporation, said they had spent about £1,250,000 on these reservoirs, and they supplied a population of from 900,000 to 1,000,000. Their water arrangements ought not, therefore, to be lightly interfered with, and, above all, one authority ought not to take over a property of this kind against the will of another. It was said that this was the only possible site for such an institution; but this, he thought, was not a good contention. It could not stand when it was placed side by side with the fact that the scheme would bring risk of contamination to about a million people. Resolutions from a number of Local Authorities who opposed the scheme having been put in, the Town Clerk of Liverpool (Mr. Harcourt E. Clare) and the Water Engineer (Mr. J. Parry) gave evidence; the latter saying it would be extremely difficult, under any circumstances, with very extensive and costly works, to intercept the whole of the sewage by means of a canal or sewer, or both. There were always risks of leakage in drainage and sewerage works; but there were peculiar difficulties with regard to this site, owing to the fissures that existed and the trouble attending the allocation of them. Sir H. Littlejohn, Medical Officer of Health for Edinburgh, and adviser to the Scottish Local Government Board, said he had frequently had to deal with water supplies, and he had never known an institution of the character of the one in question being placed by the side of a water supply for domestic purposes. He had inspected the site of the proposed asylum, and he held that to erect it there would be improper and dangerous. Dr. T. Stevenson and other medical witnesses expressed strong opinions against the site; while Mr. G. F. Deacon, formerly

Water Engineer to the Corporation, said the asylum could not be placed in a worse position, so far as the reservoirs were concerned. If it were erected, the water supply would have to be shut off at this particular point. He believed there was most serious risk in the scheme of the Joint Committee. Mr. Balfour Browne, Q.C., for the Committee, argued that the carrying out of the proposals of the Joint Committee would be a decided improvement upon present conditions. Complete precautions which did not at present exist would be taken to prevent contamination. He protested against the idea that the Corporation were to be set above the Local Government Board. The inquiry then closed.

**Reduction in Price at Slough.**—The Slough Gas Company have announced a reduction of 3d. per 1000 cubic feet—from 4s. 6d. to 4s. 3d.—in the price of gas.

**Appeals under the Workmen's Compensation Act.**—In the Court of Appeal last Thursday, Lord Justice A. L. Smith announced that, as no rules had been made applicable to the procedure on appeals from County Courts to the Court of Appeal under the above-named Act, the Court desired it to be known that, until further order, every appeal under the Workmen's Compensation Act, 1897, is to be by notice of motion, and must be entered at the Crown Office department of the central office by lodging a copy of the notice. The notice of motion is to state the grounds of the appeal, and be an eight-day notice. It is to be served on every party directly affected by the appeal entered.

**Sales of Stocks and Shares.**—At Durham, on Monday last week, Mr. W. T. Bowden sold some fully-paid £10 "B" shares in the West Hartlepool Gas and Water Company at £20 apiece; some fully-paid £5 "B" shares being purchased at prices ranging from £10 11s. to £10 15s. each. At Lewes, on Tuesday, Messrs. Herbert Morris and Sons submitted to public auction £1500 new ordinary stock in the Lewes Gas Company; being the second portion of capital authorized to be raised in pursuance of the powers conferred by the Company's Act of 1878. The stock was divided into thirty £50 lots; and these were briskly disposed of at prices varying from £71 to £74. On the same evening, a sale by auction was held at the Borough Mart, Chatham, by Mr. W. E. R. Randall, who put up 1000 ordinary shares of £5 each in the Brompton, &c., Water Company. They will bear a maximum dividend of 7 per cent. per annum, and form a portion of the capital authorized by the Company's Act of the present year. The whole of the shares were sold at prices ranging from £10 2s. to £10 12s. each. The bidding was brisk. Messrs. G. Nichols, Smith, and Alder offered for sale last Thursday, £20,000 worth of 5 per cent. stock and £5000 worth of new debenture stock, bearing interest at the rate of 4 per cent., in the Bristol Gas Company. The bidding began at 124, and increased by fractions to 125½, at which price the largest proportion was sold to the Chairman of the Company (Mr. J. W. S. Dix); five shares realized 125½; and about 20 went for 125. The total amount realized was £25,038, or an average of £125 8s. 9½d. per cent. The sale of a portion of the debenture stock at £131 per £100 of stock produced £3144; and the remainder was withdrawn.

### GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 267.

| Issue.    | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME.                       | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue.    | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME.                            | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|-----------|--------|-------------------|-------------------------------|-----------------------------|-----------------|---------------------|------------------------|-----------|--------|-------------------|-------------------------------|----------------------------------|-----------------|---------------------|------------------------|
| £         |        |                   | p. c.                         | GAS COMPANIES.              |                 |                     | £ s. d.                | £         |        |                   | p. c.                         | GAS COMPANIES.                   |                 |                     | £ s. d.                |
| 590,000   | 10     | Oct. 13           | 10½                           | Alliance & Dublin 10 p. c.  | 21½-22½         | ..                  | 4 13 4                 | 75,000    | 5      | June 29           | 6                             | Malta & Medn., Ltd.              | 4½-5½           | ..                  | 5 14 3                 |
| 100,000   | 10     | "                 | 7½                            | Do. 7 p. c.                 | 16-17           | ..                  | 4 8 8                  | 541,920   | 20     | June 10           | 5                             | Monte Video, Ltd.                | 13½-14½         | ..                  | 6 18 0                 |
| 800,000   | 100    | July 1            | 5                             | Australian 5 p. c. Db.      | 105-107         | ..                  | 4 13 6                 | 617,946   | Stk.   | Aug. 31           | 9½                            | Newcastle & Gateshead Con.       | 230-240         | ..                  | 4 1 3                  |
| 200,000   | 5      | May 26            | 6                             | Bombay, Ltd.                | 6½-7            | ..                  | 4 5 9                  | 252,355   | Stk.   | Jan. 8            | 8½                            | Do. 8 p. c. Db. Stk.             | 113-117         | ..                  | 2 19 10                |
| 40,000    | 5      | "                 | 6                             | Do. New, £4 paid.           | 4½-5            | ..                  | 4 16 0                 | 150,000   | 5      | May 26            | 8                             | Oriental, Ltd.                   | 7½-7½           | ..                  | 5 3 3                  |
| 380,000   | Stk.   | Aug. 12           | 12                            | Brentford Consolidated      | 275-280         | ..                  | 4 5 9                  | 135,000   | 5      | "                 | 8                             | Do. New, £410s. pd.              | 6½-7            | ..                  | 5 2 11                 |
| 240,000   | "      | "                 | 9                             | Do. New                     | 210-215         | ..                  | 4 3 9                  | 15,000    | 5      | "                 | 8                             | Do. do. 1879, £1 pd.             | 1½-1½           | ..                  | 4 11 5                 |
| 50,000    | "      | "                 | 5                             | Do. 5 p. c. Prf.            | 140-145         | ..                  | 3 9 0                  | 60,000    | 5      | Sept. 29          | 7                             | Ottoman, Ltd.                    | 6-6½            | ..                  | 6 6 2                  |
| 159,375   | "      | June 10           | 4                             | Do. 4 p. c. Db. Stk.        | 130-135         | ..                  | 2 19 3                 | 500,000   | 100    | June 1            | 6                             | People's Gas & 2nd M. of Chicago | 103-108         | ..                  | 5 11 1                 |
| 220,000   | Stk.   | Sept. 15          | 11½                           | Brighton & Hove, Orig.      | 263-268         | ..                  | 4 5 10                 | 848,070   | 10     | Oct. 13           | 6                             | River Plate Ord.                 | 9-9½            | ..                  | 6 6 4                  |
| 226,320   | "      | "                 | 8½                            | Do. A. Ord. Stk.            | 190-195         | ..                  | 4 7 2                  | 250,000   | Stk.   | June 29           | 4                             | Do. 4 p. c. Db. Stk.             | 99-101          | ..                  | 3 19 3                 |
| 933,500   | Stk.   | Aug. 31           | 5                             | Bristol 5 p. c. max.        | 125-130         | ..                  | 3 16 11                | 250,000   | 10     | Sept. 29          | 10                            | San Paulo, Ltd.                  | 14½-15½         | ..                  | 6 9 0                  |
| 420,000   | 20     | Sept. 29          | 10                            | British                     | 50-51           | ..                  | 3 18 5                 | 135,000   | Stk.   | Sept. 15          | 10                            | Sheffield A.                     | 242-245         | ..                  | 4 1 8                  |
| 50,000    | 10     | Aug. 12           | 11½                           | Bromley, Ord. 10 p. c.      | 25-27           | ..                  | 4 5 2                  | 209,053   | "      | "                 | 10                            | Do. B.                           | 242-245         | ..                  | 4 1 8                  |
| 75,000    | 10     | "                 | 8½                            | Do. 7 p. c.                 | 20-22           | ..                  | 3 17 3                 | 447,427   | "      | "                 | 10                            | Do. C.                           | 242-245         | ..                  | 4 1 8                  |
| 500,000   | 10     | Oct. 13           | 6                             | Buenos Ayres (New) Ltd      | 94-9½           | ..                  | 4 3 1                  | 5,600,000 | Stk.   | Aug. 12           | 5½                            | South Metrop., 4 p. c. Ord.      | 138-142         | ..                  | 3 15 1                 |
| 98,122    | Stk.   | June 29           | 4                             | Do. 4 p. c. Db. Stk.        | 98-100          | ..                  | 4 0 0                  | 1,460,000 | "      | July 14           | 3                             | Do. 3 p. c. Db. Stk.             | 102-105         | ..                  | 2 17 2                 |
| 150,000   | 20     | July 14           | 8½                            | Cagliari, Ltd.              | 29-30           | ..                  | 5 10 0                 | 60,000    | Stk.   | Aug. 31           | 12                            | Tottenham and A.                 | 280-290         | ..                  | 4 2 9                  |
| 100,000   | 10     | Sept. 29          | 7                             | Cape Town & Dis., Ltd.      | 14-15           | ..                  | 4 13 4                 | 60,000    | "      | June 10           | 7                             | Edmonton B.                      | 200-210         | ..                  | 4 5 9                  |
| 50,000    | 50     | May 3             | 6                             | Do. 6 p. c. 1st Mort.       | 58-60           | ..                  | 5 0 0                  | 182,380   | "      | July 1            | 5                             | Tuscan, Ltd.                     | 103-11½         | ..                  | 6 1 9                  |
| 550,000   | Stk.   | Oct. 13           | 13½                           | Commercial Old Stock.       | 310-320         | ..                  | 4 4 5                  | 149,900   | 10     | "                 | 5                             | Do. 5 p. c. Dbs. Red.            | 100-103         | ..                  | 4 17 1                 |
| 200,750   | "      | "                 | 10½                           | Do. New do.                 | 247-252         | ..                  | 4 3 4                  |           |        |                   |                               |                                  |                 |                     |                        |
| 200,750   | "      | June 10           | 4½                            | Do. 4½ p. c. Db. do.        | 148-153         | ..                  | 2 18 10                |           |        |                   |                               |                                  |                 |                     |                        |
| 800,000   | Stk.   | June 10           | 12                            | Continental Union, Ltd.     | 207-212         | ..                  | 5 13 2                 |           |        |                   |                               |                                  |                 |                     |                        |
| 200,000   | "      | "                 | 9                             | Do. 7 p. c. Prf.            | 193-198         | ..                  | 4 10 11                |           |        |                   |                               |                                  |                 |                     |                        |
| 51,600    | Stk.   | Aug. 31           | 14                            | Croydon A 10 p. c.          | 305-310         | ..                  | 4 10 4                 | 746,164   | Stk.   | June 29           | 10½                           | WATER COMPANIES.                 |                 |                     |                        |
| 168,400   | "      | "                 | 11                            | Do. B 7 p. c.               | 255-265         | ..                  | 4 3 0                  | 150,000   | "      | "                 | 5                             | Chelsea, Ord.                    | 313-318         | ..                  | 3 6 0                  |
| 555,000   | Stk.   | Aug. 12           | 5½                            | Crystal Palace Ord. 5 p. c. | 125-130         | ..                  | 4 0 9                  | 160,000   | "      | "                 | 4½                            | Do. 5 p. c. Prf.                 | 170-175         | ..                  | 2 17 2                 |
| 60,000    | "      | "                 | 5                             | Do. 5 p. c. Prf.            | 140-145         | ..                  | 3 9 0                  | 175,785   | "      | Sept. 29          | 4½                            | Do. 4½ p. c. Db. Stk., 1875      | 148-152         | ..                  | 2 19 3                 |
| 486,090   | 10     | July 28           | 11                            | European, Ltd.              | 23-24           | ..                  | 4 11 8                 | 1,720,560 | Stk.   | Oct. 13           | 7                             | Do. 4½ p. c. Db. Stk.            | 155-160         | ..                  | 2 16 3                 |
| 354,060   | 10     | "                 | 11                            | Do. £7 10s. paid.           | 17-18           | ..                  | 4 11 9                 | 654,740   | "      | June 29           | 4½                            | East London, Ord.                | 212-217         | ..                  | 3 4 6                  |
| 5,922,230 | Stk.   | Aug. 12           | 12½                           | Gaslight & Coke, A. Ord     | 288-293         | ..                  | 4 3 6                  | 390,000   | "      | "                 | 3                             | Do. 4½ p. c. Db. Stk.            | 157-160         | ..                  | 2 17 2                 |
| 100,000   | "      | "                 | 4                             | Do. B, 4 p. c. max.         | 120-125         | ..                  | 3 4 0                  | 700,000   | 50     | June 29           | 7½                            | G'd Junction, 10 p. c. max.      | 115-118         | ..                  | 3 3 7                  |
| 665,000   | "      | "                 | 10                            | Do. C, D, E, 10 p. c. Prf.  | 308-313         | ..                  | 3 8 11                 | 310,000   | Stk.   | Sept. 29          | 7½                            | Do. 4 p. c. Db. Stk.             | 140-145         | ..                  | 2 15 2                 |
| 30,000    | "      | "                 | 5                             | Do. F, 5 p. c. Prf.         | 152-157         | ..                  | 3 3 8                  | 708,000   | Stk.   | Aug. 12           | 14                            | Kent                             | 365-370         | ..                  | 3 15 8                 |
| 60,000    | "      | "                 | 7½                            | Do. G, 7½ p. c. do.         | 230-240         | ..                  | 3 2 6                  | 160,000   | "      | "                 | 7                             | Do. New, 7 p. c. max.            | 212-217         | ..                  | 3 4 6                  |
| 1,300,000 | "      | "                 | 7                             | Do. H, 7 p. c. max.         | 195-200         | ..                  | 3 10 0                 | 1,043,800 | 100    | June 29           | 10½                           | Lambeth, 10 p. c. max.           | 300-305         | ..                  | 3 8 10                 |
| 463,000   | "      | "                 | 10                            | Do. J, 10 p. c. Prf.        | 308-313         | ..                  | 3 8 11                 | 406,200   | 100    | "                 | 7½                            | Do. 7½ p. c. max.                | 228-233         | ..                  | 3 4 4                  |
| 476,000   | "      | "                 | 6                             | Do. K, 6 p. c. Prf.         | 185-190         | ..                  | 3 3 2                  | 350,000   | Stk.   | Sept. 29          | 4                             | Do. 4 p. c. Db. Stk.             | 140-145         | ..                  | 2 15 2                 |
| 1,061,150 | "      | June 10           | 4                             | Do. 4 p. c. Db. Stk.        | 131-133         | ..                  | 3 0 2                  | 500,000   | 100    | Aug. 12           | 13½                           | New River, New Shares            | 435-440         | ..                  | 3 0 2                  |
| 294,850   | "      | "                 | 4½                            | Do. 4½ p. c. do.            | 148-153         | ..                  | 2 18 10                | 1,000,000 | Stk.   | July 28           | 4                             | Do. 4 p. c. Db. Stk.             | 140-145         | ..                  | 2 15 2                 |
| 958,000   | "      | "                 | 6                             | Do. 6 p. c. do.             | 198-203         | ..                  | 2 19 1                 | 902,300   | Stk.   | June 29           | 6                             | Southwark & Vxhall, Ord.         | 166-171         | ..                  | 3 10 2                 |
| 70,000    | 10     | May 12            | 8                             | Hongkong & China, Ltd.      | 14-15           | ..                  | 5 6 8                  | 126,500   | 100    | "                 | 6                             | Do. do. 7½ p. c. max.            | 160-165         | ..                  | 3 12 9                 |
| 3,800,000 | Stk.   | "                 | 10                            | Imperial Continental        | 223-228         | ..                  | 4 7 9                  | 489,200   | Stk.   | "                 | 5                             | Do. do. 5 p. c. Prf.             | 170-173         | ..                  | 2 17 10                |
| 376,400   | 100    | Aug. 2            | 4                             | Do. 4 p. c. Dbs. Red.       | 98-101          | ..                  | 3 19 8                 | 1,019,585 | "      | Oct. 13           | 4                             | Do. 4 p. c. A Db. Stk.           | 139-142         | ..                  | 2 16 4                 |
| 473,600   | Stk.   | Aug. 12           | 3½                            | Do. 3½ p. c. Db. Stk.       | 101-104         | ..                  | 3 7 4                  | 1,155,066 | Stk.   | June 10           | 10                            | West Middlesex                   | 300-305         | ..                  | 3 5 7                  |
| 560,000   | 100    | Oct. 1            | 5                             | Met. of Mel. 15 p. c. Db.   | 110-112         | ..                  | 4 9 3                  | 200,000   | "      | "                 | 4½                            | Do. 4½ p. c. Db. Stk.            | 162-165         | ..                  | 2 14 7                 |
| 250,000   | 100    | "                 | 4½                            | bourne / 4½ p. c. Db.       | 105-107         | ..                  | 4 4 1                  | 200,000   | "      | Sept. 15          | 3                             | Do. 8 p. c. Db. Stk.             | 102-105         | ..                  | 2 17 2                 |

Next dividend will be at this rate.



## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Gas Committee of the Glasgow Corporation had before them on Tuesday the report by Mr. W. Foulis, upon the position of the gas supply, in view of the proposal to erect new works at Blochairn. In his report, Mr. Foulis pointed out that, whereas in 1874 the maximum consumption of gas in 24 hours was 9,162,000 cubic feet, in the present year it has risen to 31,354,000 cubic feet; and that it is imperative that new works for the manufacture of gas be provided in two years' time. A Sub-Committee had visited the ground, and recommended that the Blochairn site be agreed to, and that application should be made to Parliament for the necessary powers. The General Committee, at their meeting on Tuesday, were considerably divided over the matter; and their recommendation is that the site be approved of, subject to the inclusion in it of the estate of Blackhills, which already belongs to the Corporation. I suppose the desire to include Blackhills in the site is two-fold—the estate is a sort of "white elephant" in the hands of the Corporation; and it gives an opportunity for pushing the gas-works a little further away from the residential district of Dennistoun. The Blochairn ground extends to 98 acres, and Blackhills to 70 acres. The total expenditure upon the new site and works is estimated to approach a million sterling. The Gas Committee and the Parks Committee, who are interested in the matter in respect of the proximity of the Alexandra Park to the new works, held a conference on the subject on Thursday, as the outcome of which the Parks Committee, by a large majority, agreed not to offer any opposition to the proposals of the Gas Committee. The Corporation are to hold a special meeting on Monday to discuss the scheme.

At a meeting of the Sub-Committee on Finance of the Glasgow Gas Trust held last Wednesday, it was announced by the Treasurer (Mr. J. Fleming) that the revenue derived from the sale of residual products at all the works belonging to the Trust in the four months ending the 30th of September amounted to £33,763, as compared with £27,396 for the corresponding period of 1897. These figures give an increase for the present year amounting to £6367.

The Edinburgh and Leith Gas Commissioners held a meeting on Thursday for the transaction of ordinary business. The report of Mr. Herring, the Engineer, showed that since May 16 there had been an increase in the output of gas over the corresponding period of last year of more than 5 million cubic feet. The number of gas-cookers fixed since May 16 has been 381 in Edinburgh, 294 in Leith, and 56 in Portobello. Bailie Kinloch Anderson reported that the new incandescent gas lights were installed on one side of Melville Street, the old lights having been left on the opposite side to show the contrast. There were also installations in Meadow Walk and Drummond Street. He hoped the public would go and look at the lamps, and they would see the great improvement there was in the light. The Commissioners, agreeing to a recommendation of the Works Committee, let the contract for the construction of a gasholder tank upon the site of the new works at Granton, at the price of £17,804 12s., of which £2000 is for contingencies, to Mr. Colin Macandrew,

of Edinburgh, whose offer was the lowest. It was reported that Mr. Reginald Macleod, C.B., the Queen's Remembrancer, had agreed to remain tenant of Granton House, now belonging to the Commissioners, on the former conditions; also that Mr. Macdonald, the tenant of the lands at Granton, had agreed to remain in the occupation of such lands as the Commissioners did not require at Granton, and also to take a lease of the grass parks at Granton House. Mr. Herring stated that the reports of the deputations to England and the Continent were being prepared, and would be sent out to the Commissioners as soon as they were ready. The minutes of the Finance Committee showed that the Treasurer (Mr. John S. Gibb) this month redeemed £42 of the Edinburgh-Portobello gas annuities at £25; and also £28 of the Edinburgh and Leith gas annuities at £29½ each.

The tank which is about to be constructed at Granton will be the second from the east-end of a row of holders which it is proposed to erect upon the northern boundary of the new site. It will be of 252 ft. 6 in. diameter inside, and 37 feet deep, from the bottom to the coping. The wall will be of brick and puddle, with a stone coping. It is expected that abundance of stone excellently suited for the work will be found in the material to be excavated. It has been resolved not to sink the tank wholly into the ground, but to partially bank it up. The ground slopes slightly, and thus the tank will stand above the surface, at one side to the extent of 12½ feet, and on the other side of 4 feet. Specifications for the holder are being prepared.

It is advertised that the Stirling Gas Company have intimated to the Sheriff of the County their desire to have their works valued by the Assessor of canals and railways. This is a right which gas-works are favoured with; the reason being that their undertakings frequently extend into more than one jurisdiction. Of course, at Stirling there would be no difficulty in arriving at the true valuation of the undertaking of the Gas Company, if an earnest attempt to do so were made; but it is likely that the Company do not wish to remain at the mercy of a Corporation who have shown them so little good-will of late.

I am gratified to observe that, in Forfar, Mr. Craik, who was for years Convener of the Gas Committee, has put to the electors of the burgh the question whether it is fair to continue to pound away at the Gas Manager. He is sick and tired of it, and thinks that the Manager should have some peace. Bailie Pattullo, at the same meeting, remarked that the speeches of Mr. Christie at the Corporation were simply and purely attacks on the Manager. Treasurer Fenton said much ingenuity had been shown to put the Gas Manager in the wrong; but the report of the Auditors, which had been received, was a commendation of him. It is high time the Gas Corporation of Forfar were adopting saner methods of conducting their business. The Corporation have been too long swayed by personal feeling.

An explosion of gas occurred in Glasgow on Wednesday, which is worthy of note in respect that it was not caused, as is usually the case, by a light being employed to search for an escape. A vanman, who says there was no light near, opened the door of a store adjoining a stable behind the Sailors' Home; and at once he was hurled against his van and severely shaken. About 12 feet of the street paving was torn up;

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some of the stones being thrown a distance of 6 feet. It is this throwing up of the street which gives the matter an alarming appearance. A leak was found in the service-pipe supplying the Home, which accounts for the presence of the gas; but what fired it is a mystery.

Viewforth Free Church, in Edinburgh, was almost entirely destroyed by fire this morning. This place of worship was recently modernized, and fitted with electric light, and with an electric motor for driving the organ bellows. The fire broke out in the neighbourhood of the motor; and as it was being used last night, in the weekly practice of the choir, it is conjectured that something must have gone wrong with the electric current. This is highly probable; otherwise the suggestion would not have been made, because, as I have pointed out before, since the introduction of electricity, newspaper reports have become ominously silent as to the causes of the fires recorded. There can be no doubt that fires are occurring which have their origin in a derangement of the electric current; yet it seems beyond the power of the newspapers to get information to this effect.

**The Recent Visit of the Deputation of the Edinburgh and Leith Gas Commissioners to the Continent.**—At a meeting of the Edinburgh and Leith Gas Commissioners held on the 3rd ult., on the return of the deputation appointed to visit a number of gas-works abroad, Bailie Kinloch Anderson, the Convener, said his first word in regard to their visit to the Continent was that "he thought he had opened up or possibly might open up, a market for coke there, which would be of great benefit to them." The statement has evoked the following effusion from a well-known correspondent:—

Oh! Bailie K. A.,  
You've been far away,  
On a tour of inspection bent.  
You've looked well around,  
A coke market you've found  
To help your new works pay the rent.

Dear Bailie K. A.,  
Is this gratitude, pray,  
For the good time you spent on our shore?  
A time may soon come,  
When our coke will be run  
To Granton, and then we shall score!

Sweet Bailie K. A.,  
I should like much to say,  
Your morals I greatly deplore,  
To ruin our trade  
You've a little plan laid,  
Your name should be Mac Callum More!

Copenhagen, Oct. 27, 1898.

SKAAL.

**A Novel Stokers' Grievance.**—The stokers at the Driffield Gas-Works are reported to have a grievance of an unusual kind—viz., that a fellow-workman lags behind in his daily task. The Committee are giving the complaint their best consideration.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Oct. 29.

**Sulphate of Ammonia.**—During the early part of the week, the market was very quiet; but, within the past few days, there has been more activity—the demand being mainly for immediate delivery. The closing quotations are £9 11s. 3d. to £9 12s. 6d. per ton f.o.b. Hull and Leith; and £9 15s. per ton f.o.b. Liverpool. Consumers show more disposition to buy, and they have done a fair share of the purchasing; but their requirements not being urgent, they hesitate about paying an advance. In the forward position, there has also been more interest; but not much actual business has been done, owing to the firmness of makers.

**Nitrate of Soda** is firm at 7s. 7½d. per cwt. for good, up to 7s. 9d. for refined quality, on spot.

LONDON, Oct. 29.

**Tar Products.**—There is some improvement in the value of benzol, but whether of a permanent or temporary character it is difficult to say. Business, however, has been done at a considerable advance on the bottom price. Pitch and creosote are also firm, and in good request, with every appearance of better prices being touched. There is a strong inquiry for naphthalene in every form, but prices show no tendency to improve. Carbolic acid is very much inquired for, both for prompt and forward delivery, and may reasonably be expected to advance. There is nothing further to report as to the position of anthracene.

Prices are as follows: Tar, 14s. to 19s. Pitch, east coast, 25s. 6d.; west coast, 22s. 6d. Benzol, 90's, 9d.; 50's, 9½d. Toluol, 1s. 1½d. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 0½d. Crude, 30 per cent., naphtha, 3½d. Creosote, 2½d. Heavy oil, 40s. to 50s., according to gravity. Carbolic acid, 60's, 1s. 11d. Naphthalene, 50s.; salts, 32s. 6d. Anthracene, nominal, "A," 4d.; "B," 3d.

**Sulphate of Ammonia.**—The position of sulphate has somewhat improved during the past week; but only to the extent of one or two shillings a ton. The present price ranges from £9 8s. 9d. to £9 12s. 6d. per ton, less 3½ per cent.

## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—The continued exceptional mildness of the season still tends to check any development of activity in the coal trade of this district, so far as the better qualities, suitable for house-fire purposes, are concerned. Pits are mostly working full time; but with only a moderate demand coming forward, difficulty is experienced in moving away the output. Except, however, in a few isolated cases—chiefly with surplus coal from outside districts, offering for prompt clearance sale at something under full current rates—prices generally are well maintained; and the leading Lancashire collieries are all firm at the full list quotations. Best Wigan Arley can scarcely be quoted under 11s. to 11s. 6d. per ton at the pit; Pemberton four-feet and seconds Arley, 9s. 6d. to

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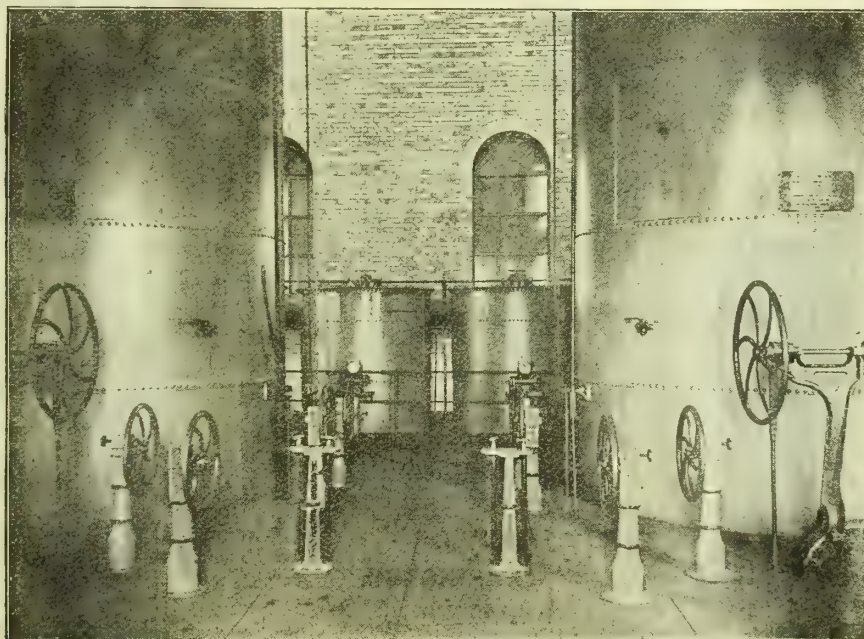
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The Maximum Daily Capacity of the Birmingham Corporation's Plant, which was erected by this Company, is 10 MILLION CUBIC FEET.



10s. 6l.; and common house coal, from 7s. 6d. to 8s. 6d. Other descriptions of round coal generally meet with a ready sale; from 7s. to 7s. 6d. per ton at the pit being obtained for good qualities of steam and forge coal. The position in the shipping trade is, however, at present anything but satisfactory. The demand has fallen off considerably of late; and not only is this the case, but collieries that have coal sold in some instances since September have been unable to secure vessels to execute their orders, while the increase in freights is also tending to further interfere with business. It is only for some of the special qualities of steam coal that more than 9s. to 9s. 3d. per ton is now being obtained for delivery at the ports on the Mersey. A decided briskening up in slack has been noticeable during the past week. Not only is there a good demand for engine requirements, but slack is going more largely into use for other manufacturing purposes where round coal has previously been employed; and with this increased consumption, and also large demands for coke making, practically withdrawing some descriptions of slack from the market, the position promises to be a very strong one, with possibly a scarcity of this class of fuel. Prices are exceedingly firm at the full rates which have been ruling recently—averaging 3s. 6d. to 3s. 9d. per ton at the pit for common; 4s. 3d. to 4s. 6d. for medium; and 4s. 9d. to 5s. 3d. for the best sorts. For forward contracts, representatives of collieries are for the most part quoting advances averaging about 6d. per ton over last year's rates, and 3d. per ton above general current quotations.

**Northern Coal Trade.**—There is a better demand for coal, and shipments have shown a considerable increase now that there is an abundant tonnage of steamers taking coal cargoes. Best Northumbrian steam coals are in fuller request, and the price is firmer at from 9s. 6d. to 9s. 9d. per ton f.o.b. Second-class steam coals average about 9s. per ton; and steam smalls are 5s. 9d. Gas coals are now being delivered in very large quantities on old contracts; and the prices for casual cargoes are steady at from 9s. 6d. to 11s. per ton f.o.b., according to quality. There are rumours of contracts being entered into for shipment next year, and the prices spoken of are from about 9s. 6d. per ton f.o.b.; but the exact rates are not yet obtainable. The price of gas coke is not generally altered this week.

**Scotch Coal Trade.**—The stormy weather has interfered with shipping so much that the market has shown a downward tendency, which, however, may soon pass away. Sales for forward delivery were expected to be strong, but as yet they do not seem to be plentiful. The prices quoted are: Main, 8s. per ton f.o.b. Glasgow; ell, 8s. 9d. to 9s.; and splint, 9s. to 9s. 3d. The shipments for the week amounted to 166,095 tons—a decrease upon the preceding week of 39,085 tons (nearly the whole of which was due to the disarrangement of shipping at the Forth and Fife ports), and of 16,637 tons upon the corresponding week of last year. For the year to date, the total shipments have been 8,019,278 tons—showing an increase upon the same period of last year of 1,447,138 tons.

**Fylde Water-Works Transfer.**—Last Thursday, the shareholders of the Fylde Water Company confirmed the agreement the Directors have entered into with the Joint Water Board for the sale of the undertaking. The terms were published in the "JOURNAL" for the 18th ult.

**The Proposed Purchase of the Godalming Water-Works by the Local Authorities.**—A statutory meeting of owners and ratepayers of Godalming was held last Thursday to consider the advisability of the promotion by the Town Council of a Bill to authorize them to purchase the Frith Hill, Godalming, and Farncombe Water Company's undertaking—a course recently sanctioned by the Council (see *ante*, p. 935). A formal resolution was put by the Mayor, who declared it lost. A poll was demanded.

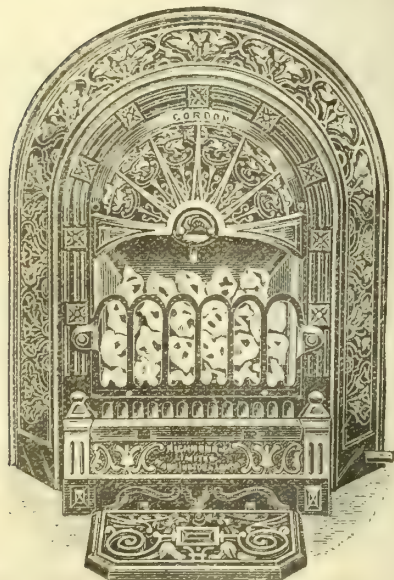
**Incandescent Gas Lighting at Lewes.**—In moving the confirmation of the proceedings of the Highways and Works Committee at the meeting of the Lewes Town Council last Wednesday, Mr. Barrett called attention to the improved lighting of the borough. He said that out of a total of 234 street-lamps, no fewer than 100 contained ordinary incandescent burners, and 28 patent ones; and they produced a most brilliant light. He thought the thanks of the Council were due to the Gas Company for the enterprise they had shown, and the public spirit they had manifested, in endeavouring to improve the lighting of the borough. The Company had spent from £150 to £200 on the incandescent burners; and they charged nothing extra for the improved illumination—in fact a three-fold light was supplied at a little under the usual cost. He did not think the public would like to go back to the old yellow light that was formerly seen in the streets.

**Austrian Incandescent Gas-Light Company, Limited.**—The Directors of the Welsbach Incandescent Gas-Light Company, Limited, in forwarding to the shareholders the report and accounts of the original Austrian Incandescent Gas-Light Company of Vienna for the year ended June 30 last, remind them that the Welsbach Incandescent Gas-Light Company absorbed the First and Second Austrian Share Companies, and by the shares thus acquired, together with subsequent purchases, the new Company have become holders of 95 per cent. of the total capital of the Vienna Company. The Welsbach Company was incorporated on Dec. 10, 1897, and is therefore entitled to the profits of the Vienna Company since that date; the proportion of profits from July 1 to Dec. 9, 1897, having been dealt with under the Scheme of Amalgamation. They think the fact that a dividend of 100 per cent. should have been declared by an undertaking so largely in their own hands cannot fail to be gratifying to the shareholders of the Welsbach Company. The business report of the Directors of the Oesterreichische Gasglühlicht Actiengesellschaft for the year ended June 30 states that the profit on trading account amounts to 1,979,674 fls. This shows, as compared with the trading profit of the previous year, amounting to 1,538,439 fls., an increase of 441,235 fls. This increase is a consequence of the larger sale of all the products of the factories, which has to a great extent been the result of the reduction in prices carried out by the Directors. The cash in hand and deposits at bank amounted at the close of the past financial year to 1,115,651 fls. The total profit for 1897-8, including the balance of profit—viz., 81,585 fls.—brought forward from the previous year, amounts to 1,528,842 fls.; and the Directors propose to pay the shareholders a dividend of 5 per cent. on the share capital, and divide the remaining sum as an extra dividend of 95 per cent.—carrying forward the balance of 28,842 fls.

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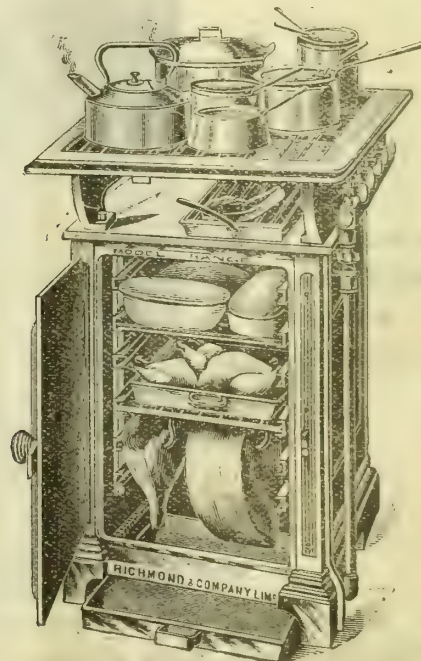
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## The Award in the Morley Arbitration—The Hard Case of Malvern.

As reported in last week's "JOURNAL," Mr. James Mansergh, the Umpire in the Morley arbitration, has awarded the Company the sum of £109,866 as the transfer value of their undertaking according to the terms of the Act. In commenting upon the proceedings before the Arbitrators, on the 4th ult., we recorded the data upon which they were asked to appraise the property. The Company made it out to be worth £133,688; while the case of the Corporation was that it was not worth more than £80,000. We remarked at the time that there ought not to be much difficulty in striking a fair balance between these claims, and have no hesitation in characterizing the award as satisfactory. The amount given is nearly 33 years' purchase of the last dividend; but, of course, this is only a rough-and-ready way of stating the result. Nobody knows what the Umpire took as the maintainable profit, nor the allowances for and against the undertaking which he felt to be necessary in the circumstances. If there were any "Golden Rule" discernible in such negotiations, arbitrations would no longer be necessary; and this would be a pity. It is one of the chief beauties of our arbitration arrangements that they always leave the main question open to be decided in the same way for every case as it comes along.

If the Morley arbitration and award are noteworthy as an example of a plain, straightforward instance of compulsory valuation of a gas undertaking for transfer to the Local Authority, and no nonsense about it on either side, so much cannot be said of the proceedings in the Malvern Link arbitration, reported in another part of the "JOURNAL" to-day. The arbitration took place last week, before Mr. Shiress Will, Q.C., as the Umpire, with Mr. Corbet Woodall as Arbitrator for the Company, and Mr. Charles Hunt for the Great Malvern District Council. It was perhaps a providential circumstance that the Umpire was a lawyer, inasmuch as the chief interest of the proceedings ultimately centred in a point of law of an unprecedented character. The facts of the case are somewhat complicated. Up to the present year, Great Malvern and Malvern Link have been adjoining, but distinct and independent, local government districts. Great Malvern had its own gas-works, under an Act of 1851, amended in 1858, whereby the gas limits were extended to include the parish of Leigh, in which the small township of Malvern Link is situated. These powers were never exercised, so far as to supply the Link; and in 1861 a Gas Company for this purpose was formed, and carried on business without statutory powers until 1896, when it was decided to apply for parliamentary sanction for the undertaking. Meanwhile, the Link had arrived at the dignity of having a District Council, and the Council desired to take over the gas supply. An agreement to this effect was arrived at between the parties; when Great Malvern suddenly awoke to the consciousness of its dormant statutory powers of supply over the Link region, and wanted to get effective control of the whole business. Both Councils went to Parliament, and there fought hardily for the body of the Link Gas Company; the Link Council proving victorious. All this is written in our parliamentary records. But having obtained their statutory powers, the Link Council hesitated about going forward to the next step, that of arbitration, for reasons with which the other party—the Gas Company—had nothing to do. Previously, the Link Council and their constituents had entertained a strong affection for their state of local autonomy, and wished for nothing less than fusion with their bigger neighbour. Influences arose in the course of the past year to modify this attitude; and accordingly one fine morning Malvern Link, as an independent local government area, ceased to exist by virtue of an order of the Worcestershire County Council, transferring the district to, and merging it with, the neighbouring district of Great Malvern. This amalgamation seems to have been carried through so quietly that the Gas Company were never disturbed in their placid attitude of waiting to be bought by the Local Authority.

When the business was once more gone into, however, it was the Great Malvern District Council, and not the Malvern Link District Council, who faced the poor little Malvern Link Gas Company, Limited, before the arbitration



tribunal; and the Great Malvern Council put forward their old statutory powers as constituting an element in the case! Mr. Newbigging, for the Company, asked for £25,457; basing the claim upon 26½ years' purchase of the maintainable profits. Mr. Newbigging's valuation was supported by Mr. H. E. Jones; and Mr. J. Gould, the Manager of the Company, testified to the good condition of the works and the prospects of the undertaking. Upon this case, Mr. Balfour Browne, Q.C., for Great Malvern, sprang the objection already mentioned, of the competing powers of the District Council which, legally speaking, knocked the maintainable profits down to zero. Counsel admitted that the multiplier might nevertheless be put at 22 years; and he seemed to allow that the valuation put upon the property by his own experts—Mr. W. A. Valon and Mr. Alfred Colson—amounting to £18,462 might stand. It is only fair to the professional gentlemen engaged, not the lawyers, to record that they did not say a word in support of the legal quibble. Mr. Valon's valuation was quite independent of this contention, upon which Mr. Fitzgerald poured the vials of his contempt and scorn. Mr. Balfour Browne, of course, acted upon his instructions in raising it; and being pressed by his learned friend on the other side, asked for a special case, in which application Mr. Fitzgerald concurred. It is an attorney's point, all over; but it is not for us to offer any opinion as to its legality whatever we may think of its morality.

#### The Affairs of the Imperial Continental Gas Association.

THE half-yearly general meeting of the Imperial Continental Gas Association was held on Tuesday, Mr. T. H. Goodwin Newton in the chair. The report of the Directors is completely satisfactory, and admirably calm in tone. Nobody reading it would receive an impression that the administration had passed through a period of exceptional trial—not to say "storm and stress." Yet the moment the Chairman began to speak, he could not help touching upon matters of the very gravest interest. The Association appear to be finding in Berlin some compensation for Amsterdam and Vienna. Not that the Association depends for its future upon any one city or commune, however large; it being a gratifying feature of the present situation that gas is going farther into the recesses of Hungary and Bohemia than would have been possible only a very few years ago. The Amsterdam undertaking passed out of the possession of the Association on the 10th of August last, when the Corporation took it over, paying the agreed net price of £1,330,000. It is instructive, in view of the practice of gas-works municipalization in this country, to take note of the conditions of the Amsterdam transfer. During the fifteen years of their Amsterdam contract, the Association expended upon the undertaking a capital sum of £1,280,000. This has been repaid by the Municipality, with £50,000 to the good; but in addition the Association have realized the amount of the depreciation fund formed during the existence of the concession, which is £340,000. Thus there was a capital profit of £390,000 upon the Amsterdam connection; and the Directors have decided to deal with the mobilized funds according to their usual wise business policy. It is only what was to have been expected of the Directors, but is nevertheless to be recorded in their honour, that in settling the Amsterdam affairs of the Association they remembered the officers and workmen who had served them so long and well. As to Vienna, Mr. Newton spoke very circumspectly. A settlement of the difficulty with the Municipality has been arrived at, thanks to the unwearied and skilful diplomacy of Mr. Lindon and Dr. Teltscher, supported (although the Chairman did not mention it) by the good faith of the Board. Before the meeting ended, steps were taken on behalf of the proprietors to mark their appreciation of the services rendered by the Directors to the Association during the last two troublous years.

#### Cases under the Workmen's Compensation Act—The "Prepositions."

TAKING up the story of the interpretation of the Workmen's Compensation Act from where we left off last week, it is to be noted that his Honour Judge Collier has decided in favour of the plaintiff the reserved case of the builders' carman killed by a fall from a timber cart standing in the street outside the defendant's premises. It was argued against the claim that an accident occurring in a public street cannot be said to arise upon the employer's premises. This question of location, or as one might say of the range of "factory" employment, is admittedly of the very utmost seriousness.

It is essential for the right interpretation of the Act that the closest study should be given to its wording. As we have already had occasion to remark, employees must be warned against the natural propensity to paraphrase the language of the Act. As regards this particular order of questions, the Act defines the employments to be those "on or in or about a railway, factory, mine, quarry, or engineering work;" and so forth. It is clear that these prepositions are susceptible of widely differing interpretations, according to the circumstances. It is not the way of English law to schedule applications, but only to lay down principles. If it is not presumptuous, we desire to remark that Judge Collier has decided this particular case in the sense we fully expected. Employers may as well make up their minds to accept the general rule that, when their establishments are included within the scope of the Act, it will be extremely difficult to cut any man upon the payroll out of the benefits conferred by it by construing the prepositions of section 7. Light upon the point is also thrown by the adverse decision of Judge Addison in the Southwark County Court, mentioned last week, upon the claim of an "overside" workman. The man claimed because he was working on the off-side of a vessel moored to a quay, which is a "factory" within the meaning of the 1878 to 1891 Acts. Unfortunately for him, none of these, nor the principal Act, mentions "ship" among the applications. The word "factory" does not include "ship;" but it does mean "dock, wharf, quay," among other things. Hence we get the apparent anomaly that a man who may be working on a wharf, and so discharging a coal cargo, comes under the protection of the Act; while another man discharging part of the same cargo into a lighter on the other side is not so protected. The anomaly, such as it is, is intentional. The line must be drawn somewhere. As the Chairman of the Liverpool Steam Shipowners' Association points out in a letter in "The Times," there is not a word in the Workmen's Compensation Act about ships or sailors. Quays—yes; but ships—no. Many a case will crop up to test the ingenuity of the Courts in drawing this and similar distinctions. Meanwhile, our readers may rest assured that where a gas-works is a factory, there is no saying off-hand where the factory boundary lies, so far as the Act is concerned. And it will perhaps be as well to repeat that the word "factory" here means "any premises wherein or within the close or curtilage of which steam, water, or other mechanical power is used." According to this definition the presence of a steam-boiler, although only used for blowing out pipes or utensils of manufacture, constitutes a gas-works a factory, and consequently brings it within the scope of the Act.

#### Mr. W. H. Preece on Street Lamp-Posts.

SOME of the amazing utterances of Mr. W. H. Preece, in his Presidential Address to the Civil Engineers, are dealt with in our "Electric Lighting Memoranda" this week. Among other ineptitudes, the speaker inquired what could be "more inartistic than a lamp-post"—as though these necessities of civilized towns were all of one pattern. It is not the object itself, whether it is a lamp-post or anything else, that is "artistic" or the opposite; the word employed by Mr. Preece being only an adjective. His language is very loose in this and other respects, which would spoil a Presidential Address otherwise instructive and interesting. After what has been advanced of late in the London newspapers with regard to the spoiling of Waterloo Bridge by the London County Council's lamp-posts, it is very disheartening to find so important a subject handled so poorly by the nominal head of English engineering science. Mr. Preece may be a good electrician, even though he does not know the difference between an adjective and a noun; but he is evidently not a man to speak after as regards the possibilities of street-lamps as aids to street embellishment. We have implored architects time and again to offer some guidance to the world in this matter; and perhaps the echoes of Mr. Preece's Philistinism may now rouse them to speak on the subject of street amenities in general and of lamp-posts in particular.

#### Depression of the Chimney Sweep's Trade.

THE statement which we reproduced last week, that the trade of the chimney sweep in London is suffering severe depression in consequence of the growing popularity of gas cooking-stoves, is exactly the kind of thing to excite the interest of the reporters for the cheaper newspapers. It



consequently was not surprising to find at least two of these journals published in London coming out with "interviews" with leading professionals in the chimney sweeping line, purporting to give the "inside" view of the alleged failure of the sweep's trade. This, we allow, is a most admirable proceeding; for to the wise observer of his times, the business interests of a sweep are quite as noteworthy as the ceaseless cackle about Art and artists which fills so many newspapers and even books of the day. Why should not one class of wielders of the brush enjoy as much free advertisement as another? True, a chimney sweep may not aspire to become a Royal Academician; but, on the other hand, many a painter not unknown to Burlington House would probably have done very much better with the brush which knows only one pigment—pure carbon. This, however, is a sadly impertinent digression. The point is that the chimney sweep nowadays hardly gets enough soot to keep him in his usual countenance. One reporter who undertook to investigate this matter seems to have fallen into poor hands. He looked up the Secretary of the Master Chimney Sweepers' Society, and inquired this gentleman's views of the situation, but found nothing better worth setting down than a tradesman's grumble against low prices and "underselling." Gas-stoves? Not much to complain of. A few years ago gas-stoves came in and threatened the sweeps with beggary; but the official opinion was that "30 per cent. of domestic gas-stoves have gone out of use." If this is the fond delusion of the London Master Chimney Sweepers' Society, the sooner the truth is realized the better. Outside practitioners whose experience is reported in the "Evening News," know what is the matter. The prepayment gas-stove, the oil-cooker, and the larger gas-kitchen combine to render summer chimney sweeping a scarce employment; but the winter still makes amends. We wonder, by the way, that our modern humanitarians, who are so fond of looking after cases of lead poisoning and "phossy jaw," and who would give worlds for a good reliable case of zymotic disease properly chargeable against one of the London Water Companies, do not investigate the phenomenon of the prevalence of cancer among the chimney sweeps. Chimney sweeping is in this respect a more dangerous trade than many occupations catalogued as such; but nobody seems to mind—there is no Trade Union sentiment or political interest in this connection. But it can scarcely be contended that chimney sweeping is one of those avocations the disappearance of which before the advance of modern material civilization, represented by the gas-stove, is greatly to be deplored.

#### Sir H. H. Fowler's Rules for Municipalization.

SIR H. H. FOWLER, M.P., has been speaking at Wolverhampton upon public affairs, and utilized the opportunity for saying a few wise words upon a subject which concerns Wolverhampton neither less nor more than other populous places—the question of the extension of municipal powers and responsibilities. A quarter of a century ago, as the speaker remarked, Municipalities in general did not trouble themselves about many of the things that are now supposed to belong to their province. The whole subject of the expediency of the municipalization of public services is not an easy one, as Sir Henry Fowler admitted; though many people are quite ready to dogmatize upon it in one way or another, as though it were perfectly simple. Certain departments of public work can undoubtedly be municipalized with advantage, and certain other necessary public services cannot satisfactorily be carried out except in the public interest and under public control. On the other hand, Sir H. Fowler asked his hearers not to forget "that in private enterprises controlled by experienced and competent administration, carried out under the supervision of those whose whole temporary interests are bound up in their success and development, there lies the basis of our commercial life and our commercial progress." The speaker would not attempt to draw the line between municipal and private enterprise. Nobody could do so with success. The fundamental question of "expediency" lies at the root of all such problems; and this is really a question that can only be answered in particular cases. Thus, for instance, Sir H. Fowler mentioned the lighting of a town as one of the services which the public authority can properly undertake; but nobody knows better than he that there is no general law under which such a service can be municipalized. Indeed, he laid very particular stress upon the

consideration that any case for municipalizing a public service must rest upon proof not only that municipal enterprise could "do the thing more efficiently, but they must be prepared to do it more cheaply." We thank thee, Sir Henry, for this particularly neat expression of the principle. Municipalities, he said, have "no right to any control, and Parliament has no right to grant any power, which would deprive the ordinary citizen of his undoubted right to buy in the cheapest market." This is the reason why some gas undertakings will never be municipalized. But this is by no means all. Sir H. Fowler went on to lay down the further rule that "municipal enterprise should be so assuredly reproductive that it could be carried on without entailing loss on the rates." This was Rule Two. Rule Three was what we have always contended for in these columns. The municipalized service must in equity be rendered at cost price. "If they charged higher for any article produced by public enterprise than the cost of producing that article, they were taxing the consumer; and if they charged lower than the cost, they were taxing the general community." The speaker specifically mentioned gas supply as furnishing an illustration of the bearing of this principle; but he shrank from driving home his own declaration of principle, as "two of the greatest cities in the North of England" had taken precisely different lines with reference to it. Here the politician overawed the economist.

#### WATER AND SANITARY AFFAIRS.

THE extraordinary drought of the past summer having prevented the East London Company from maintaining the constant supply in their district, the London County Council have resolved to go to Parliament for power to buy up the Companies and to introduce a fresh supply from Wales. In the Purchase Bill, there is to be a clause authorizing the Council to connect the mains throughout London, so that every district shall be able to draw upon the common supply. Of course, if the Purchase Bill fails to pass, the Council will not be in a position to connect the mains and secure one supply for all London. The East-end, therefore, is dependent on the passing of the Purchase Bill for the introduction of the remedy which the Council have devised for the prevention of any future deficiency in the supply. Thus the East-end trouble is made the foundation of a big scheme, involving the expenditure of millions, instead of a Bill to deal with the East London question by simply providing that if the Companies do not voluntarily connect their systems they shall be compelled to do so. As a matter of fact, the Companies do not require compulsion; but the Council take no note of this circumstance—preferring to raise a cry that the so-called water famines will never end unless all the undertakings are united under one authority. And it is further asserted that all London may perish for want of water unless a supply is brought from Wales. So the pyramid is made to stand upon its apex, and a local and temporary deficiency of supply, the repetition of which is now being effectually guarded against, is brought forward as an irrefragable argument for getting rid of the Water Companies, and laying an aqueduct from Wales to the Metropolis. The people of East London have little to thank the Council for; but the Council have reason to thank East London for furnishing a plausible pretext wherewith to precipitate what is called the settlement of the water question. The Royal Commission has been blamed for delay; but Lord Onslow states that Lord Llandaff promises there shall be a report from the Commission on the subject of linking the mains in time for legislation in the coming session. The sittings of the Royal Commission were resumed yesterday, when a fresh aspect was given to the case; Mr. Pope, Q.C., announcing that the Companies were themselves prepared to introduce a Bill (of which he gave the leading particulars) for connecting the different systems of water supply. Mr. Ernest Collins stated that the cost of carrying out the scheme would be about £307,000. Lord Llandaff observed that the President of the Local Government Board would certainly expect the Commission to lay before him some criticism on the proposals which the Companies set forth in their Bill, as specified by Mr. Pope. He also thought that the Board would be prepared to bring in a Bill of their own, or that possibly they would adopt the measure



proposed by the Companies. In any case, they considered immediate legislation necessary for connecting the different works.

The fact that certain Moderates have gone over to the Progressive side on the subject of the water supply, says nothing as to the real merits of the case. The heat of a debate and the clamours of the Press may be fatal to the exercise of a sound judgment. But the entire Press is not agreed to support the Council in proceeding on the extravagant career proposed by the Water Committee. Naturally, the Progressive organs are jubilant; and the vote of Tuesday last appears to them a token of speedy victory. "London" declares that "nothing can now" "upset or indefinitely postpone the policy of purchase, or" "the completion of the scheme by introducing a supplementary supply from Wales." The members of the Royal Commission are expected to be duly impressed; and it is thought that the Government will be glad to leave the water question in the hands of the Council. The vote of 101 to 15 really settles everything. This "phenomenal majority" excites the "Daily Chronicle" to ecstasy. If the Companies are able to offer effectual resistance in Parliament, then the Council are advised to drop their Purchase Bill, and throw their energies into a demand for a Welsh municipal supply. The word demand is used "advisedly." If Parliament obstructs the policy of the County Council, it will be possible, we are told, to raise such an agitation in London as no Government dare resist. But there are other voices to be heard than these. "The Times" gives warning against hasty and ill-advised legislation, and points out that the deficiency in the rainfall has been such that the amount of water withheld from the Thames basin by the drought is equal to a nine years' supply of London at 31 gallons per head. Mr. Dickinson's harangue in support of the recommendations of the Water Committee is described by "The Times" as a panic speech and by the "Pall Mall Gazette" as an admirable piece of special pleading. Mr. Dickinson went so far as to say that the resources of the Southwark and Vauxhall Water Company were rapidly coming to an end, and the West Middlesex Company were admitting that they required further powers in order to give an efficient supply. But the exhaustion of parliamentary powers is not equivalent to the drying up of the Thames. On this subject, a good deal of nonsense is being spoken and written, and predictions are freely uttered that the Thames is in danger of becoming a mere tidal ditch. Lord Farrer has written to "The Times" giving figures to show that the river is now undergoing a process of exhaustion. It is said that figures can be made to prove anything; and certainly there has been no other evidence during the past summer that the Thames was in a bad way, except sundry calculations resting on a doubtful basis.

The real bearings of the water question are largely obscured by an attempt to show that those who take a reasonable view of the subject are defending the Water Companies. This kind of charge is levelled against Mr. Chaplin and the Government, as well as against parties less eminent. But if defence is offered, it is because of an attack. Mr. Shaw Lefevre has written a long letter to "The Times," in which he virtually warns the Companies to agree with their adversary quickly, on pain of making a worse bargain at some future time. What kind of bargain Mr. Shaw Lefevre has in view, is shown by his notion of arbitration, which is to take into account the present and future obligations of the Water Companies, the actual condition of their works, and many other questions affecting them "peculiar to the case of London." If the present Government refuse to favour the Council in this matter, there is hope that a future Administration will be "more" "in sympathy with the Council, and less favourable to" "the Water Companies." With Mr. Shaw Lefevre again in authority, we know what may be expected, so far as his influence will extend. That the Companies will resist purchase to the death, is only true so far as relates to something which is called purchase, but which is in reality spoliation. To fair and reasonable terms, as Mr. Boulnois has intimated, the Companies will not object; and Sir Arthur Arnold has expressed his opinion that the opposition of the Companies to a fair system of purchase would be merely perfunctory, and would not be a "tooth- and-nail" opposition, as had been asserted. Then why this fiery antagonism to the Companies? Against what were the Progressives launching their thunder on Tuesday?

What was it that so roused the volcanic ire of Mr. Burns, some of whose remarks were scarcely within bounds? If the future is so dark for the Water Companies, it is curious that Mr. Shaw Lefevre's friends should be so anxious for early purchase. They must buy up the Companies; and it must be at once. They have raised an agitation, and must strike the iron while it is hot, or they fear it will get cool. Perhaps they have some dread of the coming report of the Royal Commission, which, after all, may arrive too soon to suit their purpose. Already they shrewdly suspect that the report will not altogether harmonize with their plans and purposes. However, as the case stands, there is to be a fight in Parliament next session. Having spent some £40,000 of the ratepayers' money in promoting or opposing Water Bills, the Council are now going to spend something more. If London wants to buy up the Water Companies, it can do so. But do the Council properly represent London? If the ratepayers looked more keenly after their municipal interests than they are in the habit of doing, London might have a different County Council.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1051.)

THE Stock Markets again last week, as in the week before, shaped their course very irregularly; and the evenness of their movement was broken by the close holiday on Tuesday, which is an annual fixture. Hopes and fears as to the upshot of the Fashoda incident alternately buoyed them and depressed them; and the fluctuation went on through the week until Saturday when Lord Salisbury's announcement at the Mansion House the previous evening effectually turned the scale. Prices consequently recovered what they had lost; and in most cases showed a balance to the good. Buyers, however, are not in a great hurry to invest—confidence being a plant of slow growth; and so business still remains rather quiet. The Money Market was firm and steady. There was less demand for short loans; but discount rates keep level. Business in Gas securities is still at a very reduced level, although transactions last week were not quite so limited as they were the week before. Changes in quotation were few, and all the leading issues are quite unaffected; but two or three of those of lesser importance had a small decline. In Gaslights, there was a fairly numerous list of transactions in the "A;" and prices ruled very steady and even all through the week—never going outside 289-91. The secured issues were not uniformly quite so strong; but the only actual retrograde movement was in the 6 per cent. debenture. South Metropolitan was firm and unchanged on quiet business. Commercial were quite inert again. The Directors have resolved to issue at Christmas the £75,000 further capital—half in new stock and half in debenture—which was authorized at the October meeting. There was hardly anything done in the Suburban and Provincial group; but Alliance and British were each a little weaker. The Continental Companies were again almost absolutely stagnant. Transactions were rare; and they gave no sign. Among the rest, the only feature was a further advance in Buenos Ayres. There was perhaps a shade more animation in the Water Companies; the tendency being towards reduced prices, especially for the debenture issues, most of which had a set-back. This may be sufficiently accounted for by the policy adopted last week by the London County Council.

The daily operations were: Business in Gas opened very quiet on Monday; but prices were steady, and Buenos Ayres rose  $\frac{1}{2}$ . Tuesday was a holiday. Wednesday was a little more brisk; but British dropped  $\frac{1}{2}$ . In Water, West Middlesex fell 5. Thursday produced some activity in Gaslight "A" at middle figures; but the 6 per cent. debenture stock receded 3. Business on Friday relapsed into extreme quietude. Alliance and Dublin old fell 1. In Water, the 4 per cent. debenture stocks of the Grand Junction, Lambeth, and New River Companies moved back 2; ditto of Southwark, 1; and Southwark ordinary, 1. Saturday was as active as any day of the week; but no further changes took place.

### ELECTRIC LIGHTING MEMORANDA.

Mr. W. H. Preece as President of the Institution of Civil Engineers—Misplaced Optimism—A Sorry Argument.

MR. W. H. PREECE is this year's President of the Institution of Civil Engineers; and in this capacity he delivered his Inaugural Address at last Tuesday's meeting. Mr. Preece is a specialist, and he very rightly put this fact in the forefront of his address, which was largely devoted to the praise of the electrical branch of engineering. Thus was heard—not for the first time—how in supplying light, without defiling the air we breathe in our dwellings with "noxious vapour," electricity has proved to be a true benefactor of the human race. Mr. Preece cannot find anything



good to say of the operation of the Companies Acts, which he accuses of retarding the development of electric lighting in this country; but, happily, "the success, the comfort, the intrinsic value, the economy, and the sanitary properties of electric light have commended it to our municipal magnates, and its introduction has become the fashion." The British joint-stock company system may be as black as Mr. Preece paints it; but it is a little difficult to reconcile his denunciation of the system with his declared admiration of the progress of the electrical industries in the United States. This he describes as "phenomenal," using the word in the usual but improper sense of "remarkable." He gives £48,207,527 as the capital of United States electric lighting companies; while the same kind of companies in the United Kingdom have only £3,258,343 of capital. What is the distinction between English and American companies, that we should admire the enterprise of the latter and throw stones at the former? Logic, however, was never Mr. Preece's strong point. He goes on to assure his hearers that, in spite of all drawbacks, English electrical engineering is doing pretty well. "Lamps are being improved and cheapened, wiring is being reduced in cost, and the economic distribution of energy is being furthered." Is all this being accomplished by English joint-stock companies, or in spite of them?

We are bidden by the same high authority to mark that "the most promising field for economy is the combination of all classes of electrical industry in one centre, especially that of light and tramway works, where fuel is cheap, water abundant for condensing, and nuisances of no account." But it was made to appear at the recent meeting of the Associated Municipalities that this was precisely the kind of electrical enterprise that these authorities could not countenance by any means. Mr. Preece endeavours to sit upon two stools. He remarks that the cost of the production of electrical energy depends chiefly upon the continuity of its output. "If it can be generated continuously during the 24 hours of the day, its cost is only a fraction of a penny per unit. If it is used solely for light, a unit may cost 3d. Hence local authorities who are undertakers of electric energy, neglect their duty to those who have elected them as the custodians of their interests if they fail to secure the tramways in their district, either as their own property or as customers for their current. For the tramways, by taking energy during the day, reduce the cost of working during the night by removing the incubus of running continuously imposed on undertakers by Act of Parliament." What in the world does this mean? The speaker is not merely illogical here, he is slipshod to the verge of stumbling over the plainest facts. This is not the style of diction, nor is it the quality of proof, that one looks for in a presidential address of the Institution of Civil Engineers. Mr. Preece went on to dilate upon the success of electric lighting for ships; but he did not mention the case of the "Mohegan."

It is perhaps only another example of Mr. Preece's careless use of words, when he declares that electric lighting on board ship has been an "unqualified success." Even he, however, shrinks from saying as much of electrical lighthouses. No new electric lighthouse has been fitted up on the English shore line since 1888, which is a very remarkable fact. There are only four such lighthouses upon the English coast; and they are all in the Channel, except the one at Soutar Point. There are electric lights at the Lizard, St. Catherine's, and the South Foreland; and Mr. Preece admits that sailors do not like them. The lights do not assist navigators in judging distances; they are too dazzling during fine weather; while in fogs they are no better than common oil-lamps. Wrecks have occurred in the immediate vicinity of all these lights. It is questionable whether any addition to the electric lights in this service would be of any benefit; while every establishment of the kind is notoriously costly to fit up and maintain. Says Mr. Preece, "Any change of our well-considered and deeply-important coast lighting system is not to be hastily effected. We are very proud of our well-guarded shores. Every headland and landfall, every isolated rock, all dangerous shoals and banks and narrow channels in lines of trade, are so illuminated that navigation by night is as safe and easy as by day." And the "Mohegan" yet lies in her grave on the Manacles.

Mr. Preece is hardly more convincing in his observations upon electric traction. He remarks that the relative merits of overhead and underground conductors, and the use of storage batteries, are "practically the only important engineering questions under discussion"—the coming of electric traction being certain. It is wonderful how so severe a critic of English joint-stock trading methods can shut his eyes to the flagrant methods by which the trolley wire was forced upon the people of the United States. Mr. Preece has nothing to say against the general introduction of the same system of tramway working into England. "Its erection does not interfere with the traffic of the streets. The principal objection to it is its anti-aesthetic (*sic*) appearance. But it is wonderful how ideas of utility and the influence of custom make us submit to disfigurement. What is more inartistic than a lamp-post, or more hideous than the barn-like appearance of many a railway terminus?" After this, it is almost waste of time for Mr. Preece to declare that, while the electrolytic and induction effects of the introduction of powerful currents into the earth are serious considerations, "fortunately the remedies are simple, easily attainable, and very effective." It is regret-

able; but Mr. Preece does not inspire confidence in the assertions he makes concerning the resources of electrical science. As to his implied suggestion that the British public should put up with the trolley wire because many railway stations are ugly and street lamp-posts not always "artistic," this is as strange a piece of Philistinism as ever resounded from the Great George Street Institution, which is a good deal to say. Engineers of sorts have doubtless committed many sins against the canons of good taste in buildings necessitated by the exigencies of the railway and other services of our towns; but it is not right to advance these errors as excusing the ruin of every historic and well-planned thoroughfare in the kingdom by the introduction of the trolley wire.

#### THE WATER ACTS OF 1898.

(Continued from p. 970.)

THE following Acts relating to water supply were obtained last session by Local Authorities.

The Northam Urban District Water Act authorizes the creation of an undertaking for the supply of water in a district of North Devon which is without any proper supply. The works are to include a storage reservoir, to be situated in the parish of Parkham, for impounding the waters of the stream rising on Melbury Moor known as the Melbury Stream. Compensation water is to be discharged at the rate of 67,500 gallons per day; the delivery to be "as nearly as possible continuous throughout each day." A road leading from Bideford to Bradworthy is to be diverted. The works are to be completed within seven years. The rate for domestic supplies is to be 10 per cent. on the rateable value. For the purpose of preventing and detecting waste, the District Council are empowered to place meters on mains and service-pipes, and to break up, and interfere temporarily with, public and private streets, and gas and water pipes. The price of water supplied by meter is not to exceed 2s. per 1000 gallons, with a minimum payment of 8s. per quarter. Premises left unoccupied for 48 hours may be entered for the purpose of cutting off the supply and removing the water-fittings. Public fountains may be set up; but not against private buildings without consent. The sum of £27,000 is to be borrowed for the purchase of lands and the construction of the authorized works, in addition to the cost of any land required to be bought for the protection of the sources of supply.

The Rochdale Corporation Water Act authorizes the acquisition by the Corporation of the undertaking of the Todmorden Water-Works Company, who were incorporated in 1882. The transfer is to be for a consideration set out in detail in the Act, which includes the payment of a sum of £1750 for compensating the officers of the Company and discharging the costs of winding up. The Company's Order of 1890 is repealed. The Corporation annuities issued to the shareholders are redeemable by agreement at the market price for the time being; and by the end of 1948, all outstanding annuities are to be redeemed for a cash payment of 35 years' purchase. In the event of the Todmorden Corporation procuring statutory water powers in the same session, the Corporation of Rochdale are to sell the Todmorden portion of the undertaking to them. New works are authorized, including a storage reservoir called the Ramsden reservoir, and another called the Hey Head reservoir. The water of numerous streams is to be taken, subject to detailed compensation arrangements. The works are to be completed within ten years. The provisions relating to the taking of lands, wholly or in part, are to be carried out under the direction of a tribunal. The sum of £235,000 is to be borrowed for carrying out the works extensions. Power is given for the issue of a new redeemable Corporation stock at a lower rate of interest than that sanctioned by the Act of 1884. The money required for buying out the Todmorden Company is repayable in fifty years; and the new reservoirs loan, in sixty years. Advantage may be taken of the Local Loans Act, 1875. The Corporation are not to create irredeemable stock, nor invest their sinking fund in their own securities. The Corporation may supply water in bulk to Local Authorities through whose districts the authorized works will pass. Wherever they want to go for this purpose, the Corporation are empowered to exercise the powers of the Water-Works Clauses Act, 1847, with respect to the breaking up of streets for main laying.

The Wath-upon-Dearne Urban District Council (Water) Act, provides for the sale and transfer of the whole undertaking of the West Melton Water-Works Company, Limited, to the District Council, in accordance with the terms of a scheduled agreement. The Company have an agreement with the Dearne Valley Water-Works Company for a supplemental supply in bulk, which is dealt with in a clause of the Act. The Council take over all the debts and liabilities due to or by the Company. The Dearne Valley Company are not to supply water within the district of the Council. Rates for domestic supplies are to range from 1s. 1½d. in the pound of rateable value. Water may be supplied by meter for other than domestic purposes at the price of 1s. 6d. per 1000 gallons. The right of entry is granted for the inspection of water-fittings. Outlying portions of the undertaking are to be sold to the Local Authorities on demand; and in ascertaining the value of such portions, any increased water-rates authorized by the Act, or prospective profits, are not to be considered.



The Bacup Corporation Water Act empowers the Corporation to acquire additional lands and wayleaves within five years, and construct within ten years two reservoirs for impounding the waters of the Cowpe Brook, at places situated within the boroughs of Bacup and Rawtenstall. Compensation water is to be provided under detailed conditions; and the water for the new reservoirs is only to be taken when the natural flow is above a stated minimum. Clauses are inserted for the protection of various interests. Water may be furnished by meter for all purposes. Rawtenstall residents who have been supplied with water by the Bury Corporation are not to be put to any expense when the service is taken over by the Bacup Corporation.

The Carlisle Corporation (Water) Act empowers the Corporation to obtain water from certain tributaries of the River Gelt, in Cumberland. For this purpose, works are authorized comprising intakes, weirs, and reservoirs. It will be necessary for the trunk main to cross the Settle and Carlisle section of the Midland Railway, for which purpose a cast-iron pipe, as approved by the Company's Engineer, is to be used, to be laid in and covered by cement concrete at a depth of not less than 4 feet below the rail level. The works are to be completed within ten years. The waters of the River Gelt are only to be taken when the overflow is more than  $1\frac{1}{2}$  million gallons per day. The Corporation are to supply the Brampton District Council with such daily quantities of filtered water as may be required, up to 220,000 gallons, free of charge. Clauses are inserted for the protection of the Naworth Castle and Croglin estates. Existing water-works may be discontinued, and the sites sold. A new loan of £150,000 is authorized. Surplus water profits are to be applied in reduction of the rates for domestic supplies.

The Carmarthen Improvement Act authorizes the extension of the borough; and provides for the enlargement and improvement of the water supply by the procuring of an additional supply from the Nant Cwm Tawel stream in the parish of Newchurch. The works are to be completed within seven years. The charge for domestic supplies is to be 10 per cent. on the rateable value. Supplies for all purposes may be by meter, at the maximum price of 2s. per 1000 gallons. The sum of £25,000 is to be borrowed for water purposes.

The East Ham Improvement Act extends to the district of the Council the provisions of the Metropolitan Water Acts of 1852 and 1871 relating to constant supply, so far as the East London Company's limits are concerned; the Council being substituted for the Metropolitan Authority mentioned in the Acts.

The Edinburgh and District Water-Works Act authorizes the construction by the Trustees of new and additional works, comprising the deepening of the Gladhouse reservoir, and the diversion of certain aqueducts already sanctioned. The whole surplus waters of the streams feeding this reservoir may be taken. Power is granted for the purchase of parts only of necessary property. The works are to be completed within seven years. The limits of compulsory supply are declared to be the city of Edinburgh and the town and port of Leith. The Trustees may enlarge or increase the number of their pipes; and also supply water in bulk in the parishes of Temple and Carrington, in Midlothian. The sum of £200,000 is to be borrowed for the purposes of the Act.

The Halifax Corporation Act contains a part relating to water supply. Three new reservoirs—called the Walshaw Dean Lower, Middle, and Upper reservoirs—are to be formed to impound the waters of a stream known as the Alcomden Water, or Walshaw Dean Water, with a supplementary intake from the Grey Fosse Clough. The works are to be completed within ten years. An agreement with the Todmorden Rural District Council is scheduled and confirmed. The Bradford Corporation are protected by clauses set out in detail; and there is a general protection afforded to the Keighley Corporation. The period for repayment of the existing corporation debt is equated, and one sinking fund is established. Water-works loans are repayable in sixty years.

The Hamilton Water Act sanctions the construction of an additional reservoir upon Kype Water, having a capacity of at least 142 million gallons, so that the Commissioners need not take for the purposes of the Act a greater quantity than  $1\frac{1}{2}$  million gallons of water per day. Clauses are inserted for the protection of the District Committee of the Middle Ward of the County of Lanark. A supply of water in bulk, not exceeding 100,000 gallons per day, may be demanded by the Committee. Detailed provisions are made with respect to the compensation water. If the Commissioners should find themselves unable to provide the covenanted amount of compensation water, they are to apply to Parliament for powers to construct an additional reservoir to be used for this purpose. The authorized works are to be completed within seven years. Houseowners are compellable to take a sufficient supply of water from the Commissioners. The sum of £45,000 is to be borrowed. The Corporation may contribute out of the burgh funds the sum of £10,000 to the water loan, at not exceeding 3 per cent. interest. Surplus water profits are to be applied to the enlargement and improvement of the works.

The Ilkeston Corporation Act contains a part relating to water supply, by which the Corporation are enabled to make a new well and pumping-station in the vicinity of their reservoir at Little Hallam, to be completed within five years. Supplies for all purposes may be measured. The sum of £30,000 is to be borrowed for water purposes.

The Keighley Corporation Act extends the period limited by the Act of 1891 for the completion of certain water-works to ten years from the passing of this Act. In lieu of a reservoir sanctioned by an Act of 1869, another similar work may be constructed in the parishes of Stanbury and Haworth, upon the Sladen Beck. New provisions are made for the supply of Oakworth, the population of which district are to have not exceeding 25 gallons per day, at the price of 6d. per 1000 gallons in bulk. The sum of £45,000 is to be borrowed for water-works purposes.

The St. Helens Corporation Act contains a part relating to water. It is enacted that a water reserve fund of £20,000 may be formed. Water-rates are recoverable as rates or as a civil debt, and are made parochial or local rates under section 1 of the Preferential Payments in Bankruptcy Act, 1888.

The Todmorden Corporation Water Act authorizes the acquisition within five years of lands and easements for water-works extensions. A reservoir, to be called the Gorpley reservoir, is to be formed by means of damming the stream known as Howroyd Clough or Gorpley Clough; and a similar reservoir, called the Howroyd reservoir, is to be made higher up on the same stream. Compensation water is to be provided. An arrangement is sanctioned for the temporary supply of the borough by the Rochdale Corporation, as from the transfer to them of the undertaking of the Todmorden Water Company (see *supra*). The Rochdale Canal Company are protected. The rates for domestic supplies range from  $7\frac{1}{2}$  to 6 per cent. Supplies may be by meter; and it is provided that where the Corporation refuse to supply any building used partly for trade purposes except by measure, they are to afford the occupier a sufficient supply for domestic purposes at not exceeding 1s. 6d. per 1000 gallons. But the Corporation are not compelled to afford to any premises a supply of water by measure for a less sum per quarter than the ordinary rate. The sum of £109,000 is to be borrowed for the purchase of lands and the construction of works, to be repaid in sixty years.

The Tynemouth Corporation (Water) Act enables the Corporation to acquire lands in the parish of Bedlington, within five years, without the owners' consent. An impounding reservoir is to be constructed upon the River Font, to be completed within ten years. A pipe-line across Morpeth Common is to be finished within six months. Sporting rights on the Font reservoir are reserved to the landowners, subject to the non-fouling of the water. During the construction of the new works, the Corporation are to be chargeable with the expenses of extraordinary traffic on the main roads. Dogs are not to be brought upon the works during construction. The waters of the River Font are only to be taken when the natural flow exceeds 167 cubic feet per minute, under a penalty of £50 per day. The water supply is to be efficiently treated for the prevention of plumbism. The right of storage of water in certain existing reservoirs is formally enacted, with reference to the provisions of an Act of 1786 obtained by the North Shields Water-Works Company. The sum of £430,000 is to be borrowed for water purposes, or the money may be raised by the issue of redeemable stock.

The Wigan Corporation Act is to enable the Corporation to construct settling-tanks in connection with their water-works, upon their own and certain adjacent lands to be compulsorily acquired for the purpose. The sum of £3000 is to be borrowed for the same purposes.

The Wishaw Water (Additional Supply) Act empowers the Commissioners to make a weir on the stream called the Potrenick Burn, in the parish of Crawford, Lanarkshire; another on the Potrail Water; and a third on the Peden Burn. Further parliamentary powers are to be obtained for the construction of a compensation water reservoir. The authorized works are to be completed within five years. The powers of water supply in a stated district of the Lanark County Council are abrogated, and the lump sum of £750 is payable in compensation therefor. Local authorities on the line of the works may be supplied by the Commissioners. Clauses are inserted for the protection of the Burgh of Lanark. The sum of £95,000 is required for water-works purposes. The manner of rating property for the purposes of the Commissioners is set out in detail.

The Yeovil Corporation Act authorizes the construction of additional collecting ponds, to be completed within eight years, subject to clauses protecting the owners of the Melbury Estate. The sum of £50,000 is to be borrowed for water purposes.

**A Possible Danger of Steam-Jets as Fire Extinguishers.**—The current number of "Cassier's Magazine" contains the following instance of the danger of using steam-jets for extinguishing fire: On a cargo steamer carrying several hundred tons of coal and as many more of miscellaneous chemicals and old rope, fire broke out in one of the holds, which were furnished with steam-jet fittings; and the jets were at once turned on. On the day following it was proposed to try a hose, in addition to the jets; and one of the upper deck hatches was taken off. The almost immediate result was a violent explosion, killing one of the officers and seriously injuring another. All the other hatches were blown off at the same time, and the ship began to leak, so that she soon had to be abandoned. One explanation advanced was that the steam from the jets, passing over the incandescent cargo, formed water gas, which, with a suitable admixture of air, became explosive, with the result noted.



## THE LATE MR. ROBERT HUNTER.

THE friends of the late Mr. Robert Hunter, of Chester, will learn with regret that Mrs. Hunter and her eight children (only one of whom is old enough to earn anything) are left with sadly insufficient resources to meet pressing needs. The Manchester District Institution of Gas Engineers are moving privately in this matter; and the Masonic brethren of the deceased are asked to reserve their votes for one of the orphans, a girl, who is to be nominated for election to the schools. Three of the children are too old, and four too young, for the next election. It has been suggested in several quarters that friends of Mr. Hunter, outside the Manchester Institution, would like to help his family in their necessity; and we, therefore, notify that donations to a fund for the purpose will gladly be received by Mr. Walter King, at the offices of the "JOURNAL," and duly acknowledged in our columns.

## OBITUARY.

The death occurred on Monday last week of Mr. LATIMER CLARK, the eminent civil and electrical engineer, in his seventy-seventh year. Deceased, in conjunction with Sir Charles Bright, proposed, in a paper read before the British Association, the names of ohm, farad, and volt for electrical units. Mr. Clark had taken out about 150 patents in different countries to secure the value of his various inventions, relating not only to electric telegraphy, but also to engineering work in general.

## PERSONAL.

Mr. G. F. DEACON has been appointed Engineer for the new water-works to be constructed at Gorphey for the Todmorden Corporation.

Mr. J. WOODHEAD, J.P., who has rendered eminent service to Huddersfield—having been twice Mayor, and filled the position of Chairman of the Gas and Finance Committees of the Corporation—has been presented with the honorary freedom of the borough.

On Saturday, the 29th ult., Mr. CLIFFORD G. HORTON, son of Mr. G. A. Horton, Engineer of the King's Cross station of The Gaslight and Coke Company, was presented by the employees with a handsome gold watch and chain on attaining his majority.

Mr. ALEXANDER ALLAN, who is at present filling the position of Superintendent of the Neepsend station of the Sheffield Gas Company, has been appointed Engineer to the Chester Gas Company, in succession to the late Mr. Robert Hunter. Mr. Allan has been ten years at Sheffield, during the first two of which he was Superintendent of the Company's Effingham Street station.

On Saturday, the 29th ult., the Queen Victoria Street and Stratford staffs of Messrs. Richmond and Co., Limited, met at the residence of Mr. and Mrs. E. W. T. Richmond, Summer-court, Romford, for a social evening. Opportunity was taken during the proceedings of presenting to Mr. H. MAKIN (Mr. Richmond's confidential clerk) a handsome case of cutlery, on the occasion of his recent marriage. The Warrington officials also presented a marble clock.

**Water-Meters as Waste Preventers.**—In a paper read before the Engineers' Club, Philadelphia, Mr. J. C. Trautwine advocated the general adoption of meters as the only means of preventing the excessive waste of water for which the population of that city have established an unenviable reputation. In two streets, having 539 inhabitants and 782 appliances, the daily supply was no less than 179 gallons per head, of which only 24 gallons were used—the remainder passing direct to the sewers.

**Utilization of Carbonic Acid Gas for Motive Power.**—Borings which have been made in several parts of Germany—notably in Gotha—have revealed the presence beneath the earth's surface of enormous quantities of carbonic acid gas, which is being utilized at Sondra and elsewhere for the production of motive power. At this particular boring, some 25,000 cubic metres, or close upon 1 million cubic feet, of gas are emitted daily; and it is conveyed away under its own pressure (17 to 20 atmospheres) through a 2-inch pipe to a manufactory nearly three miles distant. There half of it is reduced to a pressure of 10 atmospheres; and the energy thus liberated is used to work specially-designed engines by which the other half is further compressed till it assumes a liquid form at zero temperature. This requires a pressure of about 38 atmospheres. It is then stored in steel cylinders capable of resisting a pressure of 250 atmospheres; and in this shape it becomes an article of commerce. The price of the gas is about 6d. per litre (1·76 pints); and those who are interested in the industry contend that it has already entered into competition with the older mechanical agents, steam and coal gas.

## NOTES.

## Acetylene and Coal Gas Lighting.

Discussing the prospects of acetylene lighting, the "Iron-monger" takes a very sensible view of the situation. It is pertinently remarked that when anybody has a novelty of this sort to recommend as superior to an old and well-tried friend, it is the chief duty of the advocate to see that none of his assertions overstep the limits of bare truth. For if once an exaggeration or misrepresentation is detected, the whole case breaks down. So in the matter of acetylene lighting—which competes with coal gas if with anything—it is most important that nothing should be advanced in favour of the former which anyone with experience and knowledge of the latter knows to be false. Unfortunately, many statements about the advantages of acetylene lighting that have been put in circulation by interested parties cannot be substantiated. Our contemporary distinguishes several of these—as that acetylene made by A's apparatus is safer than B's gas of the same name; and that ceilings are not blackened by acetylene flames. It is remarked upon the latter head: "Surely everybody knows that the discoloration of the ceiling in an ordinary room is caused, not by free carbon derived from flame of candle, lamp, or gas-burner, but by the rapid current of hot air produced by these illuminants or any other hot body, which current, carrying with it in its upward path all the dust and dirt already in the atmosphere, deposits them on the cold and rough surface of the ceiling." As for the comparative cost of acetylene and coal gas lighting, it is conceded that the former is out of the running, in this regard. Yet the true field for acetylene is granted to be a wide one; and there is plenty of room in it for all deserving forms of apparatus.

## Chemists on the Rare Earths.

Chemists are still diffident of expressing themselves in definite terms with respect to the nature of the strange minerals generically called the "rare earths," which have of late years sprung into commercial prominence in connection with incandescent gas lighting. It is becoming understood that, though the epithet "rare" may be disestablished as regards these substances, in the sense of "scarce," by the discovery of unsuspected and inexhaustible deposits of the minerals, it must remain apposite as regards the extraordinary physical qualities of some of the metals and their salts. An enormous amount of labour is actually being spent upon the chemistry of the rare earths; and though the actual results attained do not appear to justify so much attention being paid to an obscure corner of chemical science, it must be remembered that it is precisely such work that goes to the heart of chemistry. Nobody can foresee the industrial applications of the future. Professor Tilden inclines to the view that as regards the origin of these strange elements, the choice lies between the notion that they represent the ruins of a former state of things upon the earth, or they might stand for those "old worn particles" referred to by Descartes. On the other hand, the idea is suggested that they are the results of the condensation of the original "protyle," though in some way the process differed from that which gave rise to the rest of the elements. All this is mere speculation, of course; but the character of the earths is such as to excite the chemical imagination to the highest degree, when, of course, it suggests many things not deducible from ordinary observation. Such remarks as those of Professor Tilden upon the rare earths go to show that there is even in the domain of chemistry—one of the most exact of the physical sciences—a borderland between the known and the unknown where the fancy can run riot and find "fairy tales" the nearest approximation to verifiable facts.

## Mr. Blashill and Coke Breeze Concrete.

Mr. Thos. Blashill, lately retired from the position of Architect to the London County Council, will be memorable as the first official of the kind to largely use and encourage the employment in town buildings of coke-breeze concrete, as a fire-proof building material. During his tenure of office, Mr. Blashill frequently expressed himself very strongly respecting the fire risk of ordinary building construction; and at the Manchester meeting of the Surveyors' Institution he questioned "whether danger from fire is not increasing in spite of Building Acts." The fact is that town buildings are getting more lofty, more closely packed together, and more thickly inhabited. In commercial buildings the rooms are larger and more encumbered with goods, among and over which manufacturing processes are being carried on. There is more machinery actuated by heat. The timber used is more easily combustible, fittings are lighter, and everything is kept warmer and drier. "All our arrangements for obtaining light, from the lucifer match to gas and mineral oil and electricity, are novel and productive of new dangers." In the last Cripplegate fire, the progress was as rapid as, and the destruction over its limited area no less complete than, in the Great Fire of 1666; the only difference was in the appliances and arrangements for fire extinction. Speaking of fire-resisting construction, Mr. Blashill stated that in the great rehousing schemes of the London County Council he has made every floor comparatively safe by the use of steel joists wide-spaced, and filled in solid with coke-breeze concrete, upon which the floor-boards are nailed; the plastered ceiling being done under



the concrete direct. The cost is no more than a good wooden floor, while the thickness is only 7 inches, which saves 2 inches or 3 inches in the height of each storey. If noise were complained of, a cork covering to the boards under the carpet would be a sufficient remedy. If wooden joists must be used, they can be double the usual thickness, 2 feet apart, and the space between "pugged" flush with coke concrete, 4 to 1, which stands fire and water better than anything else. Roofs should be of concrete. As for partitions, Mr. Blashill commonly used coke breeze concrete about 2 inches thick. Where old lath and plaster partitions exist, they can be improved by removing the plaster from one side only and fitting in with coke-breeze concrete. Mr. Blashill's chief idea was to get rid of all hollow spaces which can harbour fire. The work of the carpenter is to be excluded as far as possible.

**Professor Lewes on Acetylene.**—The first course of Cantor lectures at the Society of Arts in the coming session will be by Professor Vivian B. Lewes, F.I.C., F.C.S. They will commence on Monday, the 21st inst. In the opening lecture, Professor Lewes will sketch the history of acetylene, and deal with the various methods of forming it, its chemistry, and the part it plays in luminous flames. The second and third lectures will be devoted to the commercial production and generation of acetylene, and its purification for domestic consumption. In the final lecture, the combustion of acetylene, acetylene burners, the smoking and carbonizing of burners, the use of acetylene for heating and motive power, and its application in a diluted form, will be considered. The lectures will commence each evening at eight.

**Photometrical Tables.**—Our readers are aware that, according to the revised Notification of the Metropolitan Gas Referees issued last May, the correction of the illuminating value of the gas, to compensate for abnormal conditions of temperature and barometric pressure, might be made either by multiplying by the aerothermometer reading, or by dividing by the tabular number, the value found by the formula. With the view of saving the observer the labour of making the calculations, Mr. A. Vernon Harcourt has prepared a series of tables, with explanations as to their use, in the hope that they may promote the adoption of the system of photometry now prescribed for the Metropolis. The tables are not officially issued by the Referees, but they are to be had of Mr. W. J. A. Butterfield, No. 66, Victoria Street, S.W.

**The Kinetic Theory of Gases.**—In the current number of the "Contemporary Review," Professor Ramsay deals with the above subject in connection with recent discoveries of gaseous constituents of the atmosphere. He summarizes the facts as follows: "The discovery by Lord Rayleigh of a discrepancy in the density of atmospheric nitrogen has resulted in the discovery of a new consistent of air, argon; and its discovery has led to that of a constituent of the solar atmosphere, helium. Speculations on the ultimate nature and motion of the particles of which it is believed that gases consist has provoked the consideration of the conditions necessary in order that planets and satellites may retain an atmosphere, and of the nature of that atmosphere. The necessary existence of an undiscovered element was foreseen, owing to the usual regularity in the distribution of the atomic weights of elements not being attained in the case of helium and argon; and the source of neon was therefore indicated. This source—atmospheric air—was investigated, and the missing element was discovered." This is a highly interesting summary.

**The Nitrogen Question.**—In a paper by Messrs. W. Carrick Anderson and J. Roberts, on "Some Chemical Properties of Scottish Coal," which came before the Scottish Section of the Society of Chemical Industry last Tuesday, reference was made to the Inaugural Address of Sir W. Crookes at the recent meeting of the British Association, in which he advocated the use of nitrogenous manures to increase the fertility of the soil in order to stave off a possible failure of the wheat supply in the future. The authors thought that, in arriving at the conclusion that the imminent danger to which he pointed was only to be averted by the wholesale fixation within the next generation of atmospheric nitrogen to the equivalent of 13 million tons of nitrate of soda per annum, Sir William ignored the possibility of a more scientific utilization of the world's vast supplies of mineral fuel placed at the disposal of the farmer, and the much larger proportion of the enormous stores of combined nitrogen existing therein in every one of the continents. The annual output of 200 million tons of coal contained, it was stated, on an average 1 per cent. of nitrogen, representing 2 million tons of combined nitrogen, equivalent to nearly 9½ million tons of sulphate of ammonia from the United Kingdom alone, if it were possible to recover it completely in this form. But even the present imperfect methods of recovery would be capable of producing 1½ million tons annually in this country, if the whole of the output were carbonized, and the ammonia recovered, as was done in gas-works and blast-furnaces at the present moment. The production of Continental Europe would probably be as much; while America, India, China, and many other countries, would furnish, for a much longer period than thirty years, contributions of no inconsiderable amount.

## COMMUNICATED ARTICLE.

### THE PURCHASE OF GAS UNDERTAKINGS.

By FRANK BALFOUR BROWNE,  
Of the Middle Temple, Barrister-at-Law.

There seems to be a growing tendency to municipalize various public undertakings. Indeed, it seems to be the ordinary history of such undertakings that they are taken up at first by private enterprise, that they are pushed to success by private enterprise, and that they then excite the cupidity of corporations, and are, either by agreement or by compulsion, passed over into municipal hands. Anyone who is familiar with the Private Bill Legislation of the last half century will admit that, for many years, communities had to depend for their water supplies on the enterprise of companies, and now there are few great towns, excepting London, Newcastle, Bristol, and Portsmouth, where the water undertaking is not in the hands of the corporation. The same thing is to a large extent true with regard to means of illumination. Here, again, companies stepped in where corporations had not the courage to risk public money in the supply of gas or electricity. When, however, the pioneer companies had shown the way and had made large profits, the corporations of most of our large towns desired to have the gas-works in their own hands, and to apply gas profits in relief of rates; and to-day most of our large towns are supplied with gas by corporations as the successors of companies. A like tendency is seen in relation to tramways. These were exploited by private capital; and at one time the Legislature, having set its face against municipal trading, prevented corporations working their own tramways if they could succeed in leasing them to a company. But the Standing Order which made this law has gone; and now most of our large towns are either conveying tramway passengers or are preparing to do so when the concessions to the existing tramway companies come to an end. It would be easy to trace this tendency in other directions; but sufficient has been said for the present purpose.

It has been noted, then, that there is a tendency to pass gas undertakings over into the hands of municipal bodies. This has taken place under the powers of Compulsory Purchase Bills in a considerable number of instances. The earliest case on record, so far as we know, is the Bill for the compulsory purchase of the Rotherham Gas Company, which was promoted in 1874. There seems to have been serious default upon the part of the Company; and this probably justified the action of Parliament in compelling them to sell their works. Some more recent cases are, however, more to the point. The Ilkley Local Board promoted a Bill for the purchase of the gas undertaking. There, the Counsel for the Local Authority accused the Company of "juggling with the accounts." The quality of the gas supplied was complained of; but the Bill passed one House, and the Company came to an agreement to sell while the matter was before a Committee of the second House. But a case where the question of compulsion was fought out to the bitter end came before Parliament only three years ago. The enterprising Local Authority of Matlock Bath and Scarthin Nick promoted a Bill for the purchase of the gas undertaking; and though the Company opposed in both Houses of Parliament, the Bill passed, and the works were shortly afterwards transferred—the value having been ascertained by Sir William Coddington.

These instances would be sufficient to indicate the tendency; but I will mention one more, and that is the Bill promoted in the last session of Parliament for the purchase of the Morley Gas Company by the Morley Corporation. This Bill came before a Committee of the House of Lords and passed; and the Company wisely refrained from carrying their opposition further. Clauses were settled, and the Bill passed through the Commons as an unopposed measure. Quite recently the question of the value of the undertaking, and the price that the Corporation of Morley were to pay, came before an exceedingly skilled tribunal consisting of Mr. James Mansergh, Umpire, Mr. Corbet Woodall, Arbitrator for the Corporation, and Mr. Thomas Newbigging, Arbitrator for the Company; and the proceedings on this arbitration have suggested that the principles of valuation of such undertakings are worth considering. This, like a case recently arbitrated upon by Mr. Shiress Will, Q.C. (the Cowes, Isle of Wight, Urban District Council and the Cowes Gas Company), may be taken as a leading case on the subject of the purchase of gas companies' undertakings.

One thing seems certain—that a going concern must be purchased for a sum not fixed by the amount of capital that has been expended, but by the income that is being earned. When an Act of Parliament contained a clause that a local authority might, upon notice, purchase from another "the mains, pipes, fittings, and apparatus in its district," and that after the purchase the rights of the latter to supply water in the district of the purchasing authority should cease, it was held by the Courts that the proper basis of valuation was, not the income earned, but the mains, pipes, &c., *in situ* capable of conveying and supplying water.\* But in an ordinary case—such as that

\* *Kirkleatham Local Board v. Stockton and Middlesbrough Water Board* [1893], 1 Q.B., 375.



of the Morley Gas Company—the clause is worded differently, and what has to be purchased is not merely “mains,” and the like, but “the undertaking,” which includes goodwill; and in all such instances the purchase price is founded upon the “main-tainable income” derived from the undertaking in question.

It would seem easy at first sight to arrive at the income of a company, and also far from difficult to ascertain whether the income which has been earned in the past can be maintained in the future. But this is just one of the questions which occupies the attention of arbitration tribunals for a considerable time. The fact that the Company has earned (say)  $x$  pounds in 1897, is not conclusive proof of the fact that this amount was their fair income. For instance, the company may have obtained this income by charging a higher price for gas than they could continue to charge without diminishing the consumption. Or, again, they may have fairly earned a certain gross income, but the net income may have been made to appear too large by reason of the fact that the company had not spent the average annual amount on working expenses. One of the most fruitful sources of discussion in these cases arises in this connection. The accountants, we will suppose, have agreed upon the gross income earned. Then come the engineers, who say the net income is too large, because in the particular year chosen the company spent far too little on the repair and maintenance of the works or mains, or both.

In the Morley case, it seemed to be admitted by both sides that this was the position; but as to what was the proper amount to be spent in “maintaining the hereditament in a condition to command the rent,” there was a considerable diversity of opinion. And such diversity must always exist. The question there was whether it should be 4d. or 5d. per 1000 cubic feet of gas sold; and a good deal of cross-examination was directed to show that this engineer had said that 6d. was the right amount in the Chesterfield case, or that that engineer had expressed a different opinion in the Stourbridge case, or that a third had said something quite incompatible with his present evidence in the Ashford, the Bakewell, or the Matlock Bath case. The fact is that, within certain limits, every case must, in this regard, be tried on its own merits. It can be quite well understood that in a small gas undertaking, and under exceptional circumstances such as those that may exist in a mining district, 7d. per 1000 cubic feet for repairs and maintenance might not be an extravagant sum to charge per annum for working expenses, and that in other instances the charge might even fall below 5d. per 1000 cubic feet.

But suppose all proper adjustments have been made in the working expenses, and that these have been deducted from the gross receipts, we have then arrived at the net receipts. Now comes the question in all these cases: How is the net income to be capitalized? On the one hand, you may find the company saying, as they did in the Morley case, 30·77 years' purchase is the proper multiplier, and the Corporation contending, again as in the Morley case, that the Company would receive the full value of their undertaking if the net income were multiplied by 25 years' purchase. Here also there was ample cross-examination by the method of reminiscence: “Is it a fact that in Ystrad you claimed to have allowed 28·57 years' purchase?” “Did you not in the Ashford case agree to 24 years' purchase of a non-statutory Company's undertaking?” and so on. This cross-examination is always effective in showing the tight places in which expert witnesses are placed. But here again it is well to avoid instances which may or may not bear upon the matter of inquiry, and to ascertain principles which are sure to have some bearing. What, then, are the considerations which determine the multiplier for the purpose of capitalization? The underlying principle seems to be that when the net income has once been ascertained, you must proceed to see how the income is secured. If it were as well secured as the interest on Consols, then it might have to be put in the 2½ per cent. table. If, however, it is not so well secured, it must be put in another table, and therefore will have, as a multiplier, a smaller number of years' purchase.

The security for the income of any gas undertaking must depend upon a variety of local circumstances. In the Morley case, it was asserted that the town depended for its prosperity upon the trade in cloth, in coal, and in stone. As to the cloth trade, it was said that several mills had been closed, and that the trade, owing to the M'Kinley tariff, was far from prosperous. It was asserted, too, that the mills of the district had to an extent given up the use of gas as an illuminant, and installed electricity. As to the coal trade, it was stated that the mines had been to a large extent exhausted, and that such collieries as were still open were only being worked certain days in the week, and fewer hands were being employed. Again, it was said that there had been railway works going on in the borough which had employed some 200 men, and that these works were completed; also that the Corporation themselves had been constructing a reservoir, and that the men who had been working on it would cease to be employed. There was one other argument used to show that the Company's income was not well secured, and that was that the Corporation had recently (in March last) begun to supply electricity from their own works, and that a number of shops and public institutions had already taken or applied for a supply from the Corporation. All these considerations, no doubt, bore on the question, How is the income which we have arrived at secured? And the consequent question,

Must it be multiplied by 25 years' purchase, as the witnesses for the Corporation said, or by 30·77 years' purchase, as the witnesses for the Company, with at any rate equal confidence, asserted?

I have mentioned these contentions as showing the scope of the inquiry which must be embarked upon in these cases. If the income is  $£x$  to-day, but would be reduced to (say)  $£\frac{x}{2}$

to-morrow, how is the  $£x$  secured? Of course, the answer is that only half of it is secured. In every different case the circumstances which give security for the continuance of income must vary; and it is because of this fact that it is necessary in most cases to have recourse to an arbitration tribunal in order to determine the nice questions which are involved in such an arbitration.

While, however, on the question of the security for the income, we must not overlook an argument that is very often put forward upon such occasions, and that is that the Company has surplus plant, and that this of itself is a security. It is very frequently urged on the other side that the existing plant is in a defective condition, and that to enable it certainly and securely to earn the dividend a considerable sum must be spent upon purifiers, exhausters, gasholders, or distributing apparatus. Now this question can only be determined in each instance by evidence applicable to the particular case. If the plant is excessive and the consumption is increasing, then no doubt the extra plant is a good security for the present income. If, on the other hand, as was said in the Morley case, several of the appliances are defective, then, from the capital sum arrived at by the multiplication of the net income by a certain number of years' purchase, a capital sum to put the works in good order must be deducted. This, of course, is a question of fact which can be proved in each case, and which an expert tribunal such as sat in the Morley arbitration is eminently fitted to determine.

In the case which I have made the text for these remarks, there was another question raised, and that was the important one as to the allowance for compulsory sale. The arbitration was by the Act to be under the Lands Clauses Acts; but the special clause directed that the consideration to be paid to the Company should include a sum for the costs incurred by, or in connection with, re-investment. This provision, it was argued, was in lieu of the ordinary allowance of 10 per cent. for compulsory sale; and one of the witnesses for the Company admitted that the usual allowance would in an ordinary case cover the cost of re-investment of the money paid for the purchase. The provision for the payment of a sum for re-investment was an unusual one; and it would be interesting if the matter raised in argument could be submitted for the decision of a Superior Court. The arbitration tribunal will, of course, only find a lump sum; and it will be impossible to ascertain from the award what weight the various arguments or facts may have had upon the award.

I have purposely confined my attention in these notes to the questions which were raised in the Morley case. Many similar points were argued in the Stourbridge case (1893), in the Chesterfield case (1895), in the Matlock Bath case (1896), and in the Ashford and Cowes cases (1897); but the most recent case\* illustrates the principles which underlie all such valuations of gas companies' undertakings as going concerns, and shows, too, when these principles are applicable only in relation to the facts of the particular case.

#### Southern District Association of Gas Engineers and Managers.

—The next general meeting of the Association will be held on Thursday, at the Holborn Restaurant, under the presidency of Mr. R. Beynon, of Torquay. We learn from the circular issued by the Hon. Secretary (Mr. J. W. Helps) that the business will consist of the election of the President, Vice-President, and office-bearers for the ensuing year, as well as of new members proposed; and the reading of two papers—one by Mr. C. E. Botley, of Hastings, furnishing information as to his extended experience with the carburization process in use there for the prevention of naphthalene deposits, and the other by Mr. W. B. Randall, of Waltham Abbey, dealing with the interesting question of localizing leakage.

**Institution of Mechanical Engineers.**—The ordinary general meeting of the Institution was held on the 26th and 27th ult., under the presidency of Mr. S. W. Johnson. The President announced that Sir W. H. White, Chief Constructor of the Royal Navy, had been nominated as his successor; Mr. T. Hurry Riches as Vice-President; and Sir William Arrol, M.P., Sir B. Baker, Mr. H. Chapman, Mr. W. J. Pirrie, and Sir T. Richardson, M.P., as members of the Council. In a paper on “Electric Installations for Lighting and Power on the Midland Railway, with Notes on the Power Absorbed by Shafting and Belting,” Mr. W. E. Langdon, Superintendent of the Electrical Department, showed that a considerable loss of power takes place in shafting and belting, but that this may be reduced by arranging to drive each tool or machine direct from an electric motor.

\* Since this article was written, the value of the Malvern Link Gas Company's undertaking, which is being purchased by the Malvern Urban District Council, has been submitted to the arbitration of Mr. Shireess-Will, Q.C., Umpire, and Mr. Corbet Woodall and Mr. Charles Hunt, Arbitrators for the Company and Council respectively.



## TECHNICAL RECORD.

### INSTITUTION OF CIVIL ENGINEERS.

Mr. W. H. Preece on the Position and Prospects of Electricity.

At the first Meeting of the Institution for the present session, held last Tuesday, the PRESIDENT (Mr. W. H. Preece, C.B.) delivered his Inaugural Address.

The President opened his discourse by expressing his gratitude for the honour conferred upon him by his selection as the recipient of the highest possible reward the Institution could give to those who had endeavoured to serve it well and truly. Dealing with the progress of the Institution since he entered it as an associate in 1859, he showed that the total membership had risen from 894 to 7088. Of the latter number, 71 per cent. are home, 21 per cent. colonial, and 8 per cent. foreign members. But the President pointed out that it was not alone in numbers that growth was shown; it was more apparent in the business of the engineer. The field of the profession had extended in all directions by the advance of practical science, and by a process of evolution and agglutination; with the result that it had been broken up into special branches and individual groups, with their separate organizations and independent homes. The various classes of engineers were, however, but species of one genus—the civil engineer, whose Institution, like a good mother, tried to keep them all under the protection of her wings, and who was prepared to make any sacrifice to advance the knowledge of engineering, and maintain the solidarity and reputation of the profession. The Engineering Conference held last year was undertaken in furtherance of this aim; and it was so successful as to call for its repetition in the spring of 1899.

Turning next to the subject of the examinations introduced by the Institution, the President pointed to the highly satisfactory results of the first one. Out of 24 candidates examined for studentship, only three failed to pass; while out of 40 examined for associate membership, but seven failed. Of 48 theses submitted in lieu of examination, only five papers did not secure a satisfactory report. The popularity of the measure was shown by the fact that 71 candidates entered for the last October examination. The papers sent had been by no means of an insignificant character; yet 86 per cent. of marks had been acquired on the whole examination. Consideration of this subject naturally led Mr. Preece to pass on to that of technical education. It was well, he remarked, that England was putting her schools in order. But was she doing so on a true issue, and was the money being distributed through the right channels? He thought our educational methods had begun at the wrong end—that we ought to teach the masters first and then the men. Moreover, we had to teach the teachers and those who had control of the purse-strings. We were suffering, he said, from a lack of competent teachers. The ideal professor of pure abstract science was generally behind his age. These were not the men for technical institutes. Such teachers should possess the diploma of the Institution.

Coming to the technical portion of the address, the President first dealt with energy, the principle of the conservation of which was, he said, the great generalization of modern days. He pointed out how every branch of engineering is dominated by the application of the great principle of work, which means the expenditure of energy. He emphasized the necessity for the engineer being an educated man, not necessarily so much in the languages, arts, and history of the past, as in the changes and properties of ever-present matter, and the forms and behaviour of never-failing energy—changes and transformations directed by his will, controlled by his knowledge, and applied by his hands. He thought Tredgold's well-known definition should be modified, and read: "The profession of an engineer is to apply the great principle of work to the use and convenience of man;" and his title be rather that of "energeer" than "engineer." Dealing with "energy in its most romantic form," the President next referred to electricity, the first practical application of which was by Franklin, in 1752, for the protection of life and property. Franklin's work had been beneficial. He demonstrated successfully how to bring the lightning down from heaven, and how to dissipate its causes harmlessly away in the earth. In 1837, Cooke and Wheatstone showed how electricity could be practically used to facilitate intercommunication of ideas between town and town, country and country. The President thought it was impossible to predict what would be the future of the telegraph; while with regard to the telephone, he informed his hearers that speech is now practically possible between any two post offices in the United Kingdom, and that theoretically it is possible to talk with every capital in Europe. "Telephony," said Mr. Preece, "is an Imperial business, like the post and the telegraph; and it ought to be in the hands of the State."

The next section of the address was devoted to railways; and then the President came to the subject of the utilization of electricity for domestic purposes and lighting. He acknowledged the useful work done by it in the former sphere, and then said: But it is in supplying us with light, without defiling the air we breathe in our dwellings with noxious vapour, that electricity has proved to be a true benefactor to the human race. The Legislature has facilitated the acquisition by municipalities of

those local industries that affect the welfare of the whole community, such as road making, sewerage, the supply of water, tramways, and, above all, electric light. No one doubts that new industries of a speculative character are best pioneered by private enterprise. The company promoter has, however, so abused the power placed in his hands by the Limited Liability Act, that, not only has the development of electric lighting been retarded in this country, but the prospects of private enterprise in furthering other industries has been checked. Fortunately the success, the comfort, the intrinsic value, the economy, and the sanitary properties of electric light have commended it to our municipal magnates, and its introduction has become the fashion. The following table shows the position of the industry in this country and in the United States at the present time:—

|                           | UNITED KINGDOM. |            | UNITED STATES.  |             |
|---------------------------|-----------------|------------|-----------------|-------------|
|                           | Municipalities. | Companies. | Municipalities. | Companies.  |
| No. of central stations   | 72              | 63         | 338             | 2,251       |
| Capital stock . . . .     | £4,599,154      | £3,258,343 | £3,419,019      | £48,207,527 |
| No. of arc lamps . . . .  | 5,753           | 1,259      | 26,087          | 265,064     |
| No. of glow lamps . . . . | 1,393,514       | 1,936,893  | 693,984         | 14,278,356  |
| Kilowatt capacity . . . . | 44,219          | 24,344     | 41,193          | 578,051     |

In spite of our financial troubles, of the inertia of municipal bodies, and of the active competition of vested interests, our progress compares not unfavourably with other European countries, but the progress of the industry in the United States has been phenomenal. The return for the United Kingdom is, however, by no means complete. It omits all private installations. We in the Post Office alone have 50,000 lamps which are not enumerated; and if we consider all our great railway companies, banks, warehouses, manufactories, and shops which have their own installations, the statistics will be very considerably extended. Lamps are being improved and cheapened, wiring is being reduced in cost, and the economic distribution of energy is being furthered. But the most promising field for economy is the combination of all classes of electrical industry in one centre, especially that of light and tramway working, where fuel is cheap, water abundant for condensing, and nuisances of no account. The cost of the production of electrical energy depends principally upon the continuity of its output. If it can be generated continuously during the 24 hours of the day, its cost is only a fraction of 1d. per unit. If it is used solely for light, a unit may cost 3d. Hence local authorities who are undertakers of electric energy neglect their duty to those who have elected them as the custodians of their interests if they fail to secure the tramways in their district, either as their own property or as customers for their current; for the tramways, by taking energy during the day, reduce the cost of working during the night by removing the incubus of running continuously imposed on undertakers by Act of Parliament. This may enable the ratepayers to be supplied at a price for electric light certainly 1d. per unit less than if there were no tramways. The cheaper the supply of energy per unit, the more certain and speedy the advent of the electric light as the poor man's lamp, and the more beneficial its introduction into the confined, ill-ventilated, and overcrowded homes of the working classes. By improving the locomotion to the suburbs, and enabling them to live in pure air, and by clearing the air they breathe of the impurities due to the combustion of tallow, oil, and gas, the more readily should the public fall down and worship the golden image which Parliament and Science have set up.

But it was on board ship, continued the President, that electric light had been pre-eminently successful, and where it supplied such a crying want that its introduction had not met with any check. It was almost immediately and universally adopted. Its introduction into lighthouses, however, had not been so successful. No new electric light had been installed on the coast of Great Britain since that at St. Catherine's Point (Isle of Wight) was fitted up in 1888. Other electric lamps were to be found at the South Foreland, at the Lizard, and at Soutar Point—only four lighthouses in all upon our coasts. This, he said, was due chiefly to the great prime cost of its installation and to the annual expense of its maintenance. But the sailor himself was not enamoured of it. It did not assist him in judging distances; it was too brilliant in clear weather, while in bad weather it penetrates a fog no farther than an ordinary oil-lamp. Moreover, great modern improvements had followed each other in apparatus, lenses, and lamps. A third-order light of to-day could be made superior to a first-order light of ten years ago. Oils had improved, and gas had been introduced.

Electric traction was the next subject taken up. The President emphasized his previous remarks as to the economy of combining electric lighting and tramway working. He said the relative merits of overhead and underground conductors, and the use of storage batteries, were practically the only important engineering questions under discussion. The underground conduit system had been materially helped by the practical objection to be seen in New York, where the tramways were being very successfully worked on this plan. The trolley system was much more economical; and its erection did not interfere with the traffic of the streets. The principal objection to it was its anti-æsthetic appearance; but it was wonderful, he remarked,



how ideas of utility and the influence of custom made us submit to disfigurement. What, he asked, was more inartistic than a lamp-post, or more hideous than the barn-like appearance of many a railway terminus. The corrosion of water and gas-pipes, the disturbances of telegraphs and magnetic observations, were, he added, serious questions arising from the introduction of powerful currents into the earth; but fortunately the remedies were simple, easily attainable, and very effective.

After a few observations on electro-chemistry, Mr. Preece came to the subject of the transmission of power; his remarks thereon being as follows: The energy wasted in waterfalls is enough to maintain in operation the industries of the whole world. Great cities, as a rule, are not located near great falls; nor has a beneficent Providence provided great cities with waterfalls as, according to the American humourist, He has with broad rivers. There is but one Niagara, and we are seeing how industries are rather going to the Falls than the energy of the Falls is being transmitted to the industrial centres. The arbitrament of money is limiting the distance to which energy can be profitably transmitted. The cataracts of the Nile can be utilized in irrigating the waste lands of the upper regions of the river; but their energy cannot compete, at Alexandria, with that of coal transported in mass from England. At Tivoli, 15 miles across the Campagna, the energy of the falls is economically utilized to light Rome and drive the tramways of that city. The electric railways at Portrush and Bessbrook, in Ireland, are worked by water power; and Worcester, Keswick, and Lynton use it in this country, but on a very small scale. It is not used more, for the simple reason that there are no more falls to use. Water power is employed very extensively in Switzerland, because it is so abundant there; and in our Colonies, especially in South Africa. But it is in the United States, especially in Utah and California, that the greatest works have been installed, especially for the transmission of energy to mines. In mines electricity is invaluable. It is used for moving trams and for working hoists. It lights up and ventilates the galleries, and by pumping keeps them free of water. It operates the drills, picks, stamps, crushers, compressors, and all kinds of machinery. The modern type of induction motor, having neither brushes nor sliding contacts, is free from sparks and safe from dust. Electrical energy is clean, safe, convenient, cheap, and it produces neither refuse nor side products. It is transmitted to considerable distances. In mountainous countries the economical distance is limited by the voltage which insulation can resist; 40,000 volts are being practically used between Provo Canyon and Mercur, in Utah, in transmitting 2000-horse power 32 miles. . . . It is effecting a great economy in coal consumption in our workshops and factories. The efficiency of steam-driven shafting is known to be very poor. Scattered steam-engines and long steam-piping run away with money by their continuous waste of energy. The motor is used only when and where it is wanted; its efficiency is very high, and it costs nothing when it is idle. It can be used either for the small power required by machines and tools at present worked by hand, or for a goods locomotive of 2000-horse power such as is now being used at Baltimore. This utilization of energy at a distance is reinstating many home industries, to the great advantage of the working classes, whose time is wasted in long excursions to the factory, and whose health, morals, and well-being are not improved by herding in great numbers and by incessant association with the grievance-monger and the professional agitator.

In bringing his address to a close, the President said he had touched only lightly some of the applications of electricity; confining himself, in a very general sense, to those with which he had been personally associated. He expressed the hope that he had sufficiently impressed upon his audience the universality of electricity. Its flood-gates were opened when the Queen ascended the throne; and during her reign it had overflowed all the fields cultivated by the engineer. Though its followers were now regarded as specialists, the period was not distant when it must cease to be a speciality; its facts and tenets, its science and practice, must form the framework of the profession of the engineer. Every engineer must ultimately become an electrician; and electricity would be the most general, the most useful, and the most interesting form in which he applied the fundamental principles of energy to the wants, the comforts, and the happiness of mankind.

#### AMERICAN GASLIGHT ASSOCIATION.

##### Annual Meeting at Niagara Falls.

We learn from the last number of the "American Gaslight Journal" to hand, that the Twenty-sixth Annual Meeting of the American Gaslight Association, held on the 19th, 20th, and 21st ult., at the International Hotel, Niagara Falls, under the presidency of Mr. J. B. Crockett, President of the San Francisco Gas and Electric Company, was, in every sense a success. Heavy rain had fallen on the day before the meeting; and those who arrived then were confronted by dismal weather conditions. Fortunately, however, the following morning opened bright and bracing; and under these more favourable appearances the President "called the meeting to order," as our American cousins put it, and introduced the Mayor of Niagara (the Hon.

A. C. Hastings), who welcomed the members of the Association in a suitable speech, to which Mr. Malcolm S. Greenough, of Cleveland, Ohio, responded. The Secretary and Treasurer (Mr. A. E. Forstall) then made the gratifying announcement that 53 active and 14 associate members had been enrolled, which is stated to be a "record." The report of the Council was of unusual interest, one of its recommendations resulting in the election of Colonel Stedman, who presided over the twelfth annual meeting of the Association, held at Washington in 1884, as an honorary member. The next item was the presentation by Mr. Walton Clark of the report of the Educational Committee, which gave an account of good work. In connection with this subject, Mr. A. C. Humphreys stated that pledges had been received assuring to the education fund of the Association the sum of \$3143 per annum over five years—the sum originally fixed by the Committee being \$3000. The amount subscribed is stated to be sufficient—in fact, it is more than satisfactory. The conversation which ensued elicited the statement from General Harbison, that the authorities of Trinity College, Hartford (Conn.), had decided, mainly as the result of his influence, to establish a course in "Gas Engineering." Subsequently, the Association voted \$250 per annum towards sustaining the educational work. The report of the Committee on Research (presented by Mr. Alten S. Miller) was next discussed; and the Committee were directed to continue their labours. The office-bearers for the ensuing year are as follows:—

*President.*—A. C. Humphreys, New York City.

*First Vice-President.*—G. G. Ramsdell, Philadelphia.

*Second Vice-President.*—E. G. Pratt, Des Moines.

*Third Vice-President.*—W. R. Beal, New York City.

*Secretary and Treasurer.*—A. E. Forstall, Montclair.

The President then delivered his Inaugural Address, which dealt at some length with municipal encroachments on private enterprise. Reference was made to the recent lease of the Philadelphia Gas-Works to a private Company; this case being cited as a proof that municipalities do not carry on their undertakings as economically and as much for the interest of the citizens at large as companies controlled by private individuals. Mr. Crockett stated that the Mayor of Boston (Mr. J. Quincy) had, in a recent letter to the City Council, advocated the granting of a ten years' contract to a company for lighting the streets; giving as his reason for so doing the "uncertainty of the operation of a municipal plant." An interesting part of the address was that in which the President dealt with the difficulties experienced by suppliers of electricity who depend upon current generated by water power at some distance from the locality served. He cited the case of Fresno, where, owing to lack of water, the people had been left without light, and the mills which were dependent on the local Company for their supply of current for motor purposes had been compelled to return to steam. He contrasted this state of things with the continuous supply of gas to which people were accustomed, any interruption of which would, he said, give rise to a "howl of indignation." He then passed on to refer successively to the use of gas as fuel, inclined retorts, the utility of acetylene as a commercial product, electric traction and electrolysis, and the educational work of the Association; concluding by expressing the opinion that the future of the gas business looks exceedingly bright. The address was referred to a Committee.

With regard to the technical business, which will, as usual, be noticed at greater length in subsequent issues, the first paper was by Mr. H. L. Doherty, of Madison. It was entitled, "How can we Make the Use of Gas more Universal;" and it led to a good debate. Dr. E. G. Love, of New York, followed with a paper on "The Loss of Illuminating Power of Twenty-five to Thirty Candle Gas when Mixed with Air," upon which diverse opinions were expressed. Mr. J. M. Rusby read a paper on "The Effect of the Depth of Fire upon the Practical Efficiency of a Water-Gas Generator;" and this was succeeded by one by Mr. Walton Forstall, bearing the title of "Notes on Mains and Main Laying." Both communications were well discussed. The afternoon sitting of the second day was occupied with the consideration of "short topics" introduced. Mr. H. L. Rice raised a good discussion on the subject of "A Gas-Engine in a Blowing Plant." Mr. Irvin Butterworth described an experiment with the Shadbolt self-enriching process; and the Secretary replied to his own question of "Can we Make all our Business Pay?" The contents of the "Question-Box" were disposed of, and the technical proceedings closed.

The general business consisted of appointing a Committee to award the Beal Medal to the author of the best paper presented at the meeting; the selection of New York for the next gathering; and the placing of the educational fund in the hands of three Trustees, with the Acting President and the Junior Past-President *ex officio*.

The attendance at the meeting was phenomenal—numbering 250; and the Entertainment Committee provided ample diversion from the business. The last day (the 21st ult.) was devoted to excursions to places of interest in the neighbourhood.

**The Manufacture of Calcium Carbide.**—The "Electrical Review" gives publicity to a report that Messrs. Siemens and Halske, of Berlin, are about to establish works at Klosters, Switzerland, for the manufacture of calcium carbide.



### THE PRESENT POSITION OF ACETYLENE LIGHTING.

The following is an abstract translation of a lecture on the above subject delivered by Dr. Paul Wolff, in Berlin. The text has been published in two recent numbers of the "Zeitschrift für angewandte Chemie."

The most recent important advance in the lighting industries has been the discovery of the means of producing acetylene on a large scale. Moissan's laboratory researches with the electrical furnace led to the development of the technical processes for the manufacture of calcium carbide, which is the raw material from which acetylene can be obtained in quantity at a low cost. Moissan is morally the father of the acetylene industry, though the question of priority in the technical production of carbide is a controversial one, which is being argued in law suits on the patent rights in various countries. The same process was patented by different inventors in different lands. Willson's discovery of carbide appears to have been more or less of an accidental nature. But he forestalled Bullier (a collaborateur of Moissan) in the commercial development of the process of production; and thanks to him even to-day America retains her early predominance in carbide manufacture. The inexhaustible power at Niagara was called in requisition on both sides of the falls. The Electro Gas Company, the New York Carbide and Acetylene Company, and the Philadelphia Light, Heat, and Power Company have 22 furnaces on the American side; and the rather smaller Willson Carbide Works are situated on the Canadian side. The production of carbide in America at the beginning of this year was at the rate of about 10,000 tons per annum.

In Europe, carbide manufacture has until quite recently been confined to a few places. In Germany, the Kunheim Works were among the first to take it up; but they have since discarded it. The electro-chemical works at Bitterfeld made a limited amount of carbide. The industry is now, however, rapidly expanding; and new works are appearing in all directions. At Rheinfelden, in Baden, works with upwards of 8000-horse power have been constructed; while a Berlin company have secured 19,000-horse power in Norway, and a second works at Matrey, in the Tyrol, for the production of carbide. Other leading electrical firms in Germany are securing water power for the same purpose; and in Switzerland, France, Sweden, and Austria the new industry is also advancing rapidly. The production doubtless will soon begin to keep pace with the demand; and competition will prevent inflation of the price of carbide. On the other hand, a very low price must not be expected. Many of the published estimates of the cost of production are wholly unreliable, as they are not founded on the teachings of experience in the manufacture. Even those engaged in the industry estimate the cost of carbide at anything from £3 to £12 10s. per ton. If the extreme figures be discarded, there remains a considerable divergence, which is accounted for by the varying conditions of manufacture at different places.

The cost of production depends primarily on three factors—viz.: (1) The cost of power, (2) the cost of the raw materials, and (3) the output. Electricity obtained from water power is the only serviceable power for carbide production, though contrary statements are continually being promulgated. The calculations by which steam power for producing the current is made to appear sufficiently cheap, are based on erroneous assumptions. Even with the cheapest coal obtainable, competition with water power is out of the question; and on this account the manufacture appears to have been discontinued at Kunheim. It is conceivable that large steam-power works of at least 10,000-horse power could be made to pay under specially favourable conditions; but the profit would be far less than with water-power works of the same size. The cost of water-power varies considerably; but it is really cheap only when the fall is from a great height, and there is no great difficulty in controlling it, and when freight to and from the spot is not high. Many large waterfalls are useless for carbide manufacture, because of their inaccessible positions.

The cost of the raw materials is low, and the differences are seldom very great. The quality is, however, of supreme importance. The lime must not contain more than 2 per cent. of impurities, and must be as nearly as possible free from silica, magnesia, and phosphate; while the coke must contain but very little sulphur and phosphorus. The yield of carbide is actually much less than theory indicates as right. The loss of power at the turbines and transformers usually amounts to about 17 per cent.; while the electrical energy is but imperfectly utilized at the furnaces. The theoretical yield of carbide can be readily calculated. For the formation of 1 lb. of carbide, 967·6 calories, or 1·54-horse power, are required; and therefore the continuous application of 1-horse power will yield about 15·5 lbs. of carbide per day. Practically the yield per horse power per day is much lower. At the most, it is four-sevenths of the above, and in the majority of cases only three-sevenths. Therefore improvement in the manufacture, and consequently a greater yield and a reduction in price, may be expected in the future. The present bad results are largely due to loss of electrical energy in the furnace. In the first place, the mixture has to be raised from the ordinary temperature to 2700° C., which is the temperature

of formation of the carbide. Secondly, a considerable amount of heat is lost by radiation or conduction; and, moreover, the mechanical mixing of the materials is never so perfect that the mixture is really homogeneous.

Many methods of overcoming these evils have been suggested. The mixture has been formed into briquettes with tar, or an easily fusible material—such as calcium chloride—has been added to it. In order to reduce the loss of heat, attempts have been made to heat the mixture before it is brought into the electric furnace. Pictet has a well-conceived scheme for the preliminary heating of the material by combustion of carbon in an air-blast and by an oxy-hydrogen furnace. The value of many of these schemes cannot be rightly estimated at present, as they have not had a sufficiently prolonged trial; but the fact is that so far in regular working a greater yield than about 8·8 lbs. of good carbide (90 per cent.) per horse power per day has not been maintained. The details of carbide manufacture cannot be discussed in the present communication; but the author hopes to return to them on another occasion. In most published accounts of the manufacture, trivial points are dealt with at great length, while really important matters are almost completely ignored. This is due to the writers having only a theoretical knowledge of the subject, as those engaged in the industry observe secrecy as to their experiences.

The following shows the cost of production of a ton of carbide under the specially favourable conditions which obtain at the Vernier Works, near Geneva:—

|                                                 |      |            |
|-------------------------------------------------|------|------------|
| 2240 lbs. of lime . . . . .                     | cost | 22'35 frs. |
| 2016 lbs. of carbon . . . . .                   |      | 45'72 "    |
| Electrical power . . . . .                      |      | 40'64 "    |
| Pulverizing, renewal of electrodes, &c. . . . . |      | 50'81 "    |

Total . . . . . 159'52 frs. =  
about £6 7s. 6d.

The conditions in this case are uncommonly favourable; but if the general expenses, management, interest on capital, &c., are added, it will be seen that the total cost of production of carbide must amount to from £7 10s. to £10 per ton, according to local circumstances. If, moreover, the cost of packing the product in air-tight iron drums and freight be added, it will be found that the selling price must be from 1'90d. to 2'20d. per pound wholesale, or from 2½d. to 2¾d. per pound retail.

The apparent simplicity of production of acetylene by merely bringing carbide and water in contact, and the very high illuminating power of the gas, led to all manner of extravagant hopes when carbide was first made in quantity. Catch-titles—such as "Light of the future," "Every house its own gas-works"—were freely used; and acetylene was referred to as the ideal illuminant. As a result of the deceptive simplicity of generation, numbers of persons with no technical qualifications started in the new industry. In Germany, no fewer than 700 patents have up to the present time been applied for in connection with it. Among the inventors may be found priests and butchers. The result of the intrusion of such people, devoid of all technical knowledge, into the industry was that generators were constructed in which the simplest conditions of safety were neglected; and explosions, frequently attended by lamentable consequences, became common. Then the impression gained ground that the use of acetylene was invariably attended with great danger; and restrictive measures were adopted in many places which prevented the legitimate application of the gas. These measures have lately been so modified that they are no longer absolutely prohibitive.

It is now generally recognized that the toxic properties of acetylene are less marked than those of coal gas. Acetylene, when properly purified, is a pure hydrocarbon; whereas coal gas, and in a still greater degree water gas, derive highly toxic properties from the carbonic oxide which they contain. The objection to acetylene which continues to hold force is that it is liable to cause explosions. These explosions fall into two classes—viz.: (1) Those due to carelessness and to the same causes from which coal gas explosions arise; and (2) those attributable to the peculiar chemical and physical properties of acetylene.

The first class of explosions include those arising from the firing of a detonating mixture of acetylene and air. The range of such explosions is greater than with mixtures of coal gas and air, because the acetylene mixture is explosive within far wider limits of composition. Thus, only when air contains from 8 to 28 per cent. of coal gas is the mixture an explosive one; but air containing from 3 to 82 per cent. of acetylene will explode. Therefore greater care is necessary in the manipulation of acetylene generators than of coal-gas plant, in order to prevent admixture of air with the gas. Open flames should on no account be used in the vicinity of acetylene generators or gas-holders. The danger which thus appears to be so great, is in reality considerably modified by two facts—namely, (1) that the consumption of acetylene, owing to its very high illuminating power, is very much less than that of coal gas; and (2) that the odour of acetylene is a more penetrating one than that of coal gas, and consequently leakages may be more readily detected. Explosions of the class now under consideration can therefore only ensue from gross inattention; and relatively they should not be more common than those from coal gas or petroleum.

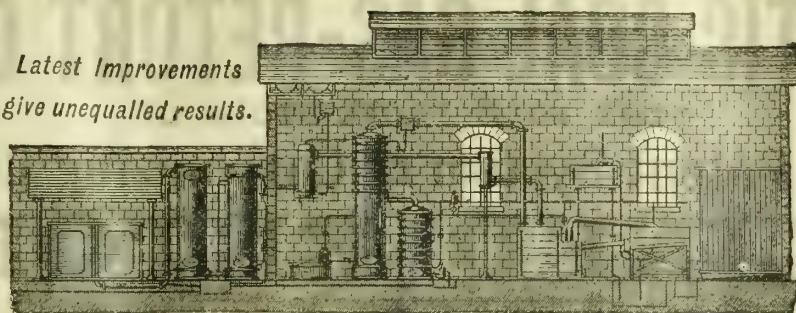
The second class of explosions are those which result from the endothermic character of acetylene. Theoretically, every endothermic gas is liable to the occurrence of a decomposition



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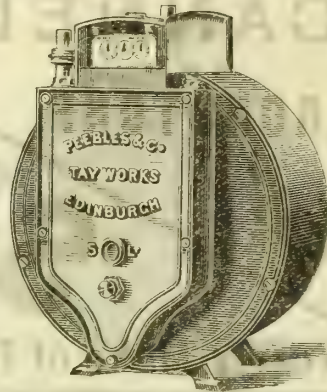
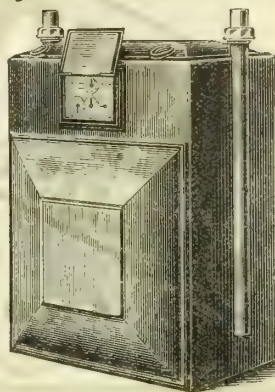
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which is propagated with such speed that it must be regarded as an explosion. In practice, fortunately, the heat liberated by the decomposition is largely expended externally, and that which remains available for the spread of the decomposition is very little. Actually, Berthelot has shown by experiment that acetylene under ordinary pressure is not in itself explosive—that is to say, decomposition of the gas initiated at one spot does not spread throughout the mass. Under increased pressure the conditions change, for acetylene becomes an explosive under 2 atmospheres pressure; and under 38 atmospheres—by which it is liquefied at 32° Fahr.—its decomposition causes a pressure of 5500 atmospheres, or it has about the same explosive force as gun-cotton. Some explosions can therefore be attributed to working consciously with the compressed or liquefied gas, and others to unintentional compression of the gas in the generator owing to the latter being of faulty construction. In the early days of the acetylene industry, many attempts were made to compress the gas in order to have it in a readily portable form for such purposes as railway carriage lighting. In France and Switzerland, some railway cars were actually lighted from reservoirs of compressed acetylene. It has been shown, however, that the compressed gas may be very easily exploded; and therefore its use for these purposes has been discontinued. But it has also been shown that the explosiveness may be modified by admixture of other gases; and on the Prussian railways a mixture of oil gas and acetylene is compressed to 6 atmospheres, and employed for lighting carriages. This mixture has about three times the illuminating power of simple oil gas.

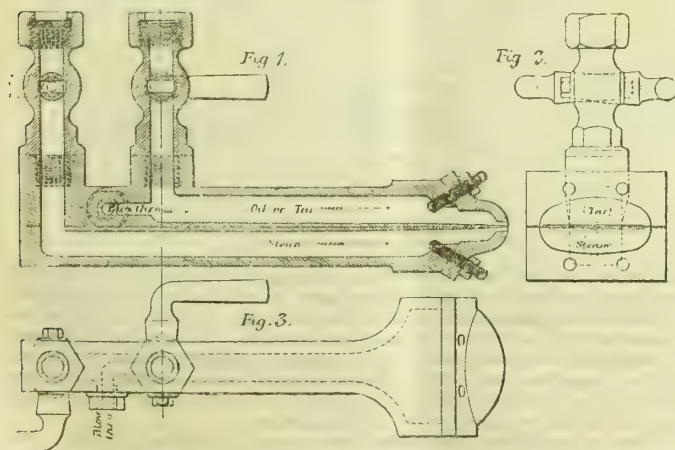
Explosions were at first also feared from the explosive compounds which acetylene forms with certain metals—especially copper. The use of copper and its alloys in acetylene apparatus was therefore forbidden, until it was demonstrated that the copper compound is not formed by the action of acetylene on alloys of copper; nor even by its action on pure copper, when the conditions are those which prevail in acetylene generators. The police regulations in Germany now permit unconditionally the use of brass or other copper alloys in apparatus for acetylene under ordinary pressure. In fact, acetylene under low pressures is not more dangerous than other gases. Bad apparatus and faulty service make it dangerous.

The construction of acetylene generators appears at first glance to be a very simple matter. Gases had been generated in laboratories for many years from a solid and a liquid, by means of Kipp's apparatus; and the early acetylene generators were merely modifications of this. But difficulties ensued, because the acetylene reaction does not occur with the same regularity as the reactions by which carbonic acid or sulphuretted hydrogen are obtained in Kipp's apparatus. The first portion of water which reaches the carbide produces a brisk evolution of gas; but after a while a coating of lime, arising from the decomposition, is found on the carbide, and water has to penetrate this in order to reach the unattacked carbide. The evolution is then less brisk; but soon the water collected on the coating breaks away the latter, and a large quantity of water suddenly gains access to the carbide within and causes a violent generation of gas. The generation thus proceeds very irregularly, and great variations of pressure are observed.

(To be continued.)

### THE SHURER TAR-BURNER.

A recent number of "Engineering" contained an illustrated description of a tar-burner adapted by Mr. E. Shurer, the General Manager of the Fairfield Shipbuilding Yard at Govan, for firing boilers. As the burner is useful for other purposes than the one in question, we reproduce the illustration, with a few of the particulars accompanying it.



A large store tank, capable of holding 1400 gallons, is conveniently placed, and is fitted with a small steam coil for keeping the tar in a sufficiently liquid state to ensure its pumping freely. From this tank the fuel is pumped into a small supply-tank

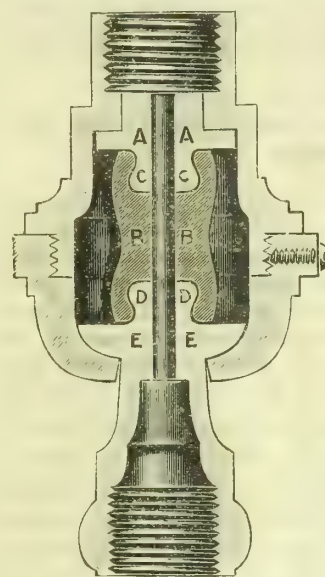
placed inside the building where the appliance is used, and above the level of the burner. In this tank there is also a small steam-coil. The tar runs from the supply-tank directly into a jointed coupling, fixed to the front of the boiler, into which also is led a steam-pipe for supplying the requisite pressure. From this coupling the tar fuel and steam pass in two  $\frac{3}{4}$ -inch pipes down to the burner itself. The form of the burner is clearly shown in figs. 1, 2, and 3; the blow-through being fitted to clear out any tar which may gather while the appliance is not in use. The steam-valve is first opened and the burner cleared of any obstruction. The tar supply is then turned on, and the light applied.

This arrangement of burning liquid fuel has been applied for some time to one of the ordinary boilers working the hydraulic machinery for the shipbuilding works, and a comparison has been made as to the difference in cost of working with tar as compared with coal. In the latter case, including the firemen's attendance, the cost works out at £7 18s. 6d. a week per double shift; and, taking the same time with the refuse tar as fuel, the cost works out at £5 19s.—thus showing a considerable saving. The only difficulty in the way of using the liquid fuel is that it is necessary to raise a certain amount of steam on the boiler so as to get the steam-jet. The weight of coal used for 116½ hours is 15 tons, and that of tar less than 9 tons; the former fuel costing 10s. per ton, and the latter 5s. per 100 gallons.

### BALL-JOINT FOR ACETYLENE GAS-FITTINGS.

The necessity for having a ball-joint on all gas-fittings liable to be moved in any way after they have been put up, is too obvious to need emphasizing; but the want of such a joint specially suitable for use with fittings for acetylene gas has been distinctly felt since the new system of lighting has advanced in public favour. One of the most noticeable properties of acetylene gas is its penetrating and searching nature; and many consumers have preferred, in the case of appliances used for this gas, to have a stiff top, with the attendant dangers of damage to the fitting and breakage of glass, &c., necessarily entailed, than run the risk of gas escaping from a moveable joint.

Messrs. Falk, Stadelmann, and Co., however, have introduced



a new joint which renders this no longer necessary. With this invention the gas does not enter the body of the joint in the usual way, and is prevented from coming into contact with the ball bearing itself—the most vulnerable part of the fitting. This object is attained by means of a simple contrivance shown in the accompanying diagram. The part marked A is ground into an absolutely gas-tight bearing, and is connected by means of a cylindrical piece of india-rubber marked B to the half ball at the bottom of the joint; thus forming a perfectly sound passage for the gas direct from the supply-pipe to the rod of the chandelier or other lamp. This pliable connecting piece is manufactured from a particular class of rubber of the finest quality, which after much experimenting has been found to remain unaffected when brought

into contact with the gas. Only a very limited portion of its surface—viz., the interior of the small passage between the two boxes C and D—is, in fact, in any way exposed thereto. The additional precaution is, however, taken of having the half ball E particularly well ground in, which renders the movement of the joint smooth and regular, and at the same time protects the outside of the rubber from heat and dirt. The joint is adapted for all kinds of gas-fitting work, whether acetylene is used or not. It is made in various sizes, and is of neat appearance.

### Lass's Analysis of the Metropolitan Water Companies' Accounts.

—The eighteenth annual issue of the above-named work is now ready. It contains analyses of the accounts of the eight London Water Companies for the year ending Dec. 31, 1897, or March 31, 1898, according as they are made up to one or other of these days. The tables are uniform in their arrangement with those of previous issues.

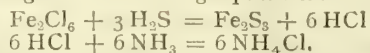
**Utilization of Water Power in Switzerland.**—According to "L'Electricien," thirty-five new schemes for the utilization of water power were sanctioned by the authorities in Switzerland last year. Seventeen of them were for lighting, four for the transmission of power, and fourteen combined lighting and transmission schemes. Most of them were small; and this fact is regarded as supporting the statement that shortly every little village in the Republic will be lighted and supplied with power for its smaller industries by electricity developed from water power in the vicinity.



## STOPPING LEAKS IN COAL GAS AND ACETYLENE MAINS.

The introduction of acetylene has drawn renewed attention to the loss of gas which occurs through unsound mains, because acetylene is distributed usually at a higher pressure than coal gas, and because it dissolves more freely packing materials of a greasy nature. The loss is said to amount in the coal-gas mains in Germany, on an average, to about 7 per cent. of the gas made. The unaccounted-for gas in Berlin is equal to the consumption of a fairly large town, such as Stettin. The loss of acetylene in distribution may usually be taken to be about 15 per cent.

It is, however, well known that some of the unaccounted-for gas is in reality due to change of temperature, of which the effect on the volume of the gas cannot be computed with certainty. An attempt to stop automatically the actually leaky places in services has been made by Herren Billwiler and Rosenthal. They impregnate the packing material with some substance on which constituents of the gas act and cause an increase in its volume. The expansion of this substance, when the gas comes in contact with it, thus renders any imperfect joints tight. The constituents of the gas which react with the substance used are the sulphuretted hydrogen and ammonia, which occur as impurities in both coal gas and acetylene. For instance, if the impregnating agent be an alcoholic solution of ferric chloride, the oxidizing action of the salt may produce more or less acetic acid, which will combine with iron to form the acetate. The unaltered ferric chloride will react with the impurities, especially when the sulphuretted hydrogen is in excess, according to the following equations:—



The final products, therefore, will be ferric sulphide and ammonium chloride, which will have about twice the weight, and occupy about twice the volume, of the original ferric chloride. An alcoholic solution is advantageous, because the alcohol readily evaporates and leaves the salt in a state of very fine division. Other salts may be used in place of ferric chloride. An excess of the salt will serve to stop leaks which may develop subsequently. According to the "Zeitschrift für Beleuchtungswesen," this method of securing sound joints has been successfully applied to long stretches of mains. It is evident, however, that it would not be fully effective in cases where the gas was properly purified.

## AUTOMATICALLY RECORDING THE WATER-LEVEL IN RESERVOIRS.

At a recent Meeting of the Bristol Association of Engineers, Mr. J. A. M'Pherson submitted some notes on "Regulating and Recording Apparatus for Reservoirs, Gauge-Weirs, and the Flow of Water." The method of electrically recording the level of water in reservoirs or tidal basins was first dealt with, and the means of transmitting and registering the fluctuations of water described. Diagrams were shown illustrating the mechanical and electrical action of the apparatus, consisting first of a transmitter at the reservoir, where a float rising and falling with the water communicates motion by means of gearing to an insulated cam-wheel, which in turning engages a tumbler, causing it to revolve until the long arm strikes a commutator, throwing it to one side or the other into metallic contact with one pole of a local battery—the direction of the current being thereby alternated for a rise or fall of water, according to the motion communicated by the gearing. The cam in revolving sets up a rubbing contact between platinum springs making connection to the line wires; while the tumbler, in falling over into equilibrium, makes a contact and completes the circuit. The current passes from the transmitter through the line wires to a recording instrument at the pumping-station or the engineer's central office, and there actuates a relay and completes the circuit of the local battery in either direction through electro-magnets for a rise or fall. Soft iron cores are attracted by whichever magnet is excited, and cause the engagement of pawls and a toothed wheel, moving a rack and pencil-carrier to obtain a diagram record on a clockwork drum, while a second wheel carries a hand that gives a constant reading at sight, upon a dial, of the fluctuations of the reservoir. A description was next given of an instrument for recording the flow of water over gauge-weirs, by means of an adaptation of the cam movement, calculated upon the formula for discharge; a record being obtained at any moment of the actual rate of flow in gallons or cubic feet, while by means of a planimeter or otherwise the total quantity registered upon the diagram in a given time may be calculated.

**The Flash-Point Test for Lubricating Oils.**—The "American Engineer" recently contained a table showing the flashing-point of hydrocarbon oils used as lubricants. The lowest figures are 330° Fahr. for ordinary purposes, and 350° Fahr. for cotton mills and places where there are inflammable materials; while for cylinder oils, 500° Fahr. is the lowest point that is generally safe.

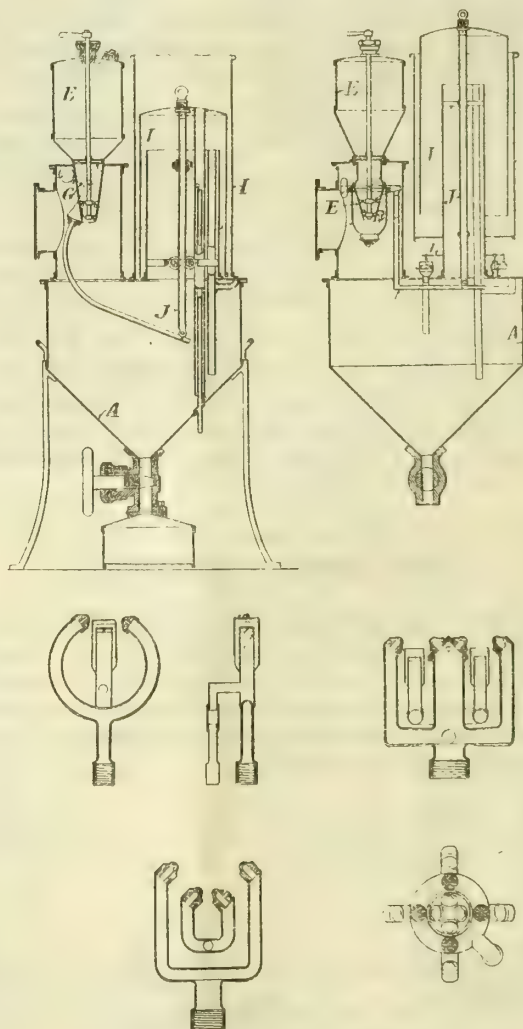
## REGISTER OF PATENTS.

**Incandescent Burners for Producer or Water Gas.**—Dymond, J., of Crediton. No. 22,065; Sept. 25, 1897.

This invention has reference to a construction of burner whereby ordinary producer gas or water gas can be employed, without being enriched by hydrocarbons. The patentee finds that, in order to obtain satisfactory results, it is necessary that the producer gas shall issue from a small nozzle into a vertical tube provided with an air inlet or inlets arranged above the nozzle and below the outlet end of the tube, which should be placed at a suitable distance above the free end of the gas-exit nozzle; also that it is advantageous, in cases where the burner is subject to draughts, that the air-way through the bottom of the burner gallery, and communicating with the bottom of the chimney, should be so constructed that the amount of air capable of passing through it should be less than is the case in the ordinary incandescent burners commonly used. He then describes such a burner, comprising "a vertical tube, into the lower part of which the gas to be burnt is admitted through a small orifice or nozzle and is mixed with air, which enters the tube through an opening or openings of suitable area and disposed at a suitable distance above the gas-inlet." This vertical tube may be made in parts arranged one above the other, with an air-way between their adjacent ends, and a gas-exit nozzle or orifice arranged to admit gas to the lower part of the tube at a point below the air-way.

**Generating and Burning Acetylene.**—Ageron, J. A., and Wirth, L. P., of Paris. No. 22,648; Oct. 2, 1897.

The claims for this invention are for apparatus for the generation and combustion of acetylene gas, in which the gas produced by the fall of carbide of calcium into water passes through a bellows pressure-regulator and reaches the burners which are also provided with a central delivery-tube for oxygen or ozone having its outlet opening below the acetylene gas flame. The gas-producing apparatus is termed an "acetylogene," and comprises a water-vessel A, a gasholder formed of a cylinder T fixed over the vessel and of a bell or sliding cylinder I, and an automatic distributing apparatus for the carbide. This comprises a funnel or hopper E, with a register valve or distributor, and an oscillating lever



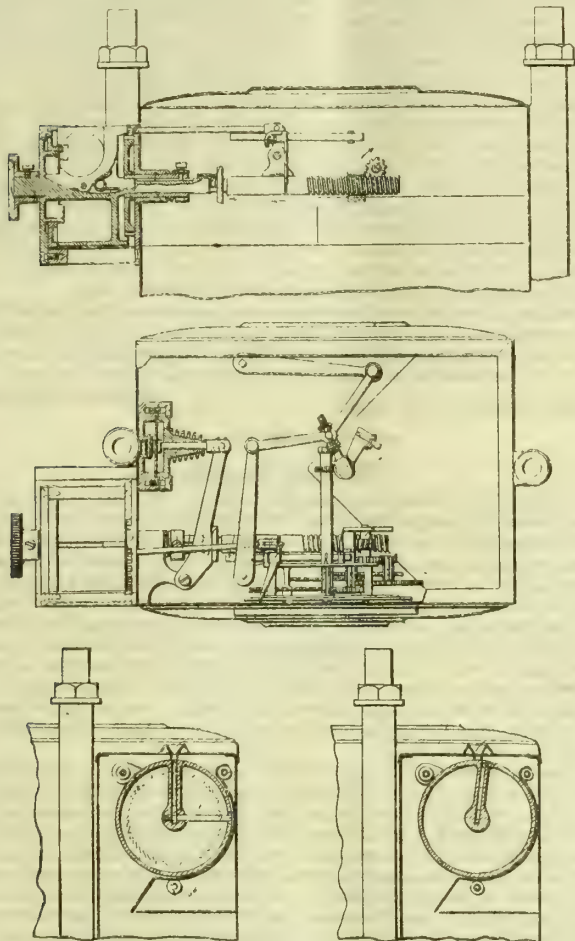
G pivoted on the funnel forming a stopper or shutter for the delivery aperture, and provided with a long arm on which the sliding cylinder or bell of the gasholder acts, so as to allow the carbide to fall into the water in the vessel A proportionally as required. This funnel or hopper E carries an oscillating box, with a stopper or shutter adapted to close its delivery aperture, and a fixed shutter adapted to close the lower opening of the box, in combination with a lever fixed to the box, and on which acts the sliding cylinder or bell I of the holder.

The burner referred to produces converging jets of acetylene gas with a central delivery of oxygen or ozone below the flame, as illustrated; and there is a pressure-regulator interposed between the acetylene producers and the burners comprising a bellows, the upper end of which is fixed and the lower end of which is jointed to the end of a lever fixed to the plug of the cock which controls the admission of the acetylene gas into the bellows.



**Coin-Freed Meters.**—Simpson, S., of Exeter. No. 22,830; Oct. 5, 1897.

One method of carrying this invention into effect when applied to a dry gas-meter (as shown in the engraving), consists in mounting a driving pinion upon a shaft or spindle geared to any convenient pinion or wheel of the ordinary index of the meter, so as to turn with it. In line with the driving pinion, but at right angles to it, is a measuring shaft carried in suitable bearings and capable of rotary and also of longitudinal movement; and upon the shaft is a long worm (which may have a single or multiple thread) gearing with the driving pinion—the worm being of such length as to remain in gear with the pinion although the measuring shaft is moved a considerable distance longitudinally. The measuring shaft is connected by a lever or other suitable means with the valve controlling the supply, in such manner that, by a longitudinal movement of the shaft in one direction or the other, the valve is opened or closed.



On the insertion of a coin, the measuring shaft with its worm is rotated (by a coin-operated device to be hereafter described); and the driving pinion being held stationary—owing to the supply being cut off—the worm and shaft are traversed forward by a screwlike action against the teeth of the pinion, which in this case acts as a nut. By this means the valve is opened, and the gas passes through the meter.

The meter being thus set in operation, and the driving pinion rotating, the measuring shaft is moved in the opposite direction (the worm in this case being operated after the manner of a rack); so that, as the gas paid for is consumed, the valve is gradually closed. Thus the quantity of gas supplied in exchange for the coin is determined by the amount of longitudinal travel of the measuring shaft.

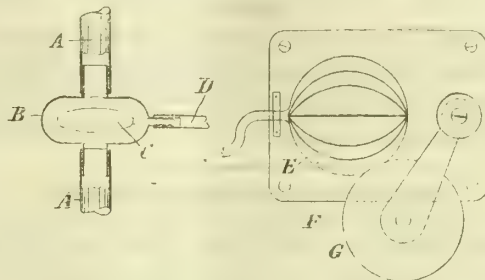
The coin-operated device for rotating the measuring shaft consists of: A toothed or notched measuring disc or wheel connected to the shaft by a feather or other means, so that the shaft may move endwise while the disc or wheel remains stationary; a coin holder or receiver revolvably mounted on the shaft, and having a radial slot adapted to receive the coin from the shoot; a spring pawl lever in the slot, which, under the action of the coin, is thrown into engagement with the teeth or notches of the measuring disc or wheel; and a stationary cam-plate having a cam-like ridge or flange projecting therefrom—the flange or ridge extending in a circular direction, and having an inclined end. The cam-plate is so arranged with relation to the coin-holder and to the coin-shoot that, when a coin is inserted—falling from the shoot into the slot of the coin-holder, and the coin-holder being rotated by a handle upon the outside of the meter-casing—the coin is carried round some distance, until (coming in contact with the inclined end of the cam-like ridge or rim) it is moved edgewise in the slot. This forces the spring pawl lever into engagement with the measuring disc or wheel, which is thus carried round (rotating the measuring shaft, and opening the valve as previously described), for an angular distance depending upon the extent of the rim or flange of the cam-plate. After this the coin falls from the slot in the coin-holder, and passes into the usual coin box or receptacle. The measuring shaft is connected to a pointer, which indicates upon the index dial, or upon a separate dial, the quantity of gas prepaid.

**Opening and Closing Supply-Pipes from a Distance.**—Becker, N., of Frankfort-on-the-Main. No. 24,807; Oct. 26, 1897.

This invention has for its object an arrangement for opening and closing low-pressure supply-pipes in place of the ordinary taps from a point at any distance from the places of consumption.

The device consists of a suitably-shaped enlargement of the supply-pipe A or a box B inserted therein, in the interior of which enlargement or

box a flat india-rubber bladder C, capable of being inflated by air pressure, is mounted by means of a gas-tight joint. The latter is connected with a supply-pipe D, provided at some suitable point of the room in question with a device E, for introducing compressed air into the bladder C. In the drawing, this device consists of an india-rubber ball,



filled with compressed air, and mounted in a recess in a plate F in such a way that, by passing over it a disc G pivotally mounted on the plate, the india-rubber ball may be compressed as desired. The air thereby discharged from the ball passes through the pipe D into the bladder C, and inflates it; thereby closing more or less the pipe A, so that the supply of gas conveyed therein is entirely or partially interrupted.

**Converting the Energy of Coal into Motive Power for the Combined Working of Gas-Engines and Gas-Generators.**—Mond, L., of Regent's Park, W. No. 27,257; Nov. 20, 1897.

This is a modification of the inventor's previous patents—No. 16,781 of 1895 and No. 28,588 of 1896—in which he proposed to utilize the hot exhaust gases issuing from gas-engines for producing a mixture of air and steam to be employed in converting coal into gas for use in the engine. He now claims as an improvement the conversion of the energy of coal into motive power by the combined working of gas-generators and gas-engines, by gasifying the coal in gas-generators, exploding the gases so obtained in gas-engines, and returning part of the exhaust gases of the gas-engine to the gas-generator, and passing them (in admixture with air or steam) through the incandescent fuel, whereby the carbon dioxide contained in the exhaust gases is re-converted into carbon monoxide, which is again used to produce motive power in the engine.

#### APPLICATIONS FOR LETTERS PATENT.

- 21,815.—SEDDON, C. A., "Igniting combustible or explosive gas mixtures." A communication from C. Killing. Oct. 17.
- 21,851.—JENKINS, H. C., and LOWDEN, T. C., "Manufacture of producer gas." Oct. 17.
- 21,977.—EISNER, W., "Water-meters." Oct. 19.
- 21,988.—WILD, M. B., and WIGHT, W. D., "Conveyor and elevator bands." Oct. 19.
- 21,994.—SCOTT, M. E., "Gas cooking-stoves." Oct. 19.
- 22,019.—WATSON, J. H., and DAWSON, J., "Acetylene gas lamps and generators." Oct. 19.
- 22,020.—LAKE, H. H., "Manufacture of gas." A communication from F. L. Slocom. Oct. 19.
- 22,041.—SUTHERLAND, J. C., "Gas-meters." Oct. 19.
- 22,054.—BRAY, G. & J. W., "Burners for acetylene gas." Oct. 20.
- 22,110.—SCHNEWEIS, J., "Acetylene generator." Oct. 20.
- 22,143.—HIRT, G., and HORN, G., "Gas and other like engines." Oct. 21.
- 22,205.—NASH, L. H., "Water-meters." Oct. 21.
- 22,228.—BARRATT, F. W., "Acetylene lamps." Oct. 22.
- 22,246.—DÜRR, F., "Gas-engines." Oct. 22.
- 22,272.—WILLIAMSON, A. D., "Generating, purifying, storing, and distributing acetylene gas." Oct. 22.
- 22,277.—MÜLLER, A., and GAREIS, O., "Automatic igniters." Oct. 22.
- 22,301.—SMITH, S., "Acetylene gas-lamps." Oct. 24.
- 22,330.—DÖLLNER, G., "Purifying acetylene." Oct. 24.
- 22,341.—FRANCETTI-SCHIERONI, E., "Acetylene lamps." Oct. 24.
- 22,412.—ADAMS, R. B., "Gas-stoves." Oct. 25.
- 22,463.—PECK, W., "Internal combustion engines." Oct. 25.
- 22,478.—HATELEY, H., "Combined deflecting shade and mantle protector for incandescent lighting." Oct. 26.
- 22,572.—IRELAND, W., "Acetylene gas generators." Oct. 27.
- 22,626.—WILES, J. L., "Internal explosion engines." Oct. 27.
- 22,628.—MARKS, G. C., "Gas and oil engines." A communication from E. Spitz. Oct. 27.
- 22,649.—HUNTER, J. W., "Gas or oil engines." Oct. 28.
- 22,701.—ROUBLEFF, A., "Self-igniters for incandescent and other gas burners." Oct. 28.
- 22,734.—DOSSETTER, W. J. A., "Acetylene gas generators." Oct. 29.
- 22,736.—SCOTT, W., "Guard for incandescent gas-mantles." Oct. 29.
- 22,737.—STRICKLAND, F., "Internal combustion engines." Oct. 29.
- 22,783.—BERNSTEIN, M., "Automatically lighting incandescent gas-burners." Oct. 29.
- 22,784.—LAFOND, J. B., "Manufacture of water gas." Oct. 29.
- 22,796.—HAMRICK, H. M'M., and MILLER, W. S., "Gas or vapour burners." Oct. 29.
- 22,797.—HAMRICK, H. M'M., "Gas or vapour burners." Oct. 29.
- 22,804.—THOMAS, T. C. J., "Lanterns for gas-burners and the like." Oct. 29.
- 22,807.—LAKE, H. H., "Incandescent gas-mantles." A communication from H. G. Semadeni. Oct. 29.

**Gas-Meter Rents at Levenshulme.**—At Levenshulme, the price charged for gas by the Manchester City Council is 2s. 9d. per 1000 cubic feet; but for more than forty years, there has been a rental of 1s. per quarter for meters. An intimation has been sent to the consumers that, from the end of the September quarter, no meter-rent will be charged, which concession will represent a saving of 4s. per annum to about 500 householders.



## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

## Retorts.

SIR,—In reply to "A Less Fortunate Brother," in your issue for Sept. 27 last, I may state that, while the results were being obtained at the rate of 8000 feet per mouthpiece, as mentioned in "Wayside Notes," the retorts were charged six times during the 24 hours, and the make per ton was from 10,500 to 10,600 cubic feet.

T. S. CLEMINSHAW.

Colombo, Ceylon, Oct. 20, 1898.

## An Objection to Sulphate of Ammonia.

SIR,—An agricultural friend informs me that one objection to sulphate as ordinarily supplied from the gas-works is that it is not in a sufficiently fine state of division to admit of distribution by means of drills, which is the cheapest way of effectively spreading artificial manures. It is thus placed at a disadvantage as compared with other manures that are specially prepared to meet this requirement. This point is worthy of the attention of the Sulphate Committee; and I should be glad to know if any of your readers have been asked to supply sulphate in a finely ground condition, and if so the means adopted for its preparation. I am told that at some gas-works the sulphate is screened, if required; and that this practice was commenced as a means of meeting a demand for coarsely powdered sulphate.

N. H. HUMPHREYS.

Salisbury, Nov. 4, 1898.

## Extension of Workmen's Breakfast Time.

SIR,—With regard to the recent alteration of breakfast time allowed in the London district, I do not know whether the majority of engineers and managers will take this as a new departure for the benefit of the working class; but I think honour belongs to whom it is due. Nearly twenty years ago Mr. W. H. Belton, the then Manager of the Wellington (Salop) Gas Company, recognizing that the half-hour system was too short a time for men to have their meal and do justice to themselves, established the three-quarters of an hour meal time there; and the arrangement existed when, in March, 1886, the writer entered the Company's service under Mr. Belton. It was in vogue when he left on Oct. 1, 1897, which was 11½ years. During his time, the men always appreciated this little favour, in comparison with men employed at other manufactures in the district, who could be seen running as if they had not many minutes to live.

This coming to some of the London works from works scarcely large enough for laboratory purposes, shows that the older managers were not unmindful of their workmen's welfare.

I might remark that the Mr. Belton I here refer to was the father of the Engineer and Manager of the Shrewsbury Gas Company, and of Mr. J. C. Belton, late of Redhill. Both these gentlemen could say a good deal in favour of the scheme if they wished.

W. H. WHITEHOUSE.

Ludlow, Nov. 3, 1898.

## Faulty Syphon Pumps.

SIR,—Upon reading the letter of Mr. T. D. Hall, in regard to the above, in the "JOURNAL" for the 1st inst., I thought perhaps the plan I have had in use for nearly forty years might be of interest. In all our drip-boxes—whether in use for gasholder inlets and outlets or for street mains, I have a small pipe ( $\frac{1}{2}$ -inch) which I designate a "test-pipe," fixed by the side of the pump suction pipe. This test-pipe is fixed short of the suction in the drip-box, by about half of the space between the bottom of the suction and the main inlet or outlet. The test-pipe reaches to the surface to about the same level as the suction pipe. A cock is fixed on the top for our gasholder and an iron plug or cap for security in the street main drips. By means of the cock or plug, the man in charge of the syphons, can in a moment tell if there is an approach to danger; and he would act accordingly—knowing also that if no gas came, there must of necessity be a certain amount of water requiring to be pumped out.

The advantage I have found in this plan is that the man, instead of trying with the pump every day or week, as he may have had instructions, has simply to open the cock. One other advantage is that if a stoppage at any time occurs on the works, it can be discovered in a moment whether or not the inlet of the gasholder is at fault.

Abergavenny, Nov. 3, 1898.

S. CROSS.

## The Disfranchisement of the Chairman of the Birmingham Corporation Gas Committee.

SIR,—As a former official of the Birmingham Corporation Gas Department, I am surprised to find that comparatively little notice has been taken of the shameful treatment accorded to Mr. Alderman Pollack, the well-known and popular Chairman of the Birmingham Gas Committee, as concisely stated in your issues of the 18th and 25th ult.

It appears to me such a gross indignity calls for some more general expression of sympathy or indignation (one hardly knows which to suggest) than has been expressed. After such an active and praiseworthy public life as Mr. Pollack has lived for so many years as Alderman, Mayor, Magistrate, and Chairman of different Committees, &c., it must be most mortifying to him to be suddenly disfranchised by so egregious a blunder as that pointed out by you. With reference to his work in the Gas Department, as is so keenly felt in Birmingham, his loss is nothing less than a calamity. True, the numerous plans and schemes he has so successfully piloted through the Council are being carried out exactly as he had arranged. Yet for him to have no voice in these matters at such a moment, is indeed preposterous.

It would ill become me to speak of his work upon the Gas Committee, which is so well-known. Suffice to say the Birmingham Corporation Gas-Works are widely known to be up-to-date in everything worth being so. Labour-saving appliances there introduced by the able Chief Engineers, Mr. Henry Hack and Mr. Charles Hunt, have received from time to time due notice and prominence in the "JOURNAL." It must be borne in mind that it is not merely labour-saving which Mr. Alderman Pollack has always had in view, so much as the reduction of exhaustive manual labour, whether arising from heat, dust, or chemical processes. To the Gas Committee itself and the Secretary, Mr. Edwin Smith, the sudden deprivation of the Chairman of his office will be most acutely realized. That men of all political parties and creeds speak of this disfranchisement as nothing less than a disaster for the Gas Department is sufficient in itself. To Mr. Alderman Pollack it must be a source of gratification to feel that, though separated from the work he loved and engaged in so ardently, it will be carried on just as he desired—only, of course, minus the advantage of his wide experience and businesslike tact.

The simple resolution of the Overseers, expressing their regret for the occurrence which has wrought such a catastrophe, is insufficient altogether for such a case, although probably it will be all that is forthcoming. The wish that some legal remedy would be found is now hopeless.

Huddersfield, Nov. 3, 1898.

EDWARD A. HARMAN.

## Tramway Traction.

SIR,—Mr. J. A. Baker has recommended the "conduit" system in his report to the Highways Committee of the London County Council; but the heavy expenditure necessary for the installation of this system, and the excessive cost of maintenance, are shown in the reports of the various deputations who have visited the Continent and the United States. The London County Council do not appear to be favorable to the "trolley," as it is dangerous, unsightly, and more or less unworkable in the busy narrow streets of London, besides causing such deadly havoc to gas and water pipes; and I hardly think that they will recommend a system which has been so universally vetoed by Provincial Corporations as the conduit. Now is the time, therefore, to bring the merits of the gas-motor cars prominently before the public and those interested in gas undertakings generally.

It seems to me that too much stress is put upon the contrast between horse and electric traction; forgetting that almost any form of mechanical propulsion of cars is more desirable than horse, because a uniform speed is maintained, a quicker and more frequent service is permitted, and, as a natural consequence, expenses per car-mile are reduced. It is, however, absurd to claim these as special advantages of electric traction only; and instead of always dwelling on æsthetic considerations by one partisan or another, it would be more useful to scrutinize closely the capital outlay and the costs of running. Unfortunately statistics under the latter head are few and far between; but those available form interesting and instructive reading. The experiences of the Dover Corporation point to 0.95 of an electrical unit as the amount of power necessary to run a car 1 mile; and as electricity is 3d. per unit at Dover, this works out at 2.85d. per mile for energy alone, as against a little under 1d. for power on the gas-motor cars at Trafford Park. And despite this heavy cost of power at Dover, a profit of £1300 has been cleared. It is, however, a very simple question of arithmetic to estimate how much cheaper gas traction would have been, and how much more profitable. "Lightning" gives comprehensive tables every week of the charge per unit of electricity for power purposes, and the average runs out at about 4d. per unit; so that the generality of towns adopting electric traction would find their energy bill a trifle high, without taking into consideration the heavy capital charges involved in an electrical installation of either the trolley or conduit system.

As mentioned in your article, another point which is so frequently lost sight of in dealing with the cost of electric traction, and which cannot be too strongly emphasized, is the leakage of the electricity, which is so destructive to gas and water mains; and though the damage is only apparent after three or four years' running, the pipes have then to be renewed, and the cost must be added to the expenses of the electrical systems. This is not a fanciful picture, as the bitter experience gained in America has clearly and definitely substantiated the dangerous nature of this most virile agent. It was also referred to in strong terms at the meetings of the British Association held at Bristol lately; and besides the corrosion mentioned by several eminent experts, Professor Silvanus P. Thompson showed that the escaped electricity was powerful enough to altogether disorganize the instruments in observatories even at some miles distant. Those who have adopted electricity as their motive power have not fully grasped their liabilities, but are hugging themselves in the belief that the present increase of traffic is due solely to the adoption of this method of traction, that the expenses will always be normal, and that the future holds nothing but good. A sad awakening awaits them.

At various times you have referred to the successful working of gas-motor cars at Blackpool; but the pulses of gas companies, and the corporations owning gas-works, have not yet been stirred into action. The operations at Blackpool, however, and the experience gained at Trafford Park, Manchester, prove that no system can be so easily installed, or worked so cheaply, as gas traction; and in view of the fact that electric lighting is making such rapid strides in this country, it behoves gas engineers to show active interest in a movement calculated to do so much for the uniform working of their plant. According to Mr. Hersey's letter, I notice that during the past two years' working at Blackpool the cars have run 250,000 miles, and carried 1,150,000 passengers; and the gas



consumption per car-mile, including that used in the compressing station, is only from 33 to 35 cubic feet for 52-passenger cars, which represents a cost of less than a *ld.* per car-mile. In no other system is the cost of energy so low as this; and when it is remembered that the capital charges of electrical installations are necessarily so heavy, it is evident that the working expenses of either the trolley or conduit system must be much higher than that of gas-motors.

Although the Birmingham Corporation reported in favour of the conduit system, yet their deputation in April, 1897, were much impressed with the working of the gas-cars at Blackpool, and said: "Even as the cars stand, however, the system appears to be an eminently practical one, and likely to be very successful on routes suited to such a form of motive power." "Your Sub-Committee saw this [the use of supplemental gearing] in satisfactory operation ascending a sharp gradient over the Railway Bridge near St. Anne's Station." And I understand that since that date important improvements have been introduced into the gas-cars to increase their efficiency and reduce the gas consumption.

The "JOURNAL" circulates among so many gas engineers, that I hope the further details of operating tramcars by means of gas-motors and the extension of the system to Neath and other lines in the West of England, will commend themselves to every gas engineer who wishes to increase his output and keep it normal both day and night. Hitherto the gas world has viewed the operations of gas-driven cars with apathy, if not with suspicion; but now that the system has proved a success, it should lend its aid in the propagation of this simple, cheap, and efficient means of tramcar propulsion.

Nov. 4, 1898.

A BELIEVER IN GAS-TRAMS.

## LEGAL INTELLIGENCE.

### The Objects and Constitution of the Herne Bay Gas Company, Limited.

Last Saturday, Mr. Frank Russell appeared before Mr. Justice Stirling, in the Chancery Division of the High Court of Justice, to support a petition presented by the above-named Company, asking the Court to confirm special resolutions which had been passed by the shareholders with the view of altering the objects of the undertaking as stated in the Memorandum and Articles of Association. He said the Company was formed in 1853, with a nominal capital of £20,000, to supply gas and other illuminating materials to Herne Bay and the surrounding districts. During the past few years, the population of the district had greatly increased, and the quantity of gas supplied was considerably in excess of what it was at the outset, or even at the date of incorporation in 1882. Under these circumstances, the Company were anxious to go to Parliament to obtain statutory powers; but the "objects," as set out in the Articles, did not specifically contain words enabling them to do this, nor were the Directors authorized to apply the funds of the Company to any such purpose. Before incorporation under the Act of 1862, the Company, by virtue of power contained in a Deed of Settlement, had leased the undertaking to certain persons at a yearly rent of £630; and out of this the dividends had been paid. The Company had now entered into arrangements to re-purchase the lease for the remaining four or five years, and to make payment in debentures or debenture stock. As there was a doubt whether the Company had power to do these things, special resolutions had been passed for the purpose; and the Court was now asked to confirm them. His Lordship said he thought the terms of the resolutions were rather too wide. He had no power to authorize the Directors to spend the funds of the Company in applying to Parliament. This was a matter which Parliament would deal with when the matter came before it. Mr. Russell argued that, under the Act, the Court had power to alter the objects in the way proposed. His Lordship said he would sanction the Company applying for and obtaining any Provisional Order or Act of Parliament for enabling them more effectually to carry any of their objects into effect, including therein any modifications of their constitution.

### Eliza Farnan v. The Omagh Gas Company—Injuries Caused by a Gas Explosion.

In the Queen's Bench Division of the High Court of Justice, Ireland, last Tuesday, a motion came before Justices Johnson, Murphy, and Kenny to remit the above case for trial to the County Court Judge of Tyrone at the next Omagh Assizes. The facts of the case were stated as follows: On June 28 an explosion occurred in the plaintiff's house at Omagh, in consequence of which she was thrown down and seriously injured. Her arm was broken in two places; and she was under treatment in Omagh Infirmary for six weeks. Defendants denied liability, as the pipes had been put into the premises in 1871, at the request of the landlord, and no gas had ever been used in the house. They relied upon the contributory negligence of the plaintiff; and it was admitted that the plaintiff had no visible means of paying any costs should a verdict be found for the defendants. The Court held that, owing to the serious nature of the injuries sustained by the plaintiff, it was a fit case to be retained in the Superior Courts, and refused the motion, with costs.

**New Water-Works for Otley.**—The question of augmenting the existing water supply was under the consideration of the Otley District Council last Tuesday. The town's supply is now drawn from a bore-hole at Menston and other small sources, which yield a total of 240,000 gallons daily. This is sufficient for present requirements; but it is proposed to extend the supply so as to provide for the expected increase during the next twenty or thirty years. To do this, it is intended to construct a reservoir at a place called Bow Beck, on the north side of the River Wharfe, near Ilkley. It was mentioned that the cost of the scheme would be £35,000; and it would yield a supply sufficient for at least thirty years. Otley, it was pointed out, would also be able to supply other townships with water. It was decided to hold a further meeting to discuss the advisability of promoting a Bill in Parliament to empower the carrying out of these proposals.

## MISCELLANEOUS NEWS.

### IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly Ordinary General Meeting of the Proprietors of this Association was held on Tuesday last at the Cannon Street Hotel, under the presidency of Mr. T. H. GOODWIN NEWTON.

The SECRETARY (Mr. R. W. Wilson) read the notice convening the meeting, and subsequently the report of the Directors, which was as follows:—

The present half-yearly ordinary general meeting of the proprietors has been convened in conformity with the Association's Acts of Parliament, for the purpose of receiving a report from the Directors upon the affairs of the Company, and of declaring a dividend for the half year ended the 30th of June last.

The following summary shows the results of the Association's operations during that period: The quantity of gas made in the half year ended the 30th of June last was 4843 million cubic feet; the quantity made in the corresponding half year of 1897 was 4631 million cubic feet—being an increase of 212 million cubic feet, or at the rate of 4.58 per cent. The total number of lights on the 30th of June last amounted to 2,760,470; and at the close of the corresponding half year the number of lights was 2,555,128, which gives an increase of 205,342, or at the rate of 8.03 per cent. The entire length of mains on the 30th of June last was 1987 miles; the length of mains on the 30th of June, 1897, was 1917 miles—an increase of 70 miles. Since the 30th of June, 1897, the number of the Association's consumers has been increased by 21,722, or at the rate of 10½ per cent.

The plant and mains at all the stations were maintained in a due state of efficiency.

The receipts for gas, and the net profit for the half year under review, exhibit a satisfactory increase.

The average cost of coal was slightly over *rd.* per ton more than in the corresponding half year.

The receipts for the bye-products, coke, tar, and ammoniacal liquor show an increase, but not in proportion to the larger quantity of coal carbonized. Owing to the mildness of the winter, the price of coke had to be lowered to prevent undue accumulation of stocks; and the market for tar continues in a somewhat depressed condition. On the other hand, an improvement has taken place in the value of sulphate of ammonia; and the revenue derived from the sale or treatment of ammoniacal liquor exhibits a gratifying increase.

At Antwerp, the erection of the premises in the Place de Meir for new offices and show-rooms, the need of which was referred to in the last report, has made good progress; and the Directors anticipate that they will be ready for occupation by April next.

At Berlin, the consumption of gas continues to increase at a rapid rate; and the additions to the producing plant and storage capacity of the works which have been recently made there will shortly be fully utilized.

The Directors anticipate that it will soon be necessary to erect new works; and they availed themselves, during the past half year, of a favourable opportunity to secure a large plot of land in the Commune of Mariendorf, which will serve as a suitable site.

The arrangements which the Directors reported had been introduced at the Gitschinerstrasse works, for the quicker unloading of the coal barges, have been put to the test during the past shipping season, and have proved eminently satisfactory.

At Brussels, the proportion of storage capacity of the gasholders to the daily consumption having reached the limits of safety, a new steel three-lift gasholder, of 140 feet diameter, in a steel tank, standing above ground on a concrete foundation, is being erected on the Forest works.

The additions to the producing plant at the Koekelberg works at this station have been completed and put in action.

At Frankfurt-on-Main, such progress was made with the erection of the eight benches of inclined retorts on the Bockenheim works, that they will be ready for use this winter.

The Directors have to report having obtained concessions for fifty years from the 1st of January next for the lighting of Nieder-Schönhausen, Französisch-Buchholz, and Heinersdorf, suburban Communes to the north-east of Berlin. They have also completed the purchase and taken over the gas-works and concession for the lighting of the town of Komotau, in Bohemia. The concession gives to the Association the monopoly to supply gas and electric current until 1920.

Reference has on more than one occasion been made to negotiations pending with the authorities of the town of Haarlem, for a prolongation of the Association's concession, which expires on the 31st of December, 1902. Although very favourable offers were made, including an immediate large decrease in the price of gas, the Town Council have decided to build works of their own and to terminate the contract at the date fixed.

The Directors desire, in conclusion, to draw the attention of the proprietors to the accounts for the half year ended the 30th of June last. These have been duly audited; and from them the Directors have, in accordance with the provisions of the Companies' Clauses Consolidation Act, prepared a scheme showing the profit of the Association for the half year and the portion thereof applicable to the purposes of dividend, which they recommend now to be declared—viz., a dividend of 5 per cent. for the half year ended the 30th of June last, payable, free of income tax, on and after Tuesday, the 8th inst.

The CHAIRMAN, in moving the adoption of the report, said he desired first to refer to the absence from the meeting of two of the Directors. Mr. Bassett had for some time been unwell; and Mr. Pigou was still suffering from a cold, caught in a cold-snap at Berlin a fortnight ago. He would not on the present occasion dwell upon statistics relating to the manufacture and distribution of gas during the past half year, because what he could say would be very much a repetition of what he said at the last meeting; and he thought there were very much more interesting matters to come before their notice. He might state that Amsterdam and Vienna had not contributed their proportion to the increase of 4.58 per cent. in the total quantity of gas made; for, excluding the gas produced at Amsterdam and Vienna from the calculation, the increase in the production at the other stations amounted to 6 per cent. At Berlin, the report said that the Association had concluded contracts for fifty years with three suburban Communes. He might say that it was due to their indefatigable agent at Berlin, Mr. Delbrick, that these contracts, like so many others, had been entered into. The improvements which had been made in the carbonizing plant at the Gitschinerstrasse were a complete success. To the skill of Mr. Edward Drory (now their Chief Engineer at Berlin) as an adapter and practical worker of inclined retorts, testimony was borne by gas engineers from all quarters of the globe. He must not, however, in this connection forget



to mention how Mr. Ernest Körting had seconded Mr. Drory's efforts. In a recent visit to Berlin by Mr. Pigou, Mr. Tindall, and himself (accompanied by Mr. Corbet Woodall, their Consulting Engineer), a question of the greatest importance came before them—namely, how the site at Mariendorf, referred to in the report, could be most economically utilized for a large gas-works, meter factory, and subsidiary works. The site consisted of about 200 acres, 6 miles south of the centre of Berlin. The need for this new site was apparent from the impossibility of extending their present works, which were situated in populous districts, while the growth of their consumption in Berlin was at the rate of 10 per cent. per annum. By Midsummer, 1900, there would have been spent on the purchase of this site, on its connection with the railway, which bounded it for half a mile between the stations of Mariendorf and Marienfelde, on the partial erection of carbonizing and storage plant, on mains, and on the meter factory, a sum of at least £250,000. He might say that these works, besides their railway connection, would have a projected canal passing through them. With regard to Haarlem, the Town Council, as reported, had decided to build their own works, and put an end to the Association's concession on Dec. 31, 1902. Every effort had been made by the Directors for years past to secure a prolongation of this contract. Very advantageous terms had been offered to the Municipality, who, inspired, no doubt, by the action of the Town Council of Amsterdam, anticipated more favourable results than the Association had ever been able to obtain there. Thus the Directors' efforts had been without avail. The report mentioned the acquisition of the concession of Komotau. Since the close of the half year, four other concessions in Hungary and Bohemia had been obtained. These towns had a total population of 80,000; and the works and concessions would cost something less than £100,000. The labours of the Directors in finding proper re-investments for the shareholders' capital when concessions expired were more difficult year by year; and therefore, of course, the terms on which acceptable re-investments could be made became less and less remunerative. This arose in a great measure from the better credit now enjoyed by the larger towns. Amsterdam could now borrow at the same rate of interest as the British Government could 25 years ago; and thus there was a tempting margin between a low rate of manufacturing profit and the rate of interest paid for the capital which produced it. It was by no means certain that these conditions would remain permanent, and Municipalities might well have to reconsider their position. Before making any statement as to the position of the Association as affected by the falling in of two important contracts, he would remind the proprietors; in order that they might have them steadily in view, what were the principles which had guided the Association during the period of prosperity of some seventy years which followed an early period of great adversity. These principles were briefly: "Look before you leap" and "Don't prophesy—at any rate long—before you know." Recent events at Amsterdam and Vienna illustrated these principles from contrasted points of view; for the loss of Amsterdam, he was glad to say, would not appreciably affect the receipts of the Association, while at Vienna a large income was involved. These principles of action were embodied in the operation of three funds—the contingency fund, the reserve fund, and the depreciation fund. The last-mentioned fund was a sinking fund to recoup definite losses of capital at definite periods in the future, which were capable of actuarial calculation. Its accretions were entirely under the control of the Board of Directors. The reserve fund now consisted of £400,000 Consols, locked up by the proprietors many years ago out of the immediate control of the Directors. With the discretion of the proprietors, he did not wish to interfere; but he could wish that the investments of this fund were in securities now equally liquid, but bearing a higher rate of interest. The contingency fund was what he might call the great "buffer" fund, which met the shock of losses both of capital and income which were outside the limits of actuarial calculation. Its accretions were entirely within the control of the Board of Directors. With respect to expiring concessions and the return of capital, he would first take Amsterdam. The arrangements for the transfer of the works and mains to the town, under the terms of the Association's contract, were in every way satisfactorily completed on Aug. 10 last, when the Municipality took possession after paying the Association the whole of the amount which had been agreed upon—namely, a net sum of £1,330,000. To this had to be added the amount standing to the credit of Amsterdam in the depreciation fund—namely, £340,000—making together £1,670,000. From this must be deducted the total amount invested by the Association in the business at Amsterdam during the fifteen years of their contract there, which was £1,280,000, leaving a capital-profit of £390,000. He informed them at their last meeting that the Directors would take into consideration how these moneys should be dealt with; and he now wished to give them particulars of the manner in which it had been determined they should be treated. He was sure that they would fully approve of the proposals. It was needless to say that they had received much advice upon the subject. It had been suggested, for instance, that they should divide a large sum among the proprietors; that even a return of capital should be made. But after examining the question with most minute care, the Directors had come to the conclusion that neither of these proposals could be recommended to the proprietors, bearing in mind the prospects of the Association, and the desirability of maintaining a steady dividend of 10 per cent. upon the nominal capital. Firstly, then, they had decided to pay off the 4 per cent. bonds, amounting to £376,400. Those which matured in August last, amounting to £142,200, had already been paid; and the money for those maturing on Aug. 1, 1899, amounting to £234,200, had been set aside and invested for the purpose. Secondly, in view of the decreased profits which they might earn for some time after 1899, they proposed to set the capital-profit of about £390,000 to form a "dividend equalization fund," for the purpose of maintaining the dividend at a normal rate of 10 per cent. With regard to the balance, they had decided to keep this for capital purposes. It was capital, and as such should be used; and the Directors thought they would be able to use it to the proprietors' advantage. They had not forgotten their duty towards the officers and workmen who had faithfully served them at Amsterdam; and they had received from them their appreciation of what had been done for them. With regard to Vienna, the events which had taken place during the current half year were briefly these: Two years ago, he told them that he had confidence that they would receive justice from the Courts at Vienna as to the suburban contracts. After the decision of two Courts had been in the Association's favour, the Corporation came to them in September last to ask whether they would be inclined to sell them the whole of the gas-meters fixed in

the inner city, and on what terms. The Board replied that they would be prepared to entertain the proposals, provided that a definite and clear understanding was arrived at in regard to matters appertaining to the suburbs, and others questions. The contracts made with the suburbs, as the proprietors knew, expired at varying dates—one as late as 1920. A way was thus paved for negotiations, which were conducted by Mr. Lindon and Dr. Teltcher; and the result was that an agreement had been arrived at, which, while it removed a considerable difficulty from the path of the Corporation, might be considered satisfactory for the Association. The chief points of this agreement were that the law suits pending between the City and the Association were withdrawn; that the Association obtained a unified contract for the suburbs (with one exception) until Dec. 31, 1911, at the expiration of which the Corporation must take over, at a valuation conducted on specified lines, all the mains, meters, lanterns, &c., belonging to the Association in these districts (the gas-works supplying these districts, for special reasons, not to be included in the valuation); and that the Association sold to the Corporation the whole of their meters in the inner town. It was gratifying to know that the Association would remain in undisturbed possession of their property, and would continue to supply a large and progressive portion of Vienna for another thirteen years. He thought they might congratulate themselves upon their policy of the past two troublous years; and he might be pardoned for expressing the hope that their future relations with the Town Authorities of Vienna would be peaceful, and of a much more friendly nature than they had been in the past. The districts which they retained would be supplied from three of their seven existing works; and the arrangements would not necessitate any considerable outlay. He was quite sure that all the Proprietors would join with the Board in specially thanking Mr. Lindon and Dr. Teltcher for their successful conduct of these negotiations. He would now say a few words as to the general position of the Association in view of the present outlook. Thanks to the dispositions which the Directors had made and proposed to make—such as the establishment of a dividend equalization fund—they might look forward to a continuance of a 10 per cent. dividend, notwithstanding the loss of income at Vienna. And the strength of their financial position at the present moment was certainly most extraordinary, contrasted with what it was (say) only twelve years ago, or, indeed, which it had ever attained in the past history of the Association.

Mr. J. HORSLEY PALMER, in seconding the motion, said he desired to endorse what the Chairman had stated regarding the services of Mr. Lindon and Dr. Teltcher. He did not think the proprietors had any idea what it was to attempt negotiations with a foreign Municipality, such as they had to deal with at Vienna; but they had had some slight idea conveyed to them by what they had seen in certain of the newspapers. There was, however, no doubt that these two gentlemen had had to bear the brunt of all sorts of abuse; and every conceivable kind of difficulty had been thrown in their way for he did not know how many years, during which the negotiations had been going on. He was very thankful, for their sakes, that the outcome had been as satisfactory as it had.

The CHAIRMAN, in reply to questions, stated that what the Municipality of Vienna now took from the Association was confined to the meters in the old town. Out of their seven works, three would be utilized for the supply of the suburbs. Three stood in the town, and one was on the left bank of the Danube at Floridsdorf, which was quite independent of Vienna. With reference to the question about the bonus, he thought the proprietors would agree with him, if they would consider what the Association were preparing to pass through, that it was quite enough for him to prophesy now that the dividend of 10 per cent. would be maintained.

The motion was then put and carried unanimously.

The CHAIRMAN next proposed the declaration of a dividend of 5 per cent. for the half year ended June 30 last, free of income-tax, upon the £3,800,000 stock of the Association.

Mr. J. HORSLEY PALMER seconded the motion, which was agreed to.

The CHAIRMAN afterwards proposed a vote of thanks to the staff at home and abroad; remarking that the Directors could not carry on the affairs of the Association satisfactorily without being supported by a faithful, energetic, and trustworthy staff. He had already referred specially to two members of it abroad; and he might state that the services of the staff at home should be equally recognized with those of their colleagues abroad. He had been upwards of thirty years a Director of the Association, and he did not know that they had been better served at any time during that period than they were now.

Mr. A. LUCAS, in seconding the motion, stated that he had been brought much into contact with members of the staff, both at home and abroad. The position of gas engineers was nowadays by no means a sinecure, as they had to fight with the electric light and to deal with all the latest improvements in gas, which followed fast and furiously upon each other. He was sure their Engineers abroad did this; a proof being that in many instances they had succeeded in ousting the electric light from many places in favour of incandescent gas-burners. It was owing in part to these burners that the very large increase in the consumption of gas of which they had heard that day was due.

The resolution was unanimously carried.

Mr. HORNCastle afterwards proposed, and Mr. JOHN DREW seconded, a cordial vote of thanks to the Chairman and Directors.

Mr. R. FOX supported the proposition; adding that he thought the proprietors should express in a more substantial manner their appreciation of what the Directors had done for them. For his own part, he considered that the Board ought to receive some honorarium; and he should also like to see the services of Mr. Lindon and Dr. Teltcher recognized in a similar manner. The proprietors had been brought out of an extremely difficult position, and they were now in a far better one than they could have expected to be at one time.

The motion was carried unanimously.

The CHAIRMAN, in acknowledging the vote, said he desired expressly to refer to what he supposed might be called the rider to the resolution which had been brought forward by Mr. FOX. Anything in the direction advocated by that gentleman, so far as Mr. Lindon and Dr. Teltcher were concerned, was a matter for the Board, who would not forget it. The proprietors' appreciation of what the Directors had done for them was one of the things which carried the Board through many difficulties. He might add that the support the Directors had received from the



proprietors in not pressing for information when it could not be given consistently with the welfare of the Association had borne good fruit in the past, and would, he was sure, do so in the future.

Mr. POTTS proposed, and Mr. YELD seconded, a motion that a Committee be appointed for the purpose of considering the grant of an honourarium to the Directors.

The motion was put and carried *nem. con.*

The proceedings then terminated.

### COLONIAL GAS ASSOCIATION, LIMITED.

The Annual Meeting of this Association was held last Tuesday, at the London Offices, Suffolk House, Laurence Pountney Hill, E.C.—Mr. SAMUEL SPENCER in the chair.

The SECRETARY (Mr. A. J. Kingdon) read the notice convening the meeting; and the report and accounts, of which an epitome appeared in the "JOURNAL" for the 25th ult., were then submitted.

The CHAIRMAN, in addressing the shareholders, said he had little to say beyond what was stated in the report and accounts. The Directors had again to regret that the Colony had not made so much progress during the past year as they had every right to expect. At the same time, so far as the Association were concerned, there was a slight improvement; and it led them to be very hopeful for the coming year. Everything pointed to a better state of affairs. The banks and railways indicated that, from an industrial point of view, things were certainly beginning to give more satisfactory results; and the Manager of the Association (Mr. George Swinburne) reported that the wheat harvest and wool-clipping prospects were most promising. He also stated that property in Victoria was selling at higher values than it had done for the past six years; and this in itself must be taken as a sure sign that trade was decidedly increasing. As regarded their own operations, the extra dividend the Directors had anticipated being able to pay this year was smaller than they had hoped to recommend. Still he would like the shareholders to accept it as an earnest of something better to be expected during the current year. Turning to the balance-sheet, he was pleased to say the number of their consumers had increased by more than a hundred; and the Manager was endeavouring to improve upon this during the coming year. With respect to the Geraldton Gas-Works, since the last meeting it had been decided to convert the concern into a local Limited Company, in which the Association had arranged to take a fairly large interest; and the Directors had also entered into an agreement for the balance of £2590 of the money advanced for the erection of the works, to be returned. The Manager reported that all the works were in good condition; and he was most sanguine as to the future of the Association—in fact, he summed up his views in this remark: "We have had seven lean years; and I trust that the coming year will be the commencement of seven prosperous ones." The Chairman concluded by moving the adoption of the report and accounts.

Mr. W. C. PARKINSON seconded the motion.

Mr. M. CURRY inquired the object of turning the Geraldton works into a Limited Company, and what benefit the Association secured by the conversion. He had understood that the business was going to be a good one; and he could not see why the Association had not kept it. Anyway, he should like to know if they had made a profit on the transaction, or only obtained exactly what had been spent on the works. There was another item on which he should like a little information. The accounts stated that they had an invested reserve fund of £533 in the Charters Towers Gas Company. By this it seemed that the Association had increased their holding in that Company. He could scarcely call that a reserve; and he should have thought it would have been better to have had the cash in hand, or to have put it in a good security paying 3½ or 4 per cent. He also noticed that they had about £30,000 more capital than in 1891, and two more works, and yet they were not earning so much profit now as they did then.

The CHAIRMAN, in replying, said that, with reference to the transfer of the Geraldton Gas-Works to a Limited Company, the Association only held a two-thirds share in them to begin with; and the idea was that, making a local Company of them would improve their profit-earning capabilities. The terms set forth in the accounts were the only ones the Directors could get. The amount expended on the works by the Association was £4697; and the Company were paying them 3666 shares of £1 each, which, taken at cost, represented £1907. The balance of the purchase money, which was payable in cash, was £2790; and of this they had had £200, leaving a balance of £2590.

Mr. PARKINSON, referring to the remarks as to the invested reserve fund of £533 in the Charters Towers Company, said they did not purchase the shares representing that sum. They were simply an allotment to the Association, as shareholders in the Charters Towers Company, by way of a bonus. The shares stood at a premium, and were paying 10 per cent.; so that there would be no difficulty about selling them.

The CHAIRMAN added that at the previous meeting it was decided that the bonus shares from the Charters Towers Company should be treated as a reserve fund; and it would be seen that they had now added the 10 per cent. dividend received on them—making the total £586. The Directors were anxious to accumulate a reserve fund, so as to make the dividend more stable. Regarding the remarks made by Mr. Curry as to the increase of the capital without a corresponding increase in the profits, the Directors felt the position very much. Although the money spent had not, through the condition of affairs in the Colony, produced what was expected of it, their prospects were better now than they had been in the past seven years.

Mr. T. K. GRIFFIN observed that, having some knowledge of the Australian trade, he thought the present position of things indicated that they had now reached the end of bad times in the Colony. For his own part, he considered the shareholders might, under the circumstances, congratulate themselves on being able to get a dividend. There was a small increase on this occasion; and he hoped with the Chairman that it was the harbinger of better things.

The motion was then adopted.

On the proposition of the CHAIRMAN, seconded by Mr. A. GODWIN-HAMMACK, a dividend was declared for the past half year at the rate of 3½ per cent. per annum, free of income-tax.

Two of the Australian Directors (Mr. Henry Andrews, jun., and the Hon. Thomas Bent) retired by rotation; and on the proposition of the CHAIRMAN, seconded by Mr. G. GREGORY FISHER, they were unanimously re-elected.

Messrs. Alfred Lass, Wood, and Co., having been re-appointed Auditors, A vote of thanks was passed to the Australian Committee and Mr. Swinburne, on the motion of the CHAIRMAN, seconded by Mr. CURRY. A similar compliment was also paid to the Chairman and Directors.

### GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

The Ordinary Half-Yearly General Meeting of the Company was held on Tuesday last, at the Offices, No. 30, Gracechurch Street, E.C.—Mr. CHARLES GANDON in the chair.

The SECRETARY (Mr. S. Wood) read the notice convening the meeting; and the report of the Directors was taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said he thought the balance-sheet for the half year ended June 30 last showed somewhat better results than those for the preceding two or three half years. The accounts would have been even more favourable but for the fact that there was a falling off both in the revenue from private consumers and in the receipts from residual products. Compared with the preceding half year, there was a decrease of £55 in the former item; but in spite of this the amount received was £28 more than in the six months to June of last year. The falling off in the receipts from residual products amounted to £94, as against the preceding half year. On the other side of the accounts, coals had cost £11 more than in the previous six months, but £45 less than in the half year to June, 1897. The principal reductions effected were in repair and maintenance, which cost £83 less, and in salaries, which were £174 less. The saving in the latter item was due simply to the fact that the salary paid to the late Engineer and Manager ceased at the end of last year. The profit for the half year amounted to £206, which was £100 more than in the preceding half year, and £136 more than in the six months to June last year. Although, as he had said, the present accounts showed some improvement over recent ones, the results were still far from satisfactory. He was, however, glad to say that, while for the previous half year no dividend was declared on either class of shares, the Directors were now in a position to recommend the payment of a dividend on the preference shares of the Company. In September last a destructive hurricane visited the West Indies, which caused great damage in many places; but fortunately it did not appear to have reached Georgetown. While, however, they might congratulate themselves on having escaped the effects of this disastrous storm, they still had to face the unfortunate fact that the business of the Colony remained in a very depressed state. Until some improvement took place in this respect, he was afraid that no very great success could attend the efforts of the Company.

Mr. ALFRED LISS seconded the motion, which was carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. R. BERRIDGE, a dividend was declared on the preference shares at the rate of 3 per cent. per annum, for the half year to June 30 last.

The CHAIRMAN next proposed, and Mr. H. W. ANDREWS seconded, a vote of thanks to the officers and staff of the Company in Georgetown and London.

The SECRETARY having briefly returned thanks,

The proceedings terminated with a similar vote to the Chairman and Directors.

### SOUTHAMPTON GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held last Thursday—Mr. R. C. HANKINSON in the chair.

The SECRETARY (Mr. C. Crowther Smith) having read the notice convening the meeting, the report of the Directors was presented.

The CHAIRMAN moved the adoption of the report. He referred to the fact that this was the Jubilee year of the Company, which was incorporated in 1848. Since that time the population had trebled; for in 1851 it was only 35,000. He mentioned this for the reason that the Company claimed to have kept pace with the increased requirements of the town consequent on its expansion. Their Jubilee year, too, was commemorated by the passing of the Bill which the Company had promoted, and which received the Royal Assent on the 2nd of August last. During the half year ending the 30th of June there was an increased sale of nearly 5 million cubic feet of gas as compared with the corresponding period of 1897. This was really the most satisfactory feature of the concern; for so long as they could augment the sale in this or a larger proportion, they would have every reason to be satisfied. There had been a substantial rise in the amount received for residuals, the value of which had been low of late years. The sum available for division was £7369; and to make this up to the amount required to pay the maximum dividends, the Directors proposed to draw £944 from the reserve fund. As to the Company's new Act, there had been, it appeared, some misapprehension. The passing of the Bill through Parliament was a very anxious time for them. They did not get it through without some opposition, which did not come from the borough but from Eastleigh; and, of course, it increased the cost of getting the Bill. The powers conferred upon the Directors for the conversion of the existing share capital and debenture stock were intended to be exercised so that the new 5 per cent. stock should be substituted for the share capital, and new 4 per cent. debenture stock for the existing debenture stock. Each 10 per cent. share would receive £100 of 5 per cent. stock, each 7 per cent. share £85, and each 5 per cent. share £20; while each £100 of 5 per cent. debenture stock would receive £125 of 4 per cent. stock. The shareholders, therefore, would not suffer at all in income by the conversion—in fact, the Directors believed the various issues would become more valuable than they were before. One thing they expected to have to submit to was that they had to raise their illuminating standard from 14 to 15 candles. This was desirable, no doubt, for consumers, but it was costly to the Company. He hoped it would prove satisfactory to the public. It might be asked why the Company wanted so much money as they were empowered to raise by the Act. The Directors had expended all their capital in extending the works, and they now contemplated adopting



prepayment meters. This would benefit the poorer members of the community who now burnt oil; and the Directors believed it would be advantageous to the Company.

Mr. J. K. SAMPSON, in seconding the motion, bore testimony to the great efforts put forth by the Directors, Secretary, and officials in connection with the new Act.

The motion was carried unanimously; and the maximum dividends were declared.

On the motion of Mr. AMES, seconded by Mr. PARSONS, the fees of the Directors were increased by £200 per annum.

The CHAIRMAN having expressed his own and his colleagues' appreciation of the kind feeling which had prompted the vote,

The business of the ordinary meeting closed.

At a Special Meeting subsequently, the Directors were authorized to issue £50,000 of 5 per cent. stock as required, £10,000 of which is to be at once offered for tender.

The thanks of the shareholders having been given to the Directors, Secretary, and staff,

The SECRETARY, in replying for his department, said the Act of Parliament just obtained might be regarded as one of the greatest successes that could have been achieved in the face of the very heavy opposition with which the Company were threatened. As regarded the rating appeal, he felt bound, in justice to the Company, to say that no less than four offers of arbitration were made by the Directors; and if these had been acceded to, litigation which had cost the town £3000 would have been avoided. The Company had saved £600 or £700 a year by the appeal; but it would take the town fifteen years to recover the disastrous expenditure incurred by the Board of Guardians in an unnecessary way.

The meeting then terminated.

#### OIL GAS ENRICHMENT COMPANY, LIMITED.

The Fifth Annual General Meeting of this Company was held in Dowell's Rooms, Edinburgh, on Thursday, the 27th ult.—Mr. J. MILNE (of Messrs. J. Milne and Son, Limited) in the chair.

The CHAIRMAN said the year had, on the whole, been a very quiet one with them. There was rather an improvement, as the proprietors would see, in their income; and they were, he was glad to say, able to pay off the final amount of their preliminary expenses. Some of them would, no doubt, be anxious to know something of the position of the plant at Paisley. It was still continuing in a very satisfactory state; but since their last meeting they had found it necessary to make some further additions to it, and to carry out certain developments which had shown themselves to be necessary in a new plant like this. They had it running for a long time in the early part of the year, and in another few weeks it would be in use permanently. The further lowering of the price of cannel coal, and the high price of gas oil, had, in one or two cases of very small gas-works, induced them to give up the use of their process. But in other places the process had increased in size; and the result was, as they saw from the balance-sheet, that they had more royalties this year than last. There was a slight shrinkage in the present value of their investments. They were still a good deal higher than they were when made; but fluctuations of this sort could not be helped. They were perfectly satisfied that the investments were good; and they had little fear, if they ever came to be realized, as to their fetching more than was paid for them. He concluded by moving the adoption of the report (*ante*, p. 926) and the payment of a dividend as recommended.

Mr. G. HARRISON seconded the motion, and it was carried.

Mr. Milne and Mr. Hugh Brown (Glasgow) were re-elected Directors; and a sum of 50 guineas was voted to the Board as remuneration for their services.

**Water Divining.**—The operation of indicating the presence of water by divination has lately been successfully carried out on the Grey Towers Estate of Mr. Dorman, at Guisborough; on the property of Mr. A. Brooke, at Killybegs, co. Donegal; and at the residence of Miss Hollans, Dene Park, near Tunbridge Wells.

**Additional Water Supply for Sutton-in-Ashfield.**—Last Tuesday, Mr. F. H. Tulloch held an inquiry at Sutton-in-Ashfield respecting an application by the District Council for sanction to borrow £8000 for new water-works. The Engineers for the scheme are Messrs. Hodson; and they gave evidence showing the necessity for an additional supply.

**Collapse of a Water Scheme for the Whaley Bridge District.**—The Whaley Bridge District Council have been promoting a water scheme for their own and surrounding authorities' districts, the estimated cost of which was £26,000. Early in the negotiations, New Mills withdrew from participation in the project; thereby reducing it by about one-half. As already reported in these columns, the New Mills District Council have decided to apply for parliamentary power to carry out a scheme of their own; and now the other authorities have come to the conclusion that they can procure supplies cheaper than by uniting with Whaley Bridge. In consequence of this, the Whaley Bridge District Council have decided to take no further action, and have directed that the costs incurred up to the present time be ascertained, and an account rendered to each authority concerned.

**The Proposed Purchase of the Larne Gas-Works.**—Last Friday week, a meeting of ratepayers was held at Larne for the purpose of considering the proposal of the Commissioners to purchase the gas-works for a sum of £4350. All the speakers on the ratepayers' side were of opinion that the price was far too high for the existing plant, as it had been running for upward of fifty years; and, in consequence, it was contended that the distributing-mains were almost unfit for use. It was also stated that numerous other defective matters would have to receive attention. Further, the lease of the present premises, it was mentioned, would expire in the course of thirteen years; and it would necessitate a large expenditure to renew it, and provide more accommodation. On behalf of the promoters, illustrations were given as to what had been done in other towns, to show the benefits that were likely to be secured by the purchase. Finally a resolution was passed asking the Commissioners to proceed no further in the matter, seeing that a new Town Council will be constituted under the Local Government Bill at the beginning of next year.

#### THE NEW GAS-WORKS FOR GLASGOW.

##### Site Agreed Upon by the Corporation.

A Special Meeting of the Glasgow Corporation was held on Monday last week, to consider the recommendation of the Gas Committee to acquire a site for new gas-works at Blochairn and Blackhill. Lord Provost RICHMOND presided. The Committee submitted the following report by Mr. David Rankine, Civil and Mining Engineer, of Glasgow:—

Since the beginning of last year, I have, both along with Mr. Foulis and individually, been making inquiry and investigation with the object of finding a site suitable for the erection of new gas-works of such magnitude as would meet the further requirements of the city.

The more prominent points which were kept in view were (1) the situation, extent, and elevation of the site; (2) facilities for public railway connection; and (3) stability of the lands, in respect of the likelihood of their being affected by past or by future mining operations.

Along with Mr. Foulis, I discussed and considered generally the vacant lands around the city; and afterwards I personally examined and inquired into those places which seemed most desirable, these being taken up much in the order of their apparent suitability.

The inquiry was, in the first instance, conducted as privately as possible; but latterly the object had to be made known to agents and owners of lands, so that facilities might be had for particular inquiry. It thus became known that the Corporation Gas Department was requiring a large area of land; and various parties came forward offering ground. In these cases also the places suggested were carefully examined.

There were nine sites specially investigated, and their situation extended from the north-east, round by the east and south-western sides of the city, and embraced lands several miles distant from the city boundary. The question of the suitability of the major number of the sites turned mainly on the stability of the ground in respect of past or probable future mining operations; and written reports were made regarding several of the subjects.

In respect of one of these subjects, which was specially investigated at an early stage of the proceedings, and which seemed to be in many respects the most eligible, the assistance of other two experienced mining engineers was obtained, and they also made special inquiry, and joined in a report with me on the subject. I did not confine my investigations simply to an ascertainment of the extent of past mining, or to speculative opinions regarding the stability of the lands; but, under my direction, and as instructed by Mr. Foulis, the lands were "bored" at considerable cost, so as definitely to ascertain the condition of the old workings, and to find whether these had consolidated to an extent which would render the lands safe for carrying the structures proposed to be put upon them.

The investigations thus made led to the condemnation of lands which, in respect of situation, elevation, and other conditions, were eminently suitable as a site for the proposed works. The risk of subsidence of the surface, with consequent damage to structures that might be put thereon, was so probable, that none of the engineers who examined the lands advised the risk being undertaken.

What was thus ascertained led both Mr. Foulis and me to be doubtful of other sites under which workings of a similar kind were known to have been made. The cost of railway carriage from coalfields on the eastern side of the city, from which coal supplies are mainly obtained, to sites on the south-west of the city, was the principal reason which operated to the exclusion of these.

One site near Blochairn, on the north-eastern side of the city, is free from mining objections, although mining operations have been conducted in other lands immediately to the westward, and also in lands a short distance to the eastward of it. The ground is undulating, but the undulations are favourable for the construction of works which have different levels for different parts; and the amount of excavation necessary to be made at one place is required for levelling up at another. Economy of construction is thus gained, in addition to facilities for handling the raw materials and the products into which these materials are converted. There is no difficulty in having satisfactory connections with both the Caledonian and North British Railways, although possibly it may be necessary to obtain parliamentary power for the construction of one or both connections.

After full and lengthened inquiry, and taking into account all the requisite conditions, I am of opinion that the site near Blochairn, on the northern side of the Monkland Canal, is, of all the sites that have come under my notice, the most suitable one for the proposed new gas-works.

The TOWN CLERK (Sir J. Marwick) said he had a communication from the Secretary of the Dennistoun Municipal Ward Committee, enclosing a resolution by the Committee, passed at a meeting on the previous Friday, "protesting against the proposal to build a gas-works in the vicinity of Alexandra Park," and asking the Council to receive a deputation on the subject. He had also a communication from the Rev. R. W. Dobbie, Free Church, Blochairn, asking to be heard very strongly in favour of the proposal. It was resolved to hear the deputations.

Mr. W. B. BUYLARS, on behalf of the Dennistoun Ward Committee, said he could hardly exaggerate, by anything he could say, the antagonistic feeling to the proposal which existed in the district. The gas-works, they learned, were to be among the largest in the kingdom; and it appeared to them to be altogether contrary to the general object of the Corporation in securing and equipping parks in the various parts of the city, that they should deliberately plant, in the immediate vicinity of a park already heavily handicapped, so large a works of this kind. It was denied that the effluvia of a gas-works were noxious; but the Committee were convinced that those who made such statements could not themselves have lived in the immediate vicinity of a large gas-works, or have attempted the culture of flowers or other vegetation in such environs. They had asked several citizens residing in the neighbourhood of the present gas-works; and their opinion seemed conclusive as to the effect on vegetation. There was the argument, they understood, that the works would draw labour to the district. The same might be said of any works; but he did not think it was a strong point, even in such a case. They had, in their deputation, large property owners in the district, who felt that a detrimental effect would be exercised by such a works upon their interests. The arguments against the erection of the works seemed to them so strong, that they had no hesitation in placing them before the Council, in the full belief that, on considering them, the Council would at least cause delay in the carrying out of the proposals of the Gas Committee. They did not urge all this in regard to Dennistoun in preference to other parts of the city. They considered that land outside the city might be obtained sufficiently cheap to counterbalance any extra expenditure involved.



The LORD PROVOST said he was pleased to hear them say that gas-works must be put down somewhere; and he was sure it was the intention of the Town Council, whatever they might do, not to erect them where they would hurt any body of the citizens. They required the works; and they had been advised that this was the place for them. What the deputation had said would receive the consideration of the Council.

The Rev. R. W. DOBBIE said that he and his office bearers believed that it was the desire of all the people in the neighbourhood that the gas-works should be erected at Blochairn. The locality had not shared hitherto in the general prosperity of the city of Glasgow. For many years feuing and building had been unknown. They saw, in the prospect of the erection of gas-works, great possibilities for the whole neighbourhood. They thought that an era of activity and prosperity would speedily follow in that part of the city. Objections had been raised, not, so far as they knew, in the locality itself, but outside it. Indeed, everywhere in the district directly involved there seemed to be unanimity in favour of the proposal. It had been said that Dennistoun would suffer from the fumes; but those who had to do with the erection of gas-works said this was a remote possibility. They were told that the beauty of Alexandra Park would be utterly destroyed. Even if this were true, beauty should always give way to the triumphs of industry and labour. Some of the loveliest flower displays he had been privileged to look upon had been in the neighbourhood of the existing gas-works. Blochairn had been called "a dark place," and so it was. Erect gas-works there, and they should be glad to give light to the whole city of Glasgow.

The LORD PROVOST thanked Mr. Dobbie for his remarks.

Mr. R. M. MITCHELL, the Convener of the Gas Committee, moved the recommendation of the Committee, as follows: "(1) That the report of Mr. Foulis be approved; (2) that in their opinion the ground referred to in the report is the most suitable site for the proposed gas-works; (3) that application be made to Parliament in the ensuing session for power to acquire the ground compulsorily, or by agreement, for the erection thereon of the proposed gas-works, and to construct the necessary roads, railway sidings, and other subsidiary works; and (4) that parliamentary authority be also applied for to purchase compulsorily, or by agreement, additional ground near Dawsholm, extending to about five acres, for an extension of the Corporation residual products works there, with the requisite railway connections." He referred, first, to Mr. Foulis's report, which could not fail to be eminently satisfactory to the Town Council. It spoke of the continued success of their gas undertaking over a long period of years, during which they had not failed to give a satisfactory supply of gas at the lowest possible price to their ever increasing consumers. They had at present three gas-works. Two of these, Dawsholm and Tradeston, were modern works, equipped with the most approved labour-saving apparatus, and had been the admiration of many visitors from other municipalities. The Dalmarnock works were antiquated, and unsuitable for the introduction of modern appliances, and were situated in what was now a crowded locality, and intersected by streets. They had been of late years worked on this account at an annual loss, compared with the results of the other works, of £9000 to £12,000. If the proposed scheme went through, it was intended to convert the Dalmarnock works into a gasholder station, and thus prevent the production of gas at so unfavourable a cost. It said much for those who controlled the Gas Department in former years that they had the foresight to extend the works, with the result that a demand for gas which had more than doubled itself within the last ten years had been successfully met. This increase of demand was still progressing, and at present had risen by 7 per cent. during the current financial year. No wonder then that their Engineer had urgently recommended the acquiring of a large area of ground on which to erect works to meet the future growth of the city. Their retorts would be fully in use by the winter of 1900. Their ground was all occupied; and it was imperative that they must, as in former years, prepare for future growth of demand. As long as five years ago the late Bailie Ure and the two Sub-Conveners considered it necessary to look out for a suitable site for new works. Many localities were visited; but, unfortunately, nothing suitable was found up to the time of Bailie Ure's death. Since then, as Convener of the Committee, he, along with Mr. Foulis, had continued these inquiries—quietly of necessity, but none the less thoroughly. As Mr. Rankine reported, there were three essential requisites for suitable ground for a large gas-works—extent and elevation of site, facilities for suitable railway connection and favourable rates from the collieries from which supplies were drawn, and stability in respect of the land not being affected by past or future mining operations. Having this in view, they took the advantage of Mr. Rankine's experience, especially as a Mining Engineer knowing well the general workings of coal in the Clyde Valley. Besides his valuable plans, they also had the advantage of the experience of two other Engineers. They visited and investigated a number of sites; and in the end were forced to the conclusion that the ground recommended both by Mr. Foulis and Mr. Rankine, as regards stability, extent, and railway communication, was in every way the most suitable that they had discovered for the erection of the proposed works. The higher part of the ground could be easily connected with both their principal railways, and was most suitable for receiving coal and conveying it to the retorts. At the lower end they had both railway and canal, by which they could distribute the bye-products—a large part of their manufacture. Indeed, such a combination of railway and canal facilities could not be easily found in any other locality near Glasgow. Besides this, they would be enabled to utilize a considerable portion of their own Blackhill land, which had hitherto been a most unprofitable asset of their Common Good. In fact, they were willing to schedule the whole of it, and thus possibly relieve the Finance Committee of an undesirable possession. The cost of all this was estimated at £1,000,000; but this amount would be spent over a considerable number of years, and the various sections of the work would only be proceeded with as the growth of the city demanded. It had been raised as an objection that the matter had been sprung too suddenly upon the Council; but new gas-works were referred to as long ago as 1894, in Sir James Bell's yearly summary of Corporation work. It had also been mentioned for years past, in moving the Gas Committee's annual report; and it was only on account of unavoidable delay in important negotiations, that this special ground was not sooner brought before the Committee. The price mentioned by the proprietors was thought by some to be in excess of its value; but they proposed nothing further in regard to price than that parliamentary authority be applied

for to acquire the ground compulsorily, in which case the sum would be fixed under the Lands Clauses Act, or by agreement, which was surely fair to both parties. A deputation had waited upon them that day objecting to a gas-works being planted so near the Alexandra Park. He was sure they would all respect as far as possible the amenity of every part of the city. But their other gas-works were situated in much more objectionable proximity to residential districts than these works would ever be; and when Mr. Whitton advised them that he could offer no serious objection to the proposed site, he thought that the Council would feel it to be their duty to confirm the decision of the Gas Committee, who were seeking to do their best for the citizens. They were under a penalty to give an efficient gas supply to their consumers. Their Engineer was no stranger to them. His past record entitled him to their confidence; and they would be incurring a grave responsibility were they to disregard his urgent recommendation. Whatever other doubtful schemes might be proposed, this at least was a proper and legitimate municipal undertaking. They had not in the past had to face anything but prosperity and success. This outlay would not impose additional burdens on the citizens; and he was sure that they would not look in vain for their loyal support, which would enable them for many years to come to continue the past traditions of the Gas Committee. He had already referred to the foresight of their predecessors; and he believed that the prudent step which they now proposed to take would be viewed with equal approbation both by their successors in office and by the inhabitants of their great and growing city.

Bailie FIFE seconded the motion. He said that the scheme which was put before them would not lead to anything like taxation upon the citizens. It was for the extension of a very large commercial business—a business which had been going on from year to year in a very successful manner. If they referred to the annual reports of the Gas Committee for some time past, they would see that the extension of the Gas Department had been going on steadily. Last year the increase was  $3\frac{1}{2}$  per cent.; while for this year, since June 1, the increase had been about 7 per cent. This showed that, even in the face of the extended use of electricity, there was still a large and increasing field for gas. He thought they were exceedingly fortunate in the fact that Mr. Foulis and the Committee had resolved to go forward and build these new works. The Convener had very clearly stated that this was no new scheme which was put forward. Those of them who had been associated with the late Bailie Ure, and who read his financial statements from year to year, must have noticed that he pointed out that the quantity of coal carbonized at Dalmarnock was 180,000 tons a year, and that it was carbonized at a cost of 1s. per ton more than they could produce gas at in either the Dawsholm or the Tradeston works. If they took the difference at £9000, they had there sufficient money, in the saving from that one item alone, at 3 per cent., to pay the annual charge on a capital outlay of £300,000, for the first instalment of the new works. In addition they had, in connection with the Bridgeton works, a very valuable asset in the shape of about 80,000 square yards of ground. All this might not be required for the storage of gas; and there must be a considerable piece of ground which could be judiciously placed on the market, and the price received for which would go largely to recoup the expense incurred in the purchase of the new ground. He believed that in going forward they were only doing their duty. He noticed from a report which was given to the Committee recently that the number of applications which had been made for meters had increased since last year by 6571. He believed that if they did not take time by the forelock, they would be placed in a very unfortunate position in regard to gas supply. He was quite sure that they were going on lines that would ultimately recoup them for any additional outlay in their capital account.

Mr. CUNNINGHAM moved—"That an advertisement be made for ground, specifying the requirements as to situation, stability, extent, elevation, &c.; and that the Special Sub-Committee appointed by the Gas Committee on the 29th ult. be continued, in order that they may further consider and report on the subject; and that the Sub-Committee be made more representative by the addition of one or two extra members." He said he should endeavour to show that the whole manner in which the proposal had been brought before them had been, to say the least of it, unusual and rather objectionable; and, further, that the proposal itself was not thoroughly satisfactory. In the report it was said that numerous sites had been examined, but that this one was found to be most satisfactory. The members of the Gas Committee had not even yet learned what were the sites which were examined, and what were the objections to those sites. A report of this sort should be brought before a responsible Committee like that—for it was the Committee who were responsible—and if it were accepted by them that day, as they were asked to accept it, at a moment's notice, they would be simply shirking their duties. The Gas Committee were not prepared to do this; but they did something like it. They appointed a very small Committee, who were called upon to investigate the matter within fourteen days. He believed that a Committee like that should have been made representative of all shades of opinion in the Gas Committee. This small Committee had too little time to carry out such an immense piece of work. This statement was justified by the fact that the gentleman who submitted the report to the small Committee did so under a reservation, and it had not been taken into account. There were sites in the immediate neighbourhood of Glasgow which many of them thought would be suitable; but to state at a moment's notice what those sites were, and to defend them against any remarks which might be made, was almost impossible. He thought, therefore, that if the Committee were strengthened, and advertisements put out asking those who had suitable lands for sale to send in their specifications, there would turn out to be a lot of sites cheaper than this one. The figure given was £600 per acre.

Mr. MITCHELL: I never mentioned a price.

Mr. CUNNINGHAM said there was a price before them; and he thought the sum which was likely to be paid for the site was too large. They would require parliamentary powers if they were to secure the land cheaper; and he thought it was the experience of the Council that it was not satisfactory to proceed to purchase land under the Lands Clauses Acts. There was another argument which he thought would go home to the heart of every councillor—and that was that it was not a right or proper thing to place such works in the immediate proximity either to public parks or residential districts. There was still another very important argument why they ought not, just at once, to accept the



report. The report was based on the supposition that in the future the increase of gas consumption would continue in the same ratio as in the past. He freely admitted that their Waterloo Street works, in the way of producing electricity, had not checked the increasing demand for gas. It would almost appear as if the theory put forward was justified—that where one shopkeeper took the electric light, his neighbours lighted up more brilliantly with gas, and that this put up the gas consumption. But the Council had already immense works for the generation of electricity; and by next year he had no doubt that it would not be one shopkeeper here and another there, in their main streets, who would take in electricity, but that they would have whole streets practically lit by electricity. He also believed that, in the not very far distant future, the electric light would be produced at a cost which would allow it to be put into working men's houses, so that in houses which were not too large the introduction of electricity would in the matter of health be a great and satisfactory reform. The Council had heard the statements which had been made by the representatives of the electors. He hoped they would give due weight to these arguments, and would not force upon them something which they would utterly object to.

Mr. G. MITCHELL, in seconding the amendment, admitted that a new gas-works was a necessity; but he did not admit that the site which had been recommended was the most suitable. It was in close proximity to a park which had cost the Corporation something like £29,000, not to speak of the annual expenses of upkeep. It had been said that the smoke in the district was not detrimental to the health of the people. Strange to say, at least two-thirds of those who were employed in the Blochairn Iron-Works, which were in close proximity to the park, lived from half a mile to two miles from the works. This seemed to him to be a sufficient argument that people were not desirous to live in such close proximity to works which emitted smoke. As one who had lived all his days in the east-end of Glasgow, he believed that he had as fair a knowledge as anyone of the workings in the north-eastern and eastern portions of the city. He had specially asked the Committee to report upon certain pieces of ground; but this report had not been given to him yet. When they had an expenditure of a million of money involved, they should have a report submitted to them which, instead of being upon two sheets of foolscap, should enable those who believed that other places were suitable to speak to them. When the subject first came before them, it was stated that the price would be £600 per acre; but the opposition was so strong that the Committee found it necessary to say that they would purchase under the Lands Clauses Acts. Already, to complete a transaction of £2700 under the Lands Clauses Acts, had cost £700 in expenses.

Ex-Treasurer GRAY said that they had, near the west-end of the city, gas-works at Dawsholm and Temple; and they had never heard that they destroyed the amenity of the neighbouring districts. Therefore he did not think there was so much in this argument as their friends were pleased to advance. He concurred entirely with the gentleman who had just spoken, that the matter had been too much hurried. It was known to Mr. Mitchell, the Convener, during the last two or three years, that new gas-works were required. But the Gas Committee were not aware of it; and why should they not have known? It was stated at the last Committee meeting that land at Balornock could be acquired for £350 per acre. Land adjoining Blackhills could be had at £250 per acre; and not long ago the City Parochial Board purchased land, a little further east, at £25 per acre. He was not going to object to the proposal of the Gas Committee; but it was not good to conduct their business as this was being conducted.

Mr. PATON thought there was only one course open to them—to approve of the minutes of the Gas Committee. The site, he believed, was not open to many of the objections which had been taken to it. This was by no means a residential neighbourhood. He had no doubt that, as Mr. Dobbie said, instead of doing harm to the district it would be one of the best things that could happen to it. There was necessity for coming to a conclusion at once. Mr. Foulis had told them in his report that if they did not acquire the ground and erect works, they would not be sure that the city could be supplied with gas for more than three years. In view of this fact, and that they must take the responsibility on their own shoulders and relieve Mr. Foulis, there was no course open to the Corporation but to adopt the report and go to Parliament to obtain the necessary powers. It should always be the duty of the Corporation to utilize their own land before they acquired that of other people. There was no necessity to take all the ground at £600 an acre, as they might not require more than half of it. Altogether, with the railway facilities which existed, and the stability of the ground, he thought that the proposal was the best which could be made to meet the requirements of the Corporation.

Dr. DOUGAN said he was one of those who believed that all public works from which noxious effluvia emanated should be put as far away into the country as possible. If after that people built houses round about the works, they had themselves to blame. He was very much surprised that a Corporation who were spending hundreds of thousands of pounds to get rid of the disagreeable effluvia from the Clyde should on the other hand place a gas-works close to residential houses, and close to a public park, where they desired the citizens from the more confined parts of the district to go out and breathe the pure air of heaven. In the neighbourhood of Alexandra Park there were numerous public works exhaling effluvia, disagreeable and dangerous to health. If they put down the gas-works there, they would almost encircle the park with works that were noxious and disagreeable. What about the other sites that had been proposed? He was not prepared to take the Engineer's or the Sub-Committee's word that there was no other ground within a reasonable distance of the city on which gas-works could suitably be built. He must be personally satisfied that such was the case before he agreed to the proposal. He could not think there would be anything serious in delaying the matter for a time. He had been on the Gas Committee for a year; and he never had heard a word said about the necessity for the erection of new gas-works. If it had been absolutely necessary, something should have been said during that time. In the face of all this, he could not support the proposal.

The LORD PROVOST called attention to the report of the Gas Committee dated July, 1898, which contained a paragraph to the effect that "as these extensions would exhaust the ground available for manufacturing purposes belonging to the Corporation Gas Department, it would be necessary to obtain parliamentary powers in the next session of Parliament for the purchase of additional ground for the erection of works, to meet

the continued increasing demand for gas." This was three months ago. The Corporation had approved of the report; and he wished to point out that it was not therefore only since the 27th of last month that they had known about the matter. He would also say from the chair that, as a member of the Finance Committee, the late Bailie Ure, along with the Engineer, made a proposal before his death, three or four years ago, to purchase the land of Blackhill. It was perfectly well known to him (the Lord Provost) that the Gas Department were getting into such a condition that they were bound to provide new works somewhere; but, as Bailie Mitchell had said, the negotiations had been necessarily very quietly and privately carried through. They must know that if it had come out that the Corporation were on the look-out for a large piece of land for purchase, prices would have gone up against them in every district. All the members of the Corporation were aware, however, that the ground was required.

Mr. O'HARE thought they had no alternative but to adopt the report of the Gas Committee, because there was no competent opposition. Besides this, there was a responsibility upon them with reference to the gas supply. One gentleman who supported the amendment said he had as good a knowledge of the district as anyone; and Mr. Rankine took upon himself the responsibility of allowing such a report to get into print. No other professional man had reported against the site which the Committee had adopted.

A division was taken, when 52 voted for the motion, and 10 for the amendment.

### MALVERN LINK GAS ARBITRATION.

(Before Mr. J. SHIRESS WILL, Q.C., Umpire.)

At the Westminster Palace Hotel, on Monday last week, an arbitration was commenced in regard to the purchase of the undertaking of the Malvern Link Gas Company by the Malvern Urban District Council. Mr. CORBET WOODALL was Arbitrator for the Company; Mr. CHARLES HUNT for the Council.

The Hon. J. D. FITZGERALD, Q.C., and Mr. FARRANT appeared for the Company; Mr. BALFOUR BROWNE, Q.C., and Mr. RAM represented the Council.

Mr. FITZGERALD, in opening the case, said the proceedings were taken under the Malvern Link Gas Act, 1897, to determine the amount to be paid by the Malvern District Council to the Malvern Link Gas Company for their undertaking. After giving the history of the attempts by the Local Authorities concerned to buy the undertaking, he said the Company proposed to base their claim upon the accounts of 1897.

Mr. BALFOUR BROWNE remarked that the value would have to be ascertained up to the time of the transfer, which would be the 1st of January next.

Mr. FITZGERALD said the works of the Company were most admirably situated for the manufacture of gas for the supply of the whole district of Malvern Link and Great Malvern. The total income in 1894 was £2158; in 1895, £2316; in 1896, £2441; and in 1897, £2404. The decrease in 1897 was owing to the Imperial Hotel taking its custom away. The profit on gas for 1894 was £866; for 1895, £953; for 1896, £982; and for 1897, £956—being a drop of £26. The quantity of gas made in 1888 was 6,581,000 cubic feet; and in 1896, it was 13,515,000 cubic feet—having doubled in these eight years. In 1897, it was 13,324,000 cubic feet; this again being accounted for by the loss of the Imperial Hotel for the last six months. The total income for 1897 was £2735; and the total expenses were £1778—leaving a balance of £956. He proposed to take this figure, and to make the multiplier 26½ years. This was a non-statutory Company; but the difference in value between a statutory and non-statutory concern was very slight; being about the cost of obtaining the Act of Incorporation. There was not a single instance where competition had been allowed against a non-statutory company. Then there would be an additional sum for surplus land and surplus capacity of works; for the works were very much in excess of the immediate requirements of the district. In ordinary cases there would have been a claim for 10 per cent. for compulsory purchase; but as this was an agreement to sell, he did not think they could claim this 10 per cent. They were, however, entitled to the cost of re-investment and of winding up the Company.

Mr. E. W. DREW, of the firm of Alfred Lass, Wood, and Co., said he had gone through the Company's books. In 1882, Mr. Deakes valued the works at £8500; and at present the total stock issued was £10,862, and the existing debentures were £1500—making a total capital of £12,362. The capital expenditure was £12,067. The quantity of gas made from 1888 to 1895 had rather more than doubled. He calculated the profit on revenue account for 1896 at £982.

In cross-examination by Mr. BALFOUR BROWNE, witness said that the £956 of profit for 1897 had to be drawn upon for interest and dividend; and as there were £1500 debentures, the interest would be taken from the £956 before a multiplier could be applied.

Mr. FITZGERALD submitted that the other side had agreed to take the accounts of 1897 as the basis of the claim.

Mr. BALFOUR BROWNE replied that they expressly reserved the right to go into the make of gas since 1897.

The UMPIRE decided that they must hear the evidence and contentions of the parties.

Witness (continuing) said the figure for repair of works in 1897 was 3-65d. per 1000 cubic feet sold; but in 1894, it was 5-70d. Of course, if repairs were taken at the latter figure, the profit would be reduced. The unaccounted-for gas was 11-22 per cent. The price was 4s. 10d. per 1000 cubic feet to the public; but if they paid within a month, they obtained a reduction of 10d.

Mr. Thomas Newbigging said he had visited the gas-works and the district supplied. The site of the works was freehold, of about an acre and a half in extent. There was room upon the site for extensions, which would admit of a very largely increased production in the future. The situation was an excellent one, both for the delivery of coals and other materials and for the supply of the district with gas. It was connected with the Great Western Railway by a siding. The works had 16 retorts, and were capable of producing 108,000 cubic feet of gas per



day of 24 hours. The actual maximum make was 66,000 cubic feet; but this occurred only on one day. This would leave 40 per cent. excess of productive power. The covered storage was equal to 450 tons, or ten weeks' stock, based on the maximum daily consumption. This was ample. The other apparatus generally—the machinery, exhausters, boilers, condensers, gasholders, &c.—were sufficient, and most of them in excess of present requirements. The scrubber power needed enlarging. Then there were storage tanks, smithy and fitting-shop, a dwelling-house for the manager, and two cottages for workmen. The works were capable of producing gas economically. There were 11 miles of mains; and they varied in diameter from 12 inches downwards. Having regard to the district and the mileage of the mains, the unaccounted for gas was reasonable. The structural valuation of the works was £11,964; and the capital expenditure to Dec. 31, 1897, was £12,067. The actual price realized for gas was 3s. 10½d. per 1000 cubic feet; and the consumption during nine years had risen from 6,581,000 to 13,244,500 cubic feet. The district was an increasing one, and several new streets were being laid out. The Company would be able to increase the dividend if they remained in possession of their undertaking. As to the difference in value between a statutory and non-statutory company, there was really no competition allowed in either case. Parliament would never permit a local authority to compete with a non-statutory company. The local authority must first of all purchase the company before they could set up another gas-works. As to his valuation, he took £938 18s. 9d. as the maintainable profit; and adopting 26½ years' purchase, this amounted to £25,038. Then in addition there was the profit on the sale of fittings of £9 7s. 2d., multiplied by five years, making £47. Again, there was excess land and surplus works £833. This included the coal-stores. They contained 450 tons; but the actual quantity required was 273 tons, so that there was an excess of 177 tons. The gross total was £26,216; and from this was deducted £1500 debentures, leaving £24,716. Adding to this 3 per cent. for winding up expenses and re-investment, £741, made a total claim of £25,457.

In cross-examination, witness admitted that in the Morley case, where he was Arbitrator for the Company, they deducted the cost of making a stand-by engine and boiler, but that was without his approval. The fact was that fully 80 per cent. of the gas-works in the country had not a stand-by in the shape of exhausters and boilers. At one time a non-statutory company used to receive 16½ years' and a statutory company 20 years' purchase. When money cheapened, and the value of non-statutory companies rose to 20 years, it was said the value of statutory companies was 25 years; but this was merely for want of reasoning the thing out.

Mr. H. E. Jones gave corroborative evidence. He agreed with Mr. Newbigging that the multiplier should be 26½ years' purchase. His figure for the maintainable profit was £1006, making a total of £26,826. Then the value of surplus works was £1391; and five years' purchase of the profit on the sale of fittings gave very nearly £47. His gross total value was £28,263 15s. 10d. From this he deducted the £1500 debentures; leaving £26,763 15s. 10d. He had not put anything down for re-investment or winding up expenses, which he thought should be done.

In cross-examination, witness said that he had allowed £50 more than the £956 profit on account of ammonia which at present was wasted. He made no difference between a statutory and non-statutory company. In fact, he knew some statutory undertakings that were not worth so much as non-statutory ones. He would only make some difference for the cost and the risk of applying to Parliament for an Act.

On Tuesday Mr. FITZGERALD said they had complied with the Umpire's suggestion, and the Accountants for the respective sides, Mr. Drew and Mr. Howard Smith, had agreed on the figures.

Mr. BALFOUR BROWNE: But merely as figures, leaving them to be argued upon.

Mr. FITZGERALD: Yes.

The following table was then handed in:

*Malvern Link Gas Company, Limited.*

We are agreed that the profit for the year 1897 may be taken as follows:—

|                                     |          |
|-------------------------------------|----------|
| Profit on revenue account . . . . . | £957 0 0 |
| Profit on fittings . . . . .        | 9 0 0    |

|                 |          |
|-----------------|----------|
| Total . . . . . | £966 0 0 |
|-----------------|----------|

Subject to the following:—

|                                       |          |
|---------------------------------------|----------|
| Income-tax . . . . .                  | £35 18 0 |
| Interest on temporary loans . . . . . | 10 7 9   |
| Interest on debentures . . . . .      | 65 5 0   |

|                 |           |
|-----------------|-----------|
| Total . . . . . | £111 10 9 |
|-----------------|-----------|

The above figures are arrived at after charging revenue with the following:—

|                                                                                                             |          |
|-------------------------------------------------------------------------------------------------------------|----------|
| Repair and maintenance of works (equivalent to 3½d. per 1000 cubic feet of gas sold) . . . . .              | £165 0 0 |
| Repair and maintenance of mains and services (equivalent to 1¼d. per 1000 cubic feet of gas sold) . . . . . | 60 0 0   |

Oct. 31, 1898.

(Signed) ERNEST W. DREW,  
HOWARD S. SMITH.

Mr. Newbigging was re-called, and showed that the production of gas and the profit since the 1897 figures were got out had largely increased.

Mr. John Gould, the Manager of the Company, spoke as to the condition of the works. He said that the mains were very good. The soil was marl and clay, and it did not corrode or eat the pipes.

Mr. BALFOUR BROWNE then opened on behalf of the District Council. He said the case was unique, and the Arbitrators would not have to value the undertaking on ordinary lines. It would not do to take the profit shown on the books, because it was easy to make large profits if they kept down the working expenses; and the particular year agreed upon (1897), the working expenses were kept down by reason of an unduly small expenditure on repairs and maintenance of the works and mains.

Mr. CORBET WOODALL: The working expenses in 1897 were considerably more than in 1896.

Mr. BALFOUR BROWNE said that might be so. There were some working expenses that could not be kept down; but a very usual way was to scamp the repairs and maintenance, which increased the amount that

could be carried to profit for that year. Taking the agreed figure of £957, this was not all profit, because there was included the interest on debentures. This was an outgoing; and the Company treated it as if it actually went into their pocket. By multiplying the £65 5s. by 26½, they brought up the debenture capital to £2000, while, as a matter of fact, it was only £1500; and the juggle was that in capitalizing it the Company had got it at £2000, but in deducting it they had only taken £1500—leaving the Council to pay £500 for debenture stock. This was wrong in principle; and he was sure the Court would not allow it.

The UMPIRE: Mr. Fitzgerald's argument is that when the undertaking comes into the hands of the purchaser, the latter will be able to borrow at a less rate of interest, and therefore his policy will be to pay off the debentures.

Mr. BALFOUR BROWNE: Certainly.

The UMPIRE: But it struck me that this was looking at the value of the undertaking when it comes into the hands of the purchaser.

Mr. BALFOUR BROWNE: It is; and that, of course, is improper.

The UMPIRE: I am not deciding it, but only mentioning it so that Mr. Fitzgerald may deal with it when he speaks.

Mr. FITZGERALD: Being terminable, if the undertaking had remained in our hands we could have paid the debentures off by the end of next year, and replaced them with a 3 per cent. loan.

Mr. BALFOUR BROWNE: That is a possible way of looking at it; but it is wrong, because you are going to take, not what the Company might have done, but what the condition is to-day. What you have first to arrive at is the maintainable profits that the shareholders can get.

The UMPIRE: Yes; but mind, I do not express a decided opinion.

Mr. BALFOUR BROWNE continuing, said it must be a mere accident that the shareholders could have lent this money; and therefore he contended that the Court would not allow it. Going to another matter, Mr. H. E. Jones had thrown in £50 for ammonia, which he saw was now wasted. This had never been earned; and to say that the Council might earn it when the undertaking came into their hands was sinning against the canon accepted by Mr. Fitzgerald that they could not look at the value in the hands of the purchaser but in the hands of the seller. Mr. Jones had pitch-forked £50 into profits, which was not earned, and which it would require considerable expenditure to earn; and therefore he asked that this should be disallowed altogether. Then he (Counsel) took out the debenture interest, and added £26 9s. 9d. as working expenses—leaving £854 12s. 3d. as maintainable profit, as against the £938 18s. 9d. of Mr. Newbigging, or the £1006 of Mr. Jones. Coming next to the crux of the case, by what was this amount of £854 to be multiplied so as to arrive at the capital sum? The figure the Company had put was 26½, as if it were the best established non-statutory concern in the world, instead of being the worst. Mr. Newbigging said the Company was worth this large number of years' purchase, because the Local Authority would not be allowed to compete. But the Company were not only not protected from competition, but the Urban District Council of Malvern had an absolute right to compete with the Company in the Malvern Link district. When they were before Parliament, they did not even think of protecting themselves against competition when the question was raised. The Link District Council got a clause inserted to prevent further competition. If he had been acting as Counsel for them when they obtained their Extension Order, and if the Company had asked for a clause against competition, he would have advised that it was a fair thing; but as they had not done so, they must suffer for their laches. This placed the Company in a very insecure position at present; and their undertaking must be valued accordingly.

Mr. CORBET WOODALL: When your clients became Malvern Link, did you not at the same time take over the agreement to purchase the undertaking of the Gas Company?

Mr. BALFOUR BROWNE: You must assume, for the purpose of valuing these works, that the Company is still existing and is going to exist. My clients are the Local and the Gas Authority, with power to lay mains and pipes and supply gas within this poor deluded Company's area. In the Provisional Order of 1867, my clients were enabled to establish gas-works; and we have now £3000 a year in hand with which to lay mains and compete, without having to go to the Local Government Board to borrow money, in which case we might be compelled to purchase the Company. We have power to borrow £80,000. I contend that, taking the profit of £854, you could not multiply it by anything; but in case you should take a different view, I have asked my witnesses to assume that the Council would have to go to the Local Government Board, and to fix a proper multiplier. The multiplier my witnesses (Mr. Colson and Mr. Valon) have adopted is 22 years, which comes to about £18,801. Then there is another claim—a monstrous one—on the part of the Company. They say they have got surplus land and surplus works, and the way this is calculated is to take a particular part of the works—condensers, or something—and say it is doing so and so, but it might do a great deal more. The only thing, however, in which the Company can legitimately claim to have any margin at all is the surplus land. My witnesses will say that the gasholder capacity is deficient, as there is only three-quarters of a day's supply; and we deduct something for this. To our total of £18,801 9s. 6d., we add for surplus land £204—making £19,005 9s. 6d. From this we deduct for deficiencies in condensing and scrubbing apparatus £200, and for deficiency in gasholder room £390, which leaves £18,415 9s. 6d. But to this has to be added five years' profits on the fittings, making the total £18,462 5s. 4d. The calculation which brings out this large figure is the basis that my learned friend has gone upon; but if the Court accept my argument that there is no prospective value, a very large deduction must be made.

Mr. W. A. Valon, in reply to Mr. RAM, said the works were on a suitable site, and were, for their class, very good. They had not any margin in regard to the retorts; and the coal storage, which was sufficient for about nine weeks, was ample, but not in excess. Neither the condenser nor the scrubber was sufficient. There was no more exhauster power than there should be. There was a deficiency of 13,000 cubic feet between the maximum make and the gasholder room. He estimated the structural value of the works and plant at £5355, and the land at £535. The total length of mains was 17,804 yards; and their value, £4499. Adding £302 for the meters and £112 for the stoves, brought his total valuation up to £10,803. Witness was then taken through his valuation of the undertaking (which proceeded on the assumption that there should be 22 years' purchase of the maintainable profit), and brought out a total



figure of £18,462 5s. 4d. When settling this figure, he had not been aware of any question being raised as to the legal position of the Company. He maintained that it was right to deduct the interest on debentures from the gross profit in arriving at the maintainable profit, and did not believe in the Company being able to pay off their debentures and obtain a loan at 3 per cent. If Great Malvern were to compete in the Link district, the Company would at once have to lower their price to that at present charged by the District Council; and this would mean a loss to the Company of nearly half their existing profits.

Mr. Howard Smith, of Messrs. Howard Smith, Slocombe, and Co., chartered accountants, having stated upon what information he had prepared the accounts used by the District Council in the case,

Mr. Alfred Colson said the capital account of the Company stood at £11,665, or £1014 per million cubic feet of gas sold, which was a high figure. His structural valuation came to £11,036. Leaving out the legal question as to the possibility of competition, he had capitalized the maintainable profit at 22 years' purchase, which was equivalent to the  $4\frac{1}{2}$  per cent. table. He brought out the total value of the undertaking at £18,408.

Mr. Henry Maybury, Gas Engineer and Manager to the Great Malvern District Council, said the Council were making a profit on the sale of gas in Malvern of from £2500 to £2800 a year. They were supplying gas at 3s. 2d. per 1000 cubic feet.

Mr. BALFOUR BROWNE, in closing his case, said nothing ought to be allowed for winding up and re-investment. If the undertaking were owned by one man, no winding up would be necessary; and it would not make a bit of difference to the purchaser that, instead of the works being owned by one man, they were owned by a Company. That was the Company's look out. In the Morley Act, which was passed last session, in order to give the Company the cost of winding up, a clause was specially introduced. Of course, the Umpire would not forget that Mr. Valon's and Mr. Colson's valuations were on the assumption that he (Mr. Balfour Browne) was wrong in his law. If he was right in his contention, their figures would be of very little assistance to the Court, because they were assuming a protected Company, while he said the Company had no protection whatever.

Mr. FITZGERALD, replying on the whole case, said Mr. Balfour Browne's point of law amused him, as the Company were being bought up under the Malvern Link Gas Act, 1897, which made it compulsory on the Link Council (whose obligations and liabilities were transferred to Great Malvern) to carry out a contract to purchase the Company, which was scheduled to the Act. If his learned friend was instructed to put forward such a contention, nothing more dishonest or more disgraceful had ever happened in his experience. But he believed it was really one of those flights of fancy by which Mr. Balfour Browne from time to time enlivened the monotony of arbitrations. Great Malvern had for forty years possessed the power to compete, but had never exercised it; and the power was absolutely taken away from them by the Act of 1897. In regard to the multiplier, it was impossible to say that there was any hard-and-fast rule; but looking to the fact that it was an improving Company, he thought his witnesses were justified in taking 26 $\frac{1}{2}$  years' purchase, as against the 22 years of the other side. He was not entitled to compensation for disturbance; but he was entitled to the actual cost of re-investment and winding up.

Mr. BALFOUR BROWNE: My learned friend has just said that our view was dishonest, and then he said that it was a flight of fancy. But it is my own fancy that we should succeed; and I should like the matter put in the form of a special case.

THE UMPIRE: You are entitled to a special case if you desire it. I do not know whether it will fall to me to decide this ultimately; but if it should, I do not propose, unless the parties wish it particularly, to have a "view." I shall weigh the evidence, and go by that.

This concluded the proceedings.

**Gas Workers' Wages.**—The West Ham Gas Company have granted an increase of 5d. per day to their men.

**Steyning Water Company, Limited.**—The first annual general meeting of the Steyning and District Water Company was held on Monday last week, under the presidency of Dr. T. Fuller. In submitting the report of the Directors, the Chairman explained that several attempts had been made to obtain a suitable site, and experiments had been conducted at various places. The well they had decided upon near Beeding would yield 210,000 gallons a day, and the water was of an exceptionally good character. The contracts for pipes and the construction of a reservoir were to be offered for public tender; and it was hoped that in six months all would be well supplied. The report was adopted.

**Proposed Extension of Bradford.**—On Saturday, the 29th ult., an important inquiry conducted by Major-General Phipps Carey, on behalf of the Local Government Board, in regard to an application by the Bradford Corporation for permission to extend the boundaries of the city, was brought to a close. About fifty local authorities, gas companies, hospital boards, and large property-owners, affected by the scheme, were represented; and the proceedings lasted, without intermission, from the 20th ult. to the above-named day. In the course of the inquiry, the Town Clerk of Bradford (Mr. G. McGuire) stated that the original idea of the Corporation was to purchase the undertakings of the several Gas Companies in the areas proposed to be annexed; in fact, the Town Council had, by resolution, pledged themselves to do this. In the case, however, of the larger portion of a Company's district being unannexed, only the part taken in would be acquired. An alternative proposal was to buy gas in bulk, and distribute it in the annexed districts at the Bradford price. On the closing day of the inquiry, Mr. John Niven, Engineer and Manager of the Clayton, Allerton, and Thornton Gas Company, gave evidence. He stated that, in addition to the places named, his Company supplied Denholme and Wilsden; the price being 2s. 6d. per 1000 cubic feet net. By being annexed to Bradford, Clayton would gain £307 19s. 1d., assuming all consumers had a discount of 5 per cent., which he did not think they would get. Replying upon the evidence, Mr. Balfour Browne, Q.C., for the Corporation, invited the Inspector not to concentrate his attention either upon Bradford or upon the outside places, but to look to the interests of the whole community that would form Greater Bradford in the future, and come to the conclusion that the proposed extension should be carried out.

## LOUGHBOROUGH GAS-WORKS PURCHASE QUESTION.

### The Ratepayers Consent to the Promotion of a Bill.

A Meeting of ratepayers and property owners of Loughborough has endorsed the proposal of the Corporation to promote a Bill in Parliament, to enable them, among other things, to acquire the gas-works and establish an electric lighting plant. The Mayor (Alderman W. Tidd) presided; and, in opening the proceedings, said he thought the ratepayers would agree with the Council that the present was an opportune time to seek powers to purchase the gas-works. He formally proposed a resolution, consenting to the promotion of the proposed Bill in Parliament, and to the opposition of any Bill introduced by the Gas Company for increased powers. Alderman Godkin, in seconding the motion, observed that thirty years ago a proposition to the same effect was mooted in the town, but fell through because it was then reported that the town, with a population of 11,000, was never likely to grow beyond that; but since then it had doubled. It must not be taken that the Council had any antipathy to the Gas Company, who had only done what they thought to be necessary to make their business pay. If, however, it was worth the while of the Company to borrow more money, it must be well for the Corporation to proceed on the lines proposed. Mr. Faulks, a member of the Council, in supporting the resolution, said that from 1836 to 1838 the capital of the Company was £13,330. It was increased, in 1868, to £25,000; and in 1886 to £40,000. Had the Corporation purchased the undertaking between the years 1836 and 1868, they would only have had to pay the premium price on £13,330; or between 1868 and 1886, on the £25,000. Now they had to purchase at the premium price on £40,000; and if they allowed the Company to borrow £15,000 or £20,000 more, they would later on have to pay the premium price on that also. Many questions were asked, in reply to which it was stated that there need be no fear as to the Corporation not getting the works at a fair price. The price of gas was at present 2s. 10d. and 2s. 11d. per 1000 cubic feet; and Parliament would fix the terms upon which the Corporation would be allowed to supply it. Asked whether all methods had been tried to purchase the works without reference to compulsory powers, Alderman Godkin said the Council had approached the Company fairly, and made offers to them; but they would not enter into negotiations, and said they did not want to sell. The Corporation then inquired if the Company would allow an expert to inspect the works; but they set their backs against that also. On the motion being put, it was carried with only one dissident—a member of the Council.

## BRIGG DISTRICT COUNCIL AND THE GAS-WORKS.

The advisability of purchasing the local gas undertaking was discussed by the Brigg District Council last Tuesday. The matter was introduced by Mr. J. Spring, who presided. He said the question had been prominently brought before him recently by statements made by Chairmen of other District Councils who had acquired similar property. The general experience was that considerable profit had been derived from gas undertakings, and that this had resulted in a reduction of the rates. At present the Gas Company had no statutory powers; but since this meeting of the Council was summoned, a communication had been received from the Secretary stating that next session it was the intention of the Company to apply for a Provisional Order. Under these circumstances, he thought the Council should immediately deal with the matter one way or another. Considerable discussion ensued; several members expressing the opinion that the electric light might in the near future supersede gas. But there was a general feeling that preliminary steps should be taken in the matter of purchasing the gas-works; and it was resolved that a meeting of the Council should be specially summoned to consider the proposal. In the meantime, the Clerk was instructed to write to the Company inquiring whether they were willing to sell their undertaking. A Committee was also formed to consider the matter, and to inquire into the cost and feasibility of introducing the electric light into the town.

## THE MUNICIPALIZATION OF GAS-WORKS.

### Terms of Recent Transfers—Mr. George Livesey's Views.

The owners and ratepayers of Reigate will shortly be called upon to determine by their votes whether or not the Corporation are to go to Parliament next year for power to acquire the undertakings of the local Gas Companies. The Town Council, as already reported, have decided, with one dissident, that this course shall be taken; and they are now only awaiting the result of the poll, which will take place on the 25th inst., to confirm or countermand the instructions given to the Parliamentary Committee to proceed. The views of the ratepayers are, of course, being freely expressed in the local papers; and an influential Committee, formed to support the decision of the Council, have issued a circular reminding the ratepayers that the present is their "last chance" of securing the gas undertaking, and setting forth the reasons for purchasing it. It is scarcely necessary to deal with these or with the general correspondence. Two communications, however, deserve notice—one by a "Special Correspondent," and the other by Mr. George Livesey, who, as a resident in the locality, naturally takes an interest in the question. The former gentleman's letter is as follows:—

Now that the Reigate Town Council has decided to promote a Bill for the purchase of the Redhill and Reigate Gas Companies, it will not be uninteresting to inquire as to what is likely to follow. After what occurred in Parliament in the early part of the year, the probability, if not the certainty, is that the Bill to be promoted by the Corporation will be passed; for in recent years the Legislature has looked with increasing favour upon the purchase of gas undertakings by municipal bodies. Rarely has a Purchase Bill promoted by a local authority been thrown out. A case did occur last year, when a Bill promoted by the Stirling Town Council was rejected; but the result was due more to dissensions

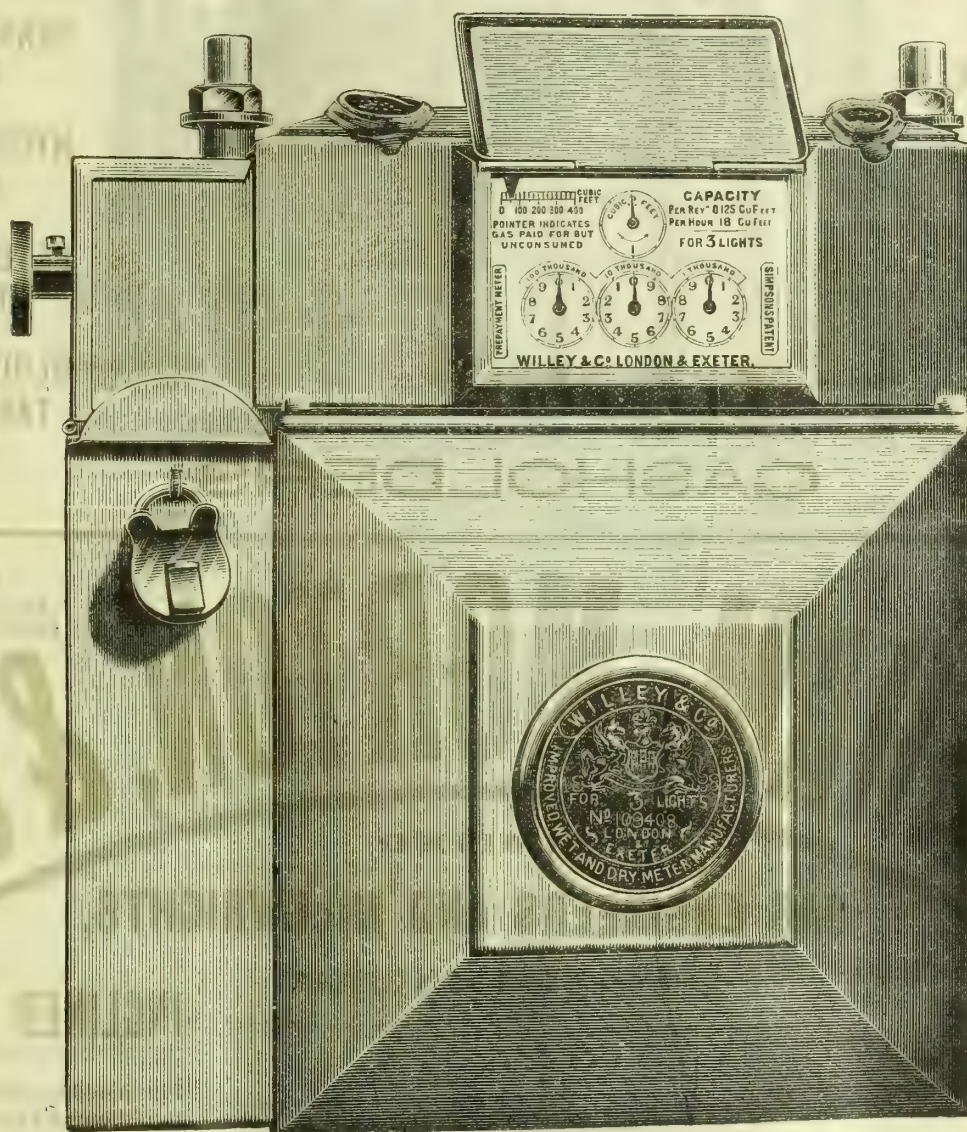


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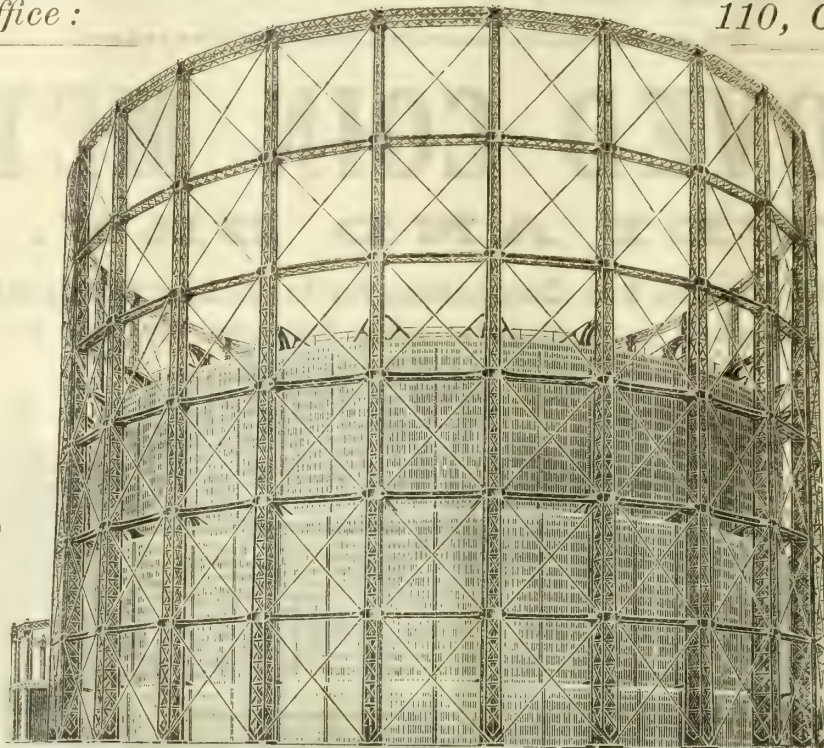
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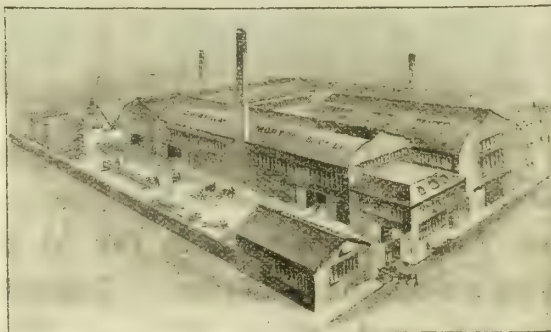
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in the Town Council itself than to any question as to the desirability of the municipalization of the gas-works. The sequel to the rejection was that the Stirling Gas Company secured a Bill this year; and now the members of the Stirling Town Council are busy trying to shift the responsibility to one another's shoulders. That the present feeling of Parliament is in favour of municipalization is proved by what happened in the case of Yeovil this year. The Yeovil Corporation and the Yeovil Gas Company promoted competing Bills—the one for the purchase of the gas undertaking, and the other for extended powers. It was proved that the Company had conducted their business in an unexceptionable manner, and yet the Corporation's Bill was passed in preference to that of the Company. The only concession made to the Company was the insertion of clauses in the Corporation's Purchase Bill enacting that the purchase price, to be settled by arbitration, is to be fixed on the most liberal basis possible. This arbitration has not yet been held. When it comes off, it will be well worth following, as it is generally admitted by experts that it will create a new precedent in gas-works arbitrations; and it may be found to have some bearing upon the Redhill case.

Several more or less important arbitrations have taken place within the last few years, which it may not be uninteresting to consider for a moment. The prominent feature in them all has been the wide difference between the amounts asked and offered for the undertakings. The method adopted of arriving at the value of a gas undertaking is to ascertain the maintainable annual profit, and to multiply that by a certain number of years. The theory is that the amount given should be sufficient to enable the shareholders of the bought company to secure an equal income from an equally safe investment. This affords much scope for the ingenuity of the experts who are called in to assist the arbitrators. They first differ as to the maintainable profits, even though the company concerned may have been paying regular dividends for years. An outsider would think that in such a case the maintainable profit would be the dividend; but the experts do not look at it in this simple light. The company's witnesses strive to show that a larger dividend could be paid; and the experts on the other side insist that if the works were kept in a proper state of repair, and gas sold at a reasonable price, the dividend could not be paid. As an instance of the disputes that may arise as to what the maintainable profit is, the Ashford Arbitration, held last year, may be cited. Parliament had fixed that the purchase price was to be 24 times the maintainable profits—that is, 24 years' purchase—and, therefore, all that had to be ascertained was the amount of the maintainable profit. A simple process one would have thought in the case of an undertaking enjoying a virtual monopoly. Yet the Company's expert witnesses said the maintainable profit would be between £2200 and £2300; and the Local Authority's witnesses said it was only £1100. The Arbitrator decided that the right figure was £1420.

It is seldom, however, that Parliament thus simplifies the arbitration by fixing the number of years' purchase. It is clear that the more the years' purchase secured by the selling company the better security will the shareholders be able to obtain to yield them the same income. Suppose a company paying a 10 per cent. dividend. If that is bought at 25 years' purchase, the shareholder can re-invest his money in a good 4 per cent. industrial preference stock, and still enjoy the same income. If he gets only 20 years' purchase, he must re-invest in a riskier 5 per cent. stock to secure the same income. If he gets 30 years' purchase, he may enjoy the security of the stock issues of a big municipal corporation. The result is that there is always a big fight over the number of years' purchase to be given. In a case that occurred in 1896—that of Matlock Bath—the difference between the two sides was no less than 8½ years. The Company claimed 26½ years, which is a favourite figure nowadays, and the Local Authority offered 18 years. As there is never agreement as to what the maintainable profits are, and the arbitrators give only lump sums in their awards, one is precluded from comparing the demand and the offer with the sum paid in terms of years' purchase; but in the case of Matlock Bath the total sum awarded was £16,726, against £28,000 asked and £9000 offered. In a case just settled—that of Morley—30-77 years was asked; representing, according to the Company's view of the maintainable profits, a purchase price of £134,000. The Corporation offered 25 years' purchase of a much smaller maintainable profit, giving a total of £80,000. The award is £109,866. In the Ystrad arbitration last year, the Company's witnesses put the value at between £202,000 and £204,000; while the Local Authority's figures were between £86,000 and £94,000. The award was £126,049. The Cowes Gas-Works were also transferred last year. The sum asked was £60,000, and the sum offered just half. The award was £52,150, which was equal to about 27 years' purchase of the previous year's profits, without any corrections to arrive at the maintainable profits. This year the Swadincote Gas Company asked £52,000, was offered about £20,000, and received £34,200. In 1896, the Falkirk Company asked more than £115,000, was offered £40,000, and received £77,050. In the same year, the Chesterfield Company asked £220,000 and received £106,500. Perhaps these recent instances are sufficient to show that prophecies about the results of gas-works arbitrations are not to be rashly indulged in by the prophet who has any regard for his reputation.

Mr. Livesey began his letter by requesting that, as his name had been somewhat freely used at the recent public meeting of ratepayers, and opinions and statements attributed to him which, if not corrected, might mislead the public, opportunity should be given to him to put them right, and make some general remarks on the subject of the purchase of gas undertakings by local authorities. He then proceeded as follows:—

I am not, and never have been, a shareholder in either Gas Company; and not residing in Reigate, I am not a ratepayer. But I have an interest in the question of cheap gas as a consumer in the Reigate Company's district. I do not know what statement of mine could have led the Mayor to say that I "told him that there was no gas company in the world that could stand against a corporation," because I hold an exactly opposite opinion. Nothing in the way of business would give me so much satisfaction as to see the gas supply on the north of the Thames administered by the London County Council, while that on the south remained in its present hands. The satisfaction would be derived from the competition, not from the purchase of the northern Gas Company, for I should regard the latter as a great misfortune for the gas consumers; and the same may be said in regard to Reigate.

The supply of gas is, and always must remain, a monopoly; and that being so, it is surely much better for the consumers to be supplied by a company, subject to modern legislation, whereby it is made to the interest of the company to serve the consumers well, and with the additional advantages of the municipality to see that the parliamentary requirements are fulfilled, than for the monopoly to be in the hands of the municipality. In the latter case, there is no protection for the consumers. The municipality has no interest in doing well by them; its only interest being to extract as much as it can, or as it dare, from their pockets for the benefit of the ratepayers, who are by no means the same body as the consumers.

English municipalities are always anxious for large surplus profits from their gas undertakings to be paid over to the borough fund in aid of the rates. In Scotland it is illegal, as it certainly ought to be in England, to make these surplus profits, which are very easily obtained by the simple process of charging a higher price for gas than would otherwise be necessary. By the Scotch system, gas is supplied at a price high enough to cover all legitimate charges—viz., for manufacture, administration, interest on the loan capital, and the sinking fund to pay off the loan or debt within a fixed term. If from any cause, such as an increase in the cost of manufacture, the receipts are not sufficient to meet all these fair and proper charges, the price of gas is of course raised; consequently, the entire burden and risk connected with the undertaking and the redemption of the debt is borne by the gas consumers. It is therefore unjust to extract from them any surplus profits to help the ratepayers, who bear none of the burdens and take none of the risks of the business. Why, then, should they take profits to which they are not entitled. To describe such action there is only one word—"robbery"—that is applicable. It is, in short, robbing Peter the consumer to pay Paul the ratepayer. If it is said that consumers and ratepayers are the same, the answer is that many ratepayers either do not consume gas at all—possibly the Electric Lighting Order will soon come into operation—or they use very little gas; while others use much above the average. Therefore the taxation of gas for public purposes is most unequal, and consequently unjust.

There appears to be an opinion that it is only necessary to promote a Bill for purchase, and that Parliament, as a matter of course, will give the power. I am not aware that such a request has ever been granted against a company under an Act of Parliament like the Redhill Company, or against any company when that company has not also had a Bill of its own before Parliament. The probability, therefore, is that the Council will be "sent empty away," somewhat sadder, wiser, and poorer than when they with so light a heart entered upon this business. If purchase were approved by Parliament, it would be on arbitration terms, with 10 per cent. above the full value added for compulsory purchase. It is, therefore, perfectly certain that the Mayor's estimate of £161,000 for the two Companies is woefully under the mark. Nothing less than 28½ years' purchase of the maximum dividend is now given for statutory companies; 28½ years' purchase was the rule five years ago, and since then the value of gas shares has risen very considerably. It is therefore very improbable that less than 30 years' purchase would be awarded for Redhill, with 10 per cent. in addition for compulsion.

As to the Reigate Company, being non-statutory, a few years' less purchase would be awarded, of course, with the extra 10 per cent. for compulsion. Add the expenses of the arbitration, which the town would have to pay, add also working capital and money for extensions, and there will not be much left out of a quarter of a million, on which interest at about 3 per cent. and the sinking fund of about 1 per cent. make the total charge not less than 4 per cent., or some £10,000 a year. This being considerably more than the total earnings of the two Companies, which the Mayor took at £3500 a year, the deficiency must be met either by economies and improvements in working or by an increase in the price of gas. Judging from what one sees of the business capacity of the Town Council, it is very unlikely that the deficiency would be made up by the first-mentioned plan, but rather that the much simpler method of increasing the price of gas would be adopted. Seeing how hopelessly the Town Council is divided by the mutual jealousy of Redhill and Reigate, is it not possible, if the Gas Companies were purchased—one being in Redhill and the other in Reigate—that this would prove an additional bone of contention, and a further obstacle to good management?

I now come to the other side of the question. The Mayor said: "Mr. Livesey was so disgusted with the greed of the Reigate Company that he has refused to have anything to do with them since." I did say that they were very greedy; but not that I had refused to have anything to do with them. I never have advised or assisted them in any way, and have never been asked to do so, though I have advised the Redhill Company. The Reigate Company, in their own Bill of last year, which was not proceeded with, put their expended capital at £20,000 with a 10 per cent. dividend; but by the terms of the proposed amalgamation with Redhill (inserted in the Redhill Bill), the Reigate Company's paid-up capital was put at £35,000, at 7 per cent., equal to £24,500 of 10 per cent. I told the Redhill Company that this was excessive. But the mischief was done; and it was this greediness which wrecked the Bill. They have also for a considerable time charged too high a price in Reigate. Their profit, which the Mayor puts at £3500 a year, is equal to 17½ per cent. on their capital, while they are actually paying 12 per cent., or £2400 a year. The difference of £1100 at least ought, in common fairness, to go to the consumers in the shape of a reduction in price. The Redhill Company make no surplus profit; but I think improvements might be made there which would also enable them to reduce the price.

Having said so much on both sides, I feel it incumbent upon me to say a little more to indicate in fact what appears to me the best course for all parties—the consumers, the Companies, and the town. The first step is to bring the Town Council and the Companies into friendly co-operation for the common good of the consumers. This is probably hopeless; but for all that it is right. The antagonism so generally shown by public authorities to gas companies—there are faults on both sides—does nothing but harm. Failing friendly co-operation, however, there is no question that the right thing is for the Companies to amalgamate on fair terms. The Reigate Company must be content with £20,000 of 10 per cent. sliding-scale capital, which, considering they would then have statutory powers, would place them in a better position than that which they now occupy, and would set free £1500 a year to go towards a reduction of price. This reduction would, in its turn, entitle them to an increase of dividend under the sliding-scale. Moreover, the



Amalgamated Company would be large enough to pay a fair salary to a competent engineer and manager, which neither Company is sufficient for at present. Improvements and economies could then be effected that would benefit Companies and consumers alike; and I see no reason why in a short time a material reduction in the price of gas should not be made. If the Town Council and the Companies could meet in friendly conference to agree upon the terms of a Bill to be promoted by the Companies, all would be well; but if not, the only alternatives for the Companies are either to remain in their present unsatisfactory state, or to promote a Bill independently of the Town Council, but most certainly not concurrently with the Council's Bill for purchase.

The municipal ownership of gas-works is perhaps the most striking survival, or revival, of—

"The good old rule, the simple plan,  
That they should take who have the power,  
And they should keep who can."

They certainly do take that to which they have no right from the consumers; and but for the fact that gas companies still exist, they would take and keep more. In short, it is only the comparison with the companies that compels them to make any reduction. Were there no companies, gas would be maintained by the English corporations at a uniformly high level, and no further reductions would ever take place. On these grounds, I object to the extension of the socialistic principle of municipalizing gas undertakings anywhere and everywhere.

### SOUTH AFRICAN LIGHTING ASSOCIATION, LIMITED.

#### Increased Storage at Port Elizabeth.

Our readers may remember that a few months ago we noticed the holding of a concert in the steel tank for the new gasholder at the Port Elizabeth works of the South African Lighting Association, the contract for which had been placed with Messrs. S. Cutler and Sons. The firm only commenced operations at the beginning of the year, and the tank was up by the 24th of May. Some idea of the size of the structure may be gathered from the fact that about 500 people were comfortably entertained on the occasion above referred to. It is 74 feet in diameter, 18 feet high, and holds 1,300,000 gallons of water, weighing 5872 tons. As the part of the town on which the tank stands was originally bog, the Engineer of the Association (Mr. W. Arnott) laid a good concrete foundation on the surface, and the tank was erected upon it. The guide-framing of the holder, which is in three lifts, rises to a height of 75 feet; the storage afforded being 200,000 cubic feet, or three times the present capacity. The plates of the holder were all hand-riveted; something like 100,000 rivets being employed. The work of erection has been personally superintended by Mr. Arnott; and it was successfully completed early last month. The gradual rising of the holder on being tested was watched with considerable interest—some Kaffirs gazing open-mouthed at the phenomenon. In addition to the new holder, extensions of the manufacturing plant have been carried out, including four settings of retorts, with Gibbons's generator furnaces.

In connection with the filling of the tank, an interesting discovery was made. As already mentioned, the tank holds nearly  $1\frac{1}{2}$  million gallons of water; and to have taken this large quantity from the town supply would have withdrawn about half of it, and would moreover have cost several hundred pounds. A well was therefore sunk on the premises; but, after going down some 30 feet, no satisfactory flow was found. While the excavation was proceeding, a copious fresh water spring was struck within a few feet of the surface on another part of the premises; and it was found to yield 140,000 gallons of water a day. From this source the tank was soon filled with a pulsometer pump, at a cost of only a few pounds.

**Kingsbridge Water Supply.**—After considerable negotiation with the owner of the Borough Estate, the Kingsbridge Urban District Council have decided to apply for a Provisional Order for the purchase of land for the construction of water-works. Mr. J. S. Hurrell, the Chairman of the Council, stated at a recent meeting of that body, that Mr. E. Sandeman, Water Engineer to the Plymouth Corporation, confirmed the opinion previously expressed that the Borough scheme was the best. The owner of the estate had offered to sell it for £10,000; but was informed that the highest price the Council could afford to pay was £7500. Subsequently the offer was increased to £8000, but it was declined; and the only course now open was to apply for a Provisional Order.

**The Quality of the Upper Derwent Waters.**—It will be remembered that the Leicester Corporation are now maturing a Bill to obtain power to impound the waters of the Upper Derwent and Ashop, and convey them to Leicester—a distance of 66 miles—at a roughly estimated cost of £1,500,000 sterling. As, however, several of the local medical men have expressed the fear that the water might introduce "Derbyshire neck" into Leicester, Sir Edward Frankland was consulted on the subject. His reply is considered both reassuring and satisfactory. "No fear," he says, "need be entertained that this disease could be introduced into Leicester by the supply to that town of the upper waters of the River Derwent. The districts in Derbyshire which suffer from the disease are situated upon the coal measures, which impart to the water flowing over, or percolating through, them an extreme degree of hardness, caused by the solution of salts of lime and magnesia; and it is well known that such hard waters favour, if they do not actually cause, the disease in question. On the other hand, the soft waters of Derbyshire, such as those supplied to Manchester, Macclesfield, and Buxton, produce no such effect. The contemplated supply from the upper reaches of the Derwent, besides possessing an extremely high degree of organic purity, is remarkably soft, being almost absolutely free from salts of lime and magnesia. It is, in fact, for all dietetic purposes, one of the most excellent waters in the kingdom." It appears that "Derbyshire neck" is at present not unknown in Leicester. So far, therefore, from the disease being increased by the introduction of the pure and soft water of the Derwent, Sir E. Frankland thinks the hope may be entertained that by the use of a water having only one-seventh of the hardness of the present supply, the disease in the town may be entirely extinguished.

### GAS APPLIANCES AT THE BREWERS' EXHIBITION.

There was no very striking novelty, as far as gas appliances are concerned, at the Brewers' Exhibition, held at the Agricultural Hall, Islington, last week. In the domain of lighting, the incandescent gas system was again well represented. The Welsbach Company occupied their accustomed place at the end of the arcade leading to the hall from the Islington Green entrance; and a splendid display they made. In the hall itself, various other incandescent gas-burners—the solid-cone, "Daylight," Wilson, Somzée-Greyson, &c.—were to be seen, either at special stalls or employed in lighting exhibits; and Mr. C. Maynard Walker showed his "Electricpatt" wind and weather proof gas-lamp, suitable for use with incandescent or any other burners. As on previous occasions, the gas-stove makers were well to the front—Messrs. Arden Hill and Co., the Davis Gas-Stove Company, Limited, and Messrs. Richmond and Co., Limited, all making good shows; while Messrs. S. Clark and Co. had, as usual, an excellent assortment of gas and oil bar-stoves, mullers, &c. The use of gas for motive power was exemplified by the well-known types of engines supplied by Messrs. Crossley Bros., Limited, and by Messrs. J. E. H. Andrew and Co., Limited; Messrs. Lawton and Parker, of Openshaw, showed their improved "Otto" engine, for which Mr. J. Lawton was awarded a silver medal at the Industrial Arts and Manufacturers' Exhibition at Manchester; Messrs. Blackstone and Co., of Stamford, had at their stand a gas and an oil engine driving dynamos; and the "Gardner" engine, specially designed for running up to high speeds for electric lighting, was shown by Mr. G. F. Zimmer, of Mark Lane. At the stand of this gentleman was to be seen one of the most interesting exhibits in the hall. It was a full-size working model of the Kreiss swinging conveyor, which is largely in use on the Continent for transporting materials of various kinds. As shown, it was conveying grain; but it will, of course, carry coal or coke, and we believe it has been adopted for this purpose in the gas-works at Zurich and Geneva. The appliance consists of an open trough, fixed on inclined springs, either on the floor or suspended from the ceiling. The trough is set into a shaking motion by means of a small countershaft and crank. The material, which is deposited in one end of the trough, travels steadily forward to the other. The trough can be made any length, and can be extended without disturbing the driving-gear. The conveyor may be driven at any point; thereby enabling the driving power, which is stated to be small, to be taken from the most convenient source. Another exhibit which may find a place in gas-works was the Bundy time-recorder, by which every workman records his own time. It is a simple and ingenious clockwork arrangement, and is already in use at the Eastbourne Gas-Works.

### ELECTRIC LIGHTING NOTES.

Last Saturday evening, the shops and private residences around Hampstead High Street were in partial darkness, the Vestry's electric lighting installation having temporarily failed.

The electric light seems to be a success in the little town of Chagford, on the verge of Dartmoor. At a parish meeting last week, it was stated to have been satisfactory from the public lighting aspect, and the arrangement with the owners for the lighting of the streets during the present winter was renewed. As there was a balance in hand on the lighting fund, it was decided to levy a rate of only  $1\frac{1}{2}$ d. in the pound on houses and  $\frac{3}{4}$ d. on land, as compared with  $2\frac{1}{2}$ d. and  $\frac{3}{4}$ d. last year.

On the application of Alderman Page, the Lincoln City Council agreed last Wednesday to seek the permission of the Local Government Board to borrow an additional £19,000 for electric lighting purposes. The information laid before the Council was to the effect that about 4 miles of cable had been put down, and that the light would be available in a few weeks at most. To meet the demands of the citizens, the Council found it already necessary to extend the mileage to about ten, and the capacity of the works from 5000 to 18,000 8-candle power lamps.

The West Hartlepool Corporation have not yet (says the "Northern Echo") been able to adjust the difficulty which has arisen with regard to the plans for the electric lighting station. It will be remembered that those originally submitted by Professor Kennedy would have entailed a cost in carrying out far beyond his first estimate (see *ante*, p. 825); and though he has forwarded revised plans, the Committee entrusted with the matter appear to be unable to come to a satisfactory decision respecting them. They have therefore invited him to visit the town for the purpose of thoroughly discussing the matter. From all this it would seem that there has been a blunder somewhere respecting the original estimate as to the cost of a station adequate to local requirements.

A special meeting of the Glossop Town Council was held yesterday week to determine whether or not a resolution to apply for a Provisional Order to enable the supply of electricity should be rescinded. Captain Partington presented a petition, signed by 933 persons, protesting against the Corporation undertaking the supply; and he moved that the former resolution be rescinded. He pointed out that the petition had been signed by a number of mill and large property owners; and he contended that the scheme would be a financial failure. He was not at all against the electric light being introduced into the borough; but those people who wanted it should pay for it, and not tax the remainder of the inhabitants of the district. It was eventually decided that the Council should apply for the Provisional Order; but notice of motion was given to discuss on Nov. 9 as to whether or not the Corporation should transfer the Order to a private Company.

The relations between the Ilfracombe District Council and the Gas Company appear to stand upon an unusually good footing. Recently negotiations were opened up with the Council by the Electrical Distribution Company, who were anxious to acquire the powers possessed by the Council for the supply of electricity in the district. The Company made proposals which very favourably impressed the Council, and were described by the Chairman (Mr. H. Braund) as excellent. Good as they were, the Council appear to have concluded that the whole of the advantage of the concession would not be on their side; and before closing with the offer, they decided to approach the Gas Company, to see if they cared to take up electric lighting. Being a local industry with local capital, Mr. Braund explained, they thought the Company should



have the first option. If they could offer as favourable terms as the Electrical Distribution Company, they ought to lose no time in negotiating with the Gas Company. This is certainly a pleasant variation from the usual denunciation by local authorities of the monopoly of gas companies, and their eagerness to welcome a rival illuminant in the electric light.

In addition to the £68,152 already borrowed for electric lighting purposes, the Cheltenham Town Council desire to obtain the sanction of the Local Government Board to a loan of £17,200. Evidence in support of their application was laid before Lieut.-Col. A. E. Smith last Friday; and, as will be seen, it showed that the Council are hopeful that the undertaking will this year earn sufficient to pay the whole of the interest and the amount required for sinking fund. Figures given by the Deputy Mayor (Alderman Norman) revealed that in 1895-6 47,700 units of electricity were sold; the gross receipts being £1050. In the following year the figures were 90,300 units and £2040; in the next, 140,600 units and £3215; and a moderate estimate for the current year gave 204,200 units and £5020 as the receipt. After allowing rebates and for the street arc lighting, he put the receipts for the current year at £6600 net, as compared with £971 net in the first year. The first year's trade result was a deficit of £622; in the following year there was a surplus of £54 on the working expenses to go to the sinking fund; in the next year the surplus was £1262; and he put the figure this year at £3300, which was sufficient to pay the whole of the interest and the amount required for the annual sinking fund. There was no opposition.

A writer in a local paper comments on the evidence given by Mr. R. Hammond at the recent Local Government Board inquiry at Hastings, noticed last week. The witness, it may be remembered, said he could prophesy good results to the Corporation from the purchase of the electric light undertaking; and the writer remarks: "Mr. Hammond made a great point of the success of corporation ventures in many places; but he was bound to admit that in the instances he cited electric lighting had been started under the most auspicious conditions. The corporations, in short, where the greatest success has been achieved have been in the position to take advantage of the accumulated experience and knowledge gained after many years of research, mainly at the expense of the ordinary investor. Very different is the case when a corporation takes over a concern not only possessing much obsolete plant, but so circumstanced as not to have been able to benefit to the extent to which more prosperous companies have benefited by the achievements of electrical science. That the Hastings Corporation will have to incur great expenditure in order to meet the demands made upon them, no one who knows anything about the matter doubts; and after they have spent their money, they will not be in nearly so good a position as they would be if they started upon an entirely new basis. The one thing essential at the present time for this borough is that every enterprise, of whatever character, undertaken, should lessen, as the result of its operations, the demands made upon the ratepayers. Mr. Hammond was very careful to leave out from his evidence all allusions to places where the reverse of this has happened. But he might have given one place close at hand—Brighton, for instance. In 1892—six years ago—Brighton was paying for public lighting by gas a total sum of £9095, and the general district rate was 2s. 10d. in the pound; they are now paying a total of £11,937 for gas and electric lighting, and the rate has risen to 3s. 3d."

Further complaints about the bad arc lighting at Hampstead were made at last Thursday's meeting of the Vestry; and Sir H. Harben, the Chairman, personally brought the Chief Engineer to task for not remedying this scandalous state of things after the exposure at the previous meeting. He suggested that a competent assistant, and not an artisan, should now inspect the lamps and report to the Chief Engineer. This gentleman, in defence, explained that 28 lamps were connected with a dynamo which can only serve 26; and, besides, this engine was not properly "governed," though the makers are daily endeavouring to rectify this, but so far without success. After a few more uncomplimentary remarks from disaffected members, the Vestry considered the Committee's report, which stated:—"(a) That they had carefully considered the following reference from the Vestry of Oct. 6, 1898: 'That it be referred to the Lighting Committee to consider and report whether a reserve fund should be formed in connection with the Vestry's electric lighting undertaking.' (b) That, under the Hampstead Electric Lighting Order, the Vestry may, if they think fit, provide a reserve fund, by setting aside, out of the profits of the undertaking, such money as they may from time to time think reasonable, and investing and accumulating it at compound interest, until the fund amounts to one-tenth of the aggregate capital expenditure. (c) That the reserve fund would be applicable to answer any deficiency at any time happening in the income of the Vestry from the undertaking, or to meet any extraordinary claim or demand. (d) That the Vestry have already borrowed for electric lighting purposes the sum of £116,080, and one of the conditions upon which this money has been lent is, that if any portion of the plant, &c., upon which it has been expended requires renewal during the term for which the money was borrowed, the cost thereof must be paid out of revenue. With the exception of £5000, the whole of this money has been borrowed for the term of forty-two years. (e) That a large proportion of the plant, &c., provided out of borrowed money will require to be renewed before the expiration of the term for which the money was borrowed." The Committee thereupon recommended that a reserve fund should be formed; and that it should be referred to the Finance Committee to consider and report on the matter. To this the Vestry agreed; but there was some dissent expressed to the Committee's further statement that they were "strongly of opinion that the whole of the profits arising from the undertaking should be set aside to form the reserve fund above-mentioned." The Finance Committee's action will be interesting.

#### METROPOLITAN WATER SUPPLY COMMISSION.

The Commission, which held its last meeting on the 25th of July, resumed its sittings yesterday—Viscount Llandaff presiding. It will be remembered that, when the adjournment took place, Mr. Reginald E. Middleton, who was an Assistant-Commissioner on Lord Balfour's Commission, and is Joint Engineer with Mr. W. H. Hunter to the Staines Reservoirs Committee, was under examination by the Chairman, and that his evidence was not completed. On the Chairman taking his seat,

he stated that the President of the Local Government Board had written to the Commission asking them to take evidence regarding the question of inter-communication between the different Companies, and to report upon it as soon as possible. Mr. Pope said that, since the communication from the Commission to the Companies on the point, the latter had met and carefully considered what their position should be with regard thereto. They were prepared to offer general evidence as to the practicability of such a matter; but as it involved so many questions of detail and legal matters, it appeared to them that it would be desirable to save the time of the Commission to direct their evidence to the general question rather than to go in detail with respect to any particular scheme of connection. The Commission were also aware, he believed, that the result of inter-communication between the Companies was that they had come to the conclusion that it would be a convenience to promote a Bill next session obviating these questions of detail; and they would undertake to bring forward such a Bill. He proceeded to call attention to a series of resolutions agreed to by the associated Companies, expressing in general terms their views with regard to such legislation. Briefly, it was that, while a scheme of inter-communication was perfectly practicable, it would be desirable that some authority should be armed with power to say how and in what way connection should be made—not merely when the emergency came, but anticipating the necessity; and the Companies would suggest that the details might be left to the Local Government Board. Further conversation having taken place, Mr. Ernest Collins, Distributing Engineer to the New River Company, was called, and gave evidence regarding means of effecting inter-communication between all the Companies. The proceedings will be reported at greater length next week.

#### THE LONDON COUNTY COUNCIL AND THE WATER QUESTION.

##### Financial Considerations—The Water Companies' Undertakings to be Acquired.

By the recommendations concluding the report of the Water Committee of the London County Council (see *ante*, p. 985) which came under discussion last Tuesday, the Council, it will be remembered, were advised to ask Parliament for power to purchase the undertakings of the Metropolitan Water Companies, and to bring an additional supply of water to London from Wales. As these proposals involved capital expenditure in excess of £5000, the Standing Orders of the Council directed the Finance Committee to report upon the financial bearings of the question. They accordingly did so; and their report was dealt with in the article on "Water and Sanitary Affairs" last week. The Committee were, of course, not in a position to make for themselves any estimate of the expenditure involved; but they were assisted by a memorandum prepared for them by the Comptroller (Mr. H. E. Haward), and circulated to the Council. The Committee's report is as follows:—

The subjects of purchase and of additional supply have been discussed at length before Lord Llandaff's Commission and in the reports of expert officers of the Council; and we do not think that fresh investigations on our part would add materially to the information before the Council, or would justify us in asking the Council for further time to make our report. Indeed, the data for framing a trustworthy estimate of the cost of purchase do not exist; and we shall not put forward calculations based upon assumptions for which we have not a warrant. There are, however, figures which represent facts, and upon which, therefore, reliance may be placed. The net income of the Companies, after payment of prior liens, is an ascertained fact; and the Comptroller estimated, in evidence before Lord Llandaff's Commission, that the purchasing authority would in 1901-2 enjoy a net income of £1,030,000. This estimate assumed a progress in gross profits during the five years from 1896-7 corresponding to that which obtained during the preceding seven years. It assumed also that the water-rates would continue to be levied as at present. We think that the Comptroller has proceeded upon a sound financial basis, and that the Council may bear the figure of £1,030,000 in mind when it is considering the proposals of the Water Committee. Lord Llandaff asked what was the amount of capital, the interest and sinking fund on which could be met by a net income of £1,030,000. This also is a matter of simple calculation dependent on rate of interest and term of redemption. By these data the Council may measure, to some extent, the financial result which may follow from purchase.

The question of additional supply raises a different financial issue. It is admitted that, under any circumstances, the safety of London requires a large outlay in order to secure a supply which within a comparatively short time will be a necessity. The outlay involved will earn no immediate income; and it must be incurred either in providing storage in the Thames Valley or in bringing water from a new source. It is not, therefore, a question whether fresh outlay can be avoided. On this point all parties are agreed. It is a question which of two costly schemes will best attain the end in view. The storage scheme may cost a sum not very much less than that of bringing water from Wales. Even if the outlay on storage were considerably less than on the Welsh supply, it must be borne in mind that before long the Thames may not suffice for the wants of Greater London. In that event, a new supply must be sought, and a scheme less costly at the outset may cost more in the end.

One important point remains for consideration—the term within which the water debt should be redeemed. Parliament does not permit the term of redemption for Metropolitan loans to exceed 60 years; and in the case of ordinary loan services the limit is reasonable, for the ratepayers of the future will have their own pressing needs, and the charge of a sinking fund spread over 60 years is not excessive in the case of ordinary improvements and ordinary works. The purchase of the Water Companies' interests is, however, an acquisition made once and for ever; and if, in addition, the present ratepayer undertakes a charge for which he gets no immediate return, in order to secure a lasting supply of water for future generations of ratepayers—if, in fact, he insures his successors against the calamity of water famine—the burden should at all events be made as light as possible. We have therefore no hesitation in recommending that the period of redemption, both for purchase and additional supply, should be fixed at 100 years.



At the Meeting of the London County Council on Tuesday last—Mr. T. M'KINNON Wood in the chair—the Water Committee's report was presented.

Mr. W. H. DICKINSON, in moving the reception of the report, said the Council were called together to deal with perhaps the greatest and most momentous proposals that had ever been discussed by any municipal body in the history of municipal government. Apart from the magnitude of the figures involved, he thought the proposals had a peculiar importance owing to the position of affairs in regard to the present Royal Commission on Water Supply. He could not help feeling that it required a very strong case to justify the Council in taking action on this question when the Commission were sitting to consider the matter. The Water Committee had fully realized this difficulty, and as long ago as last May they came to the conclusion that they would not put forward proposals, but await the course of events in the summer. Events had proved to the satisfaction of the Committee that any further delay would be a serious matter for London. There had already been enough delay. He thought he was right in saying that the House of Commons on two occasions had been grievously misled by Her Majesty's Government on this subject; and he could not help thinking that the members of the House of Commons themselves, now that the facts were proved, would recognize that they could not afford to go on delaying the matter because a member of the Government chose to take his information from paid Directors of the Water Companies.

Mr. BEACHCROFT, rising to order, asked whether this was a proper allegation to make in an assembly of that character.

Mr. BURNS, M.P.: And the Thames Conservancy.

Mr. DICKINSON (continuing his remarks amid expressions of disapproval from the Moderates and cheers from the Progressives) said the Government had rejected the advice of those who were honestly and honourably serving London, and not their own private interests. Parliament would now look upon the matter from a different point of view. They had now evidence that Mr. Chaplin had misled—he did not say intentionally—Parliament when he said last year that there was no chance of the recurrence of another water famine. It was not merely a question of the East London Water Company. The Lambeth Company had been drawing more than their statutory quantity of water from the Thames; the West Middlesex Company admitted that they required further powers in order to give an efficient supply; and the resources of the Southwark and Vauxhall Company were rapidly coming to an end. One of the reasons why delay was so serious was that it had been proved to demonstration that the Balfour Commission had broken down. This was a serious allegation to make; but it was borne out by every man—he believed even by Directors of the Water Companies—who had taken the trouble to investigate the matter. The fact was that by the middle of next century they would be requiring nearer 600 than the 400 million gallons of water which the Balfour Commission said would be required daily. He traversed many of the statements of the Water Companies as to the supply of water from the local sources, those of the River Lea being totally inadequate. Had the East London Company depended upon the Lea alone, no amount of expenditure upon new works would have prevented a water famine. The supply from the Lea was short by 2000 million gallons in the quarter; and if the Company had had reservoirs as large as the ocean, they could not have obtained water from the Lea to fill them. This was the position in regard to the Lea; and that of the Thames was equally dangerous and urgent. The Council had to consider the interests of between 11 and 12 million persons living on the banks of the Thames, and they were responsible for the port of the Thames. If in another thirty or forty years' time it was found that the Thames was nothing but a pond, only oscillating backwards and forwards silt and filth instead of the river that ought to run down to the sea, he ventured to think that the responsibility of the Parliament who had caused this solely in the interest of private undertakings would be a very grave one. It had recently been said that the Nile was Egypt and Egypt was the Nile. Equally could it be said that the Thames was London and London was the Thames; and he protested against Parliament allowing private Companies to destroy the natural feature which created and maintained London. All the statements of the Council's Engineer had been corroborated by facts. For years he stood alone in the position he took with reference to the capabilities of the Thames and the Lea to meet the wants of London; and nothing could be more conclusive of his foresight and ability than the facts now in the possession of the Council. It was proved that he was right and everybody else was wrong. The Council had seriously to consider what would be the position of the Thames and Lea in the next ten years, and whence they could get a supplementary supply of water. They had 290 million gallons a day, and they would want another 120 millions in the next fifteen years. There were only two possible sources—the Thames and Wales. They could get it all from the Thames if they cared to risk the terrible consequences he had mentioned. One of the chief matters of consideration was the cost of getting this extra 120 million gallons. Having regard to the serious position of affairs, he did not believe Parliament would say that the Council must go back again, and he ventured to appeal to Lord Onslow, who had placed an amendment on the paper, to think twice before he committed himself to the policy of delay. They might find the Government, a little later on, insisting on the Council withdrawing their Bill; but until that moment arrived, he thought it would be a serious matter for any party, or a portion of any party, connected with London government to admit that there might safely be one or two years' delay in this matter. The present proposals of the Committee, put shortly, were to purchase the undertakings of the eight Water Companies. They put this forward because they held it to be the only method by which they could really safeguard London from a future water famine. It was not a question of forcing one Company to supply another in a moment of emergency, but of whether they should at all times of the year have the whole body of water available for the Metropolis in the hands of one authority who would be able to use it as they pleased. This was the problem; and the only way in which they could solve it was by buying up the water-works. They offered the Companies a fair and reasonable value for their undertakings. Those words "fair and reasonable" had twice been rejected by the House of Commons; but he doubted whether they would continue always to reject them. All the Committee meant by the words was that the price should not be unfair or unreasonable. They wanted the undertakings sold at such a price that,

when the money was paid, they would be able to reap a reasonable profit, in the same way as the Companies, from the income. The Committee were prepared to say that if Parliament, in its wisdom, after the report of the Royal Commission, thought that the water supply ought not to be in the hands of the Council, but in those of some other authority, they would accept it as the decision of a higher authority.

Mr. WHITMORE, M.P., thought the prime object all ought to have at heart at that moment should be to try and approximate their views as closely as possible. He recognized that the events of the past summer and autumn made it clear that for any part of London to depend for its water supply on any one Company was a bad system which must be remedied as soon as possible. He thought, therefore, that the Committee's third recommendation (as to the connecting of mains) ought to receive the unanimous support of the Council; and if a separate Bill to this effect were brought before Parliament, it would doubtless pass the second reading in the House of Commons. London must certainly have a new source of supply; but he would not commit himself to the scheme of the Committee. A Bill to effect this purpose would, he thought, pass its second reading; but he could not vote for the second reading of such a Bill if he thought he was in any way implicating himself with the idea that the Council would necessarily be the future owner and controller of that supply. With regard to the proposal for the purchase of the Companies' undertakings, he had always said that they could not safely, in the financial interests of London, buy them up; and before they asked Parliament to sanction such a scheme, they ought to show that it could be made a profitable transaction. Here they came to the embers of the old controversy. Then there was a Royal Commission sitting, charged with the duty of inquiring into this very question; and no legislative assembly would, he thought, dream of giving its sanction to such proposals as those of the Committee until that Commission had reported. He therefore disagreed absolutely with the recommendation to introduce the question of purchase until the Royal Commission had reported.

The report was then formally received; and the recommendations were considered *seriatim*. To the first—"That a Bill be promoted in the coming session of Parliament for the purchase by the Council of the undertakings of the eight Metropolitan Water Companies by agreement, or, failing agreement, by compulsion,"

Lord ONSLOW moved, as an amendment—"That the recommendation be referred back to the Committee, inasmuch as Parliament cannot be expected to deal with the whole question of the London Water Supply pending a report of the Royal Commission which has been appointed to consider the subject, and only useless expense will be incurred by the promotion of any Bill framed without due consideration of the recommendations of that Commission; but that, as it is a matter of great urgency that provision should be made at the earliest possible moment against a recurrence of the scarcity of water in one part of London, while in the other parts there is more than a sufficiency, the Council do promote a Bill providing that any Metropolitan Water Company be required, in case of emergency, to supply water to any other such Company whose supply may be deficient, and providing for the connection of the reservoirs and mains of the several Companies for facilitating arrangements for this purpose. That, in view of the urgency of the matter, application be made to Parliament for the suspension, if necessary, of Standing Orders, so as to admit of the introduction of the Bill, as was done in the case of the Southwark and Vauxhall Water Company's Bill of 1897. That, therefore, the preparation of a Bill for the purchase of the Water Companies' undertakings be deferred until it can be seen how far the Council can harmonize its policy with the views of the Royal Commission; and that it be an instruction to the Committee to take that report into consideration as soon as issued, and advise the Council, without delay, what steps should then be taken to deal with the supply of water to London."

The CHAIRMAN ruled that the words from "but that," after the word "Commission," down to "Bill of 1897," were out of order.

Lord ONSLOW, speaking in support of his amendment, took exception to the remarks of Mr. Dickinson, in which he had charged the President of the Local Government Board with having taken the advice of the paid Directors of the Water Companies in dealing with the water question. The fact was that whenever Mr. Chaplin had occasion to take advice on this subject he consulted different independent and expert gentlemen on the permanent staff of the Board. With reference to the third clause of the Committee's recommendations, he desired to fully associate himself with the attitude taken up by Mr. Whitmore. He did not, however, believe that it was possible to settle this question except by the purchase of the Water Companies' undertakings by a public authority. But they must consider the circumstances in which they were now placed; and until the Royal Commission reported he did not believe Parliament was likely to look at the measures the Committee were proposing to place before it. There was nothing new in the report which had been presented. It was the same old policy—going back, indeed, to 1895—and was less in accordance with the expressed views of Parliament than more recent proposals. There was no evidence in the report that the Committee had endeavoured in any way to meet the views of Parliament with the object of settling a question which all were agreed had been too long delayed. It was chiefly round the arbitration clauses that the controversy had raged; and yet the same conditions, already rejected by Parliament, were to be retained. He pointed out that the Comptroller of the Council purposely avoided going into financial matters because the Royal Commission were considering these questions. He (Lord Onslow) did not believe the Committee had seriously considered the effect of the purchase on the rates of London. They could not expect that the water-rate would remain the same. The time had come when all parties would co-operate in framing a measure which would be likely to meet the approval of Parliament; and he would be glad to give his services to the Committee in this direction. By his amendment, he was simply asking the Council to defer for one year—because it could not be longer—the presentation of a complete scheme. No one in that room believed that the Royal Commission would not report during the year 1899; and then would be the time for the Council to seriously devote itself to devising a scheme which it was likely Parliament would accept. He believed that nothing but waste of time and money could result from forcing on the proposal in the present circumstances. He advised members to join with him in voting for what was a practical and businesslike policy—to await the report of the Royal Commission, when they could bring in a full and final scheme based upon



independent testimony, and one which would be supported by the unanimous voice of London, to which Parliament would not refuse to listen.

Mr. COHEN, M.P., in seconding the amendment, protested against any more of the ratepayers' money being expended in promoting hopeless Bills. A return showed that the Council had spent £32,000 in promoting and opposing Water Bills, without any benefit to the ratepayers. It was desirable to secure sources of future water supply; but it was ridiculous to expect parliamentary sanction to any scheme until the Commission had reported. Anxious as he was to put an end to the Water Companies and have a Central Water Authority, he would be no party to hasty and abortive proposals.

Mr. BEACHCROFT said he was unable on the present occasion to regard the matter from the same point of view as Lord Onslow. The question was now, not whether the Council would be justified in promoting a Bill for purchase in anticipation of a report from the Royal Commission, but whether there was any justification for waiting another year before asking Parliament to consider the want of London in the matter of supplementary sources of water. The past few months had satisfied him that this was immediately urgent, and that a mere Bill for connecting mains and reservoirs would only tide over matters for a year or two. Not only in the East-end was there scarcity, but the streams of Kent were depleted, and even the springs of Hertford were being drained dry by the New River Company. He did not believe that any storage system would be sufficient. Liverpool, Birmingham, Swansea, and Cardiff had already appropriated areas in Wales; and Leicester, Nottingham, and Derby were now in search of water, and would have Bills before Parliament. If London were not quick, it would be too late, and the blame would fall on those who blocked the way of reasonable application to Parliament. Holding the view that the Council could not promote a Bill for a Welsh supply without at the same time depositing one for the purchase of all the Companies' undertakings, he saw no alternative but for them to bring forward both Bills.

Mr. CORNWALL criticized the policy of Lord Onslow, the general effect of which would, he said, be to play into the hands of the Companies.

The DEPUTY-CHAIRMAN (Mr. H. P. Harris) thought a useful purpose might be served by laying the Committee's proposals before Parliament pending the report of the Royal Commission. Of course, Parliament could not be expected to agree to them without having had that report; and should it be favourable, they would provide useful machinery.

Mr. LAWSON thought the Council need not wait for the report of the Commission. If they asked Parliament to give them a supplementary supply, they must be prepared to take over the whole responsibility.

Sir A. ARNOLD appealed to Lord Onslow to withdraw his amendment. He said that the Royal Commission were bound to report in time for legislation next session; if they did not, it would be a grave scandal. Meanwhile, no excuse should be offered them for delay. He supported the policy of the Water Committee. He did not believe that their proposals would be opposed in the House of Commons, except, perhaps, in a perfunctory way, if they approached the Water Companies in a fair and liberal spirit. (Mr. BOULNOIS, M.P.: Hear, hear.) He was glad he had the approval of the Chairman of one of the Companies for this statement.

Mr. H. CLARKE said that, as a member of the City Corporation as well as of the Council, he was prepared to support the report of the Committee. He strongly deprecated any further delay in taking parliamentary action. Let them go with a firm front, and let Parliament be responsible for the result.

Dr. COLLINS congratulated the Council on the unanimity shown in the debate, and contended that no procrastinating Royal Commission should be an excuse for the Council not going forward with the recommendations of their Committee.

The Earl of HARDWICKE expressed his inability to support the amendment; and Sir J. BLUNDELL MAPLE, M.P., appealed to Lord Onslow to withdraw it.

Mr. BURNS urged that the time had come when London should have the same measure of justice in the matter of water supply as the big provincial towns.

After some remarks by Mr. ANTROBUS, the discussion was closed.

The Council then divided, when there voted for the amendment, 15; against it, 101—majority, 86. The recommendation was subsequently adopted *nem. con.*, amid loud cheering from the Progressives. The majority was composed of 74 Progressives and 27 Moderates. Mr. Boulnois did not vote.

The second recommendation—"That, subject to such provision as may be made by Parliament as to the ultimate relationship between London and the outside authorities, provision be made for the undertakings of the Companies vesting in the Council at a date not later than six months after the passing of the Act"—was then submitted. An amendment had been moved to delete the words "relationship between London and the outside authorities," and to substitute in their place the words "authority or authorities." This was accepted; and the recommendation as amended was unanimously agreed to.

To the third recommendation—"That the Bill contain provisions authorizing the Council to proceed forthwith with the connecting and laying of mains and other works necessary in order to enable it to protect any part of the Metropolis from want of water"—Mr. BEACHCROFT moved the following amendment: "That, inasmuch as it is certain that no Bill promoted by the Council could become law until the end of the ensuing session, and in view of the urgency of the situation, Her Majesty's Government be asked to bring in a Bill to ensure that, pending the settlement of the water question, whether by means of the Council's Bill for purchase or otherwise, immediate steps will be taken to secure such connections of mains and reservoirs and interchange of water between the several Companies as may be necessary to protect all parts of the Metropolis from actual want of water." After some discussion, however, the amendment was lost by 70 to 28.

Colonel FORD then moved to add the following words: "But, in order to meet the contingency of the proposed Bill not receiving the sanction of the Legislature during the ensuing session of Parliament, it be an instruction to the Committee to also introduce a separate Bill, securing to the Council powers (with the approval of the Local Government Board) to compel an interchange of water supply between the several Companies, if and when the necessity arises, upon such terms and conditions as may be from time to time sanctioned by the Local Government Board; such

powers to include authority to the Council to incur all expenditure necessary to secure the connecting and laying of mains and other necessary works."

Mr. BALIAN seconded the proposition; but it was not carried. The recommendation was then agreed to, as were the remaining five; the one dealing with the subject of bringing a supply of water from Wales being carried unanimously.

The debate, which had occupied practically the whole of the sitting, then closed.

## THE PROJECTED WELSH WATER SUPPLY SCHEME FOR LONDON.

The Report of Sir B. Baker and Mr. G. F. Deacon.

(Continued from p. 988.)

Dealing with the second point—the influence of the project upon the flow of the Thames—the Engineers say:

In an ordinary scheme of water supply, the source of which is a pure mountain stream, the high floods, which may well be spared, are available for storage and use. By impounding such streams, the dry-weather flow is not reduced, but on the contrary is, in all important cases, greatly increased, in virtue of the compensation water which the Special Act requires to be given. By the conditions of the Staines project as laid before the Royal Commission, the whole of the water for storage must be taken from the river when the flow exceeds 200 million gallons, and does not exceed 2300 million gallons a day, unless the latter volume has continued for more than fifteen days. This condition makes it necessary to draw the river down to the 200 million gallon level at Teddington for long periods at a time. During the last fourteen years, the natural average weekly flow of the river has on no occasion fallen below 273 million gallons a day. This minimum occurred in 1896. After deducting the water taken by the Companies, the weekly average of the discharge at Teddington has only fallen to 200 millions a day in six out of the last fourteen years; and the average period during which it has remained so low during the fourteen years has only been seven days a year.

The Royal Commission do not specifically approve the proposal to permit the river to be pumped down to 200 millions for longer periods than at present. They say (paragraph 182): "We think that regulations could be framed under which the quantity we suggest could be taken not only without reducing the flow of the river on the rare occasions of exceptional drought to the present minimum, but in such a way as to secure that the volume of water left in the river at these times would be substantially greater than it is under existing conditions." Here there is no reference to the effect of the project upon the duration of the minimum. *Ceteris paribus*, any increase of the volume of the minimum flow, however short the period, is some improvement; but the words "substantially greater than it is under existing conditions" can scarcely have referred to the mere bringing up of the extreme minimum to what, notwithstanding the existing pumping, is now the minimum, except on an average of seven days in a year, especially if during the remaining days of summer and autumn the flow were to be reduced to that minimum. But such is the effect of the project.

Reverting to the conditions which would have obtained in 1893 if the project had been in operation, we find that the principal changes in the flow of the river would have been as follows: Whereas the weekly natural flow of the river at Teddington never during that year fell below 281 million gallons, and after the deduction for pumping by the Companies only fell to 200 millions on 28 days, the project for the supply of 200 millions to London would have brought that flow down to the 200 million limit on 153 days, while that for the supply of 300 millions would have done so on 185 days, and that for 400 millions on 223 days.

|                                                                                                                                   | Percentage of<br>Natural Flow. | Duration of<br>Reduced Flow. |
|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------|------------------------------|
| As matters stood in 1893, the flow fell, in consequence of pumping by the Companies, to or below 200 millions, or about . . . . . | 62 per cent.                   | during 28 days.              |
| If the 200-million scheme had been in operation, the flow would have fallen to 200 millions, or about . . . . .                   | 53 "                           | " 153 "                      |
| If the 300-million scheme had been in operation, the flow would have fallen to 200 millions, or about . . . . .                   | 50 "                           | " 185 "                      |
| If the 400-million scheme had been in operation, the flow would have fallen to 200 millions, or about . . . . .                   | 45 "                           | " 223 "                      |

It is not only in the dry years that serious changes would occur. There have been several years of approximately average rainfall on the Thames basin since 1883, when the records of gauging at Teddington were begun. The first of these (1885) was more than 2 per cent. above the average; but the effect upon the river would have been as follows:—

|                                                                                                                                   | Percentage of<br>Natural Flow. | Duration of<br>Reduced Flow. |
|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------|------------------------------|
| As matters stood in 1885, the flow fell, in consequence of pumping by the Companies, to or below 200 millions, or about . . . . . | 65 per cent.,                  | during 10 days.              |
| If the 200-million scheme had been in operation, the flow would have fallen to 200 millions, or about . . . . .                   | 52 "                           | " 95 "                       |
| If the 300-million scheme had been in operation, the flow would have fallen to 200 millions, or about . . . . .                   | 47 "                           | " 127 "                      |
| If the 400-million scheme had been in operation, the flow would have fallen to 200 millions, or about . . . . .                   | 46 "                           | " 134 "                      |

The effect upon the river between the new intakes (situated probably



above Bell Weir) and Teddington Weir—a length of 18 miles—requires consideration. In this length the water from about 26 per cent. of the whole area of the Thames basin down to Teddington is discharged into the river; and it was stated in evidence by the promoters of the Staines Reservoirs Bill, 1896, that the natural flow over Bell Weir was about 71½ per cent. of the natural flow over Teddington Weir. Assuming this to be correct, 200 million gallons at Teddington Weir would, in the absence of pumping between the two weirs, be equivalent to 143 million gallons at Bell Weir. But the conditions of the project, as laid before the Royal Commission, imposed no obligation upon the promoters with respect to the quantity passing over Bell Weir; and it would often happen that Bell Weir would be pumped down much below 143 million gallons, while the 200 millions was maintained at Teddington, by streams discharging into the Thames at intermediate places. For example, with the 300 million gallons scheme in operation, the average daily flow at Bell Weir during 167 days in 1893 would have been about 88 million gallons, and during some weeks it would have been still less. The reaches most affected would be those between Bell Weir and Penton Hook, and between Penton and Chertsey. If the condition were imposed that the river at Bell Weir should not be drawn below 143 million gallons, the reservoirs would have to be considerably enlarged. The exact effect of these considerations depends upon the position of the intakes; but wherever they are placed above Staines, the principle will be the same.

It has already been stated that during the last fourteen years the natural average weekly flow of the river has on no occasion fallen below 273 million gallons a day; and that, after deducting the water taken by the Companies, the weekly average of the discharge at Teddington has only fallen to 200 million gallons a day in six out of the last fourteen years. If the scheme for the supply of 200 millions to London had been in operation, the 200 million minimum at Teddington would have been reached (for periods exceeding a week at a time) in eleven out of the fourteen years; while by the 300-million scheme the river would have been similarly drawn down in all years.

The direct effect of this abstraction by reason of the extent to which it reduces the level of the water in the tidal portion of the river may not be of much importance; but the reduction produced in the velocity and scouring action of the ebb tide (caused by prolonging the dry weather flow in the manner involved in the Staines project) would, in our judgment, have a detrimental effect upon navigation and upon the sanitary condition of the river. Were large additional volumes of water abstracted from the Thames, extra expenditure would have to be incurred in dredging local deposits; and having regard to the fact that the abstraction of fresh water will, in an exactly proportionate degree, be accompanied by a corresponding increase in the volume of sewage effluent poured into the river at Barking and Crossness, it might be found necessary or desirable to discharge the additional sewage at some point lower down the river than the present outfalls.

• It is proper to draw attention to the fact that since the finding of the Royal Commission an instalment of the Staines scheme has received the sanction of Parliament—by the Staines Reservoirs, &c., Act, 1896—but without the safeguards which the Commission recommended. The Act as it stands provides that the main reservoirs shall be kept full to the greatest capacity so far as practicable; but no condition is imposed to prevent the water from being supplied to such reservoirs, or direct to the town, in any state of the river except when it is flowing at less than 265 million gallons a day at Bell Weir, which is fixed as the equivalent of 200 millions at Teddington, some 18 miles lower down, after allowing for the abstraction of 130 million gallons a day which the existing Companies have power to pump from the river between the two places.

In laying the Staines scheme before the Royal Commission, even the original projectors provided that no water should be drawn direct from the Thames during the first 15 days of a flood exceeding the rate of 2300 million gallons a day at Teddington; but the Staines Reservoirs Act, 1896, contains no such condition, or any other provision in lieu of it. Moreover, the Act contains no limitation (except that set up by the limit of quantity to London) to the period during which the river may be pumped to its minimum; and the Companies even by this small instalment of the project, providing only 35 million gallons a day for London, may increase the present maximum duration of the flow of 265 million gallons at Bell Weir from about 59 days to 103 days, or, with the permission of the Local Government Board, they may take 45 million gallons a day, and thus increase the period of minimum flow to 117 days.

There is no doubt a serious difficulty in dealing piecemeal with the subject of storage reservoirs either on the Thames or the Lea; and we think that any provision for the better storage of the supplies which the Companies at present have power to derive from the Thames and Lea should be common to all the Companies pumping from either of these rivers respectively.

(To be continued.)

## THE TYNEMOUTH CORPORATION AND THE NORTH SHIELDS WATER COMPANY.

### The Recent Arbitration Proceedings.

At a Special Meeting of the Tynemouth Corporation on Monday last week, the Town Clerk submitted a report of a Consultative Committee on the recent arbitration proceedings, and also the proposed terms of settlement. After fully detailing the arrangement come to with Earl Percy respecting his rights, the document stated that the Corporation were to pay to the Company, on behalf of themselves and Earl Percy, the sum of £75,000; and thereupon to succeed to all the property (including money in hand, reserve fund, plant, stock-in-trade, &c.), rights, and liabilities of the Company, in all respects other than their liabilities to the debenture holders. The costs of the Company and Earl Percy in the arbitration are to be paid by the Corporation, who were to immediately take possession of the undertaking, and pay the Company 5 per cent. on the £75,000 until it was paid. Alderman Elliot moved—"That the proposals made by Counsel for the North Shields Water Company, as contained in the terms of arrangement, dated Oct. 19, as to the price to be paid by the Corporation to the Company and Earl Percy for the purchase of the undertaking, and the settlement of other matters, set forth in the terms of arrange-

ment, for the sum of £75,000, be adopted and confirmed." Alderman Armstrong seconded the motion, and said he believed that neither Earl Percy nor the shareholders had any reason to complain at the price they were getting for what they had to sell. The borough was now the water authority for practically the whole of East Northumberland, and would be enabled to supply all the district between Shields and Blyth in the near future. If this was not realized, it would be the fault of the rate-payers themselves. The motion was unanimously adopted.

## PROGRESS OF THE NIDD WATER SCHEME OF THE BRADFORD CORPORATION.

The report of the Water Committee of the Bradford Corporation for the municipal year just ended contains the following account of the progress of the Nidd water undertaking: Concerning the Gouthwaite reservoir, the building of the masonry wall, the gauge basin, river retaining walls, and river channel works are all completed. The whole of the arches, fourteen in number, over the dam, for carrying the roadway, as well as the parapet walls on each side, are finished. A new road along the western side of the reservoir, to replace the existing public road, has been pushed forward during the year; and two bridges carrying the road over Colthouse Beck and Burn Gill are practically completed. The work on the Nidd aqueduct has progressed fairly well; and but for the flooding by water of the middle section of the Greenhow tunnel on Dec. 11, 1897, which prevented two of the faces being worked for a period of some months, the work would have been further advanced. The masonry dam on the Nidd which is being constructed to intercept the water of the Nidd for the supply of the city is about one-third completed. The pipes, valves, &c., therefrom, which join up to the Rain Stang tunnel, are laid; the Rain Stang tunnel, 2486 yards in length, has been driven for a length of 2360 yards; and the main aqueduct, consisting of 36-inch pipes and cut-and-cover work, together with the branch aqueducts connected therewith, are completed to Burn tunnel. The Burn tunnel, 1844 yards in length, is finished. The pipes, aqueduct, bridges, &c., from Burn tunnel to Greenhow tunnel are all completed. The Greenhow tunnel has been driven to a length of 4850 yards, out of a total of 6200 yards. From thence to Chellow Heights reservoir and filter-beds the main-line aqueduct, pipes, valves, manways, bridges, &c., are practically completed. The 30-inch pipe-line from the main aqueduct to Barden reservoir is two-thirds finished; and the intercepting dam on the Barden Beck is in progress. The whole of the pipes for the Nidd aqueduct have, with the exception of a few special ones, been supplied. The work connected with the Chellow Heights service reservoir and filter-beds has been pushed steadily forward. The walling encircling the reservoir is nearly finished and copped, the bottom of the reservoir for about one-third of its area has been puddled with 14-inch clay puddle, and on the top of this a layer of concrete has been laid 14 inches thick. The masonry of the upstand outlet and superstructure is complete; and other parts of the work have been finished to the following extent: 75 per cent. of the walling, concreting, and puddling of the reservoir; 28 per cent. of the work in the formation of the filter-beds, including walling, concreting, and puddling; 52 per cent. of the outlet-valve wells of the filters; 9 per cent. of the distributing canal; 79 per cent. of the sand-trap; and 73 per cent. of the pipe-trenches. In all 57·6 per cent. of the work is complete.

**Todmorden Water-Works.**—At the last meeting of the Todmorden Town Council, it was resolved to appoint Mr. G. F. Deacon Engineer for the new water-works to be constructed at Gorpely. The depth of the reservoir is to be 60 feet; and the retaining walls are to be sufficient in strength to allow for a future increase of 20 feet.

**The Horsforth District Council and the Water-Works.**—The Horsforth District Council had quite an exciting discussion yesterday week over the contemplated purchase of the local water-works. The Company are proposing to apply for parliamentary powers in the coming session, and to secure authority to carry out some new works. In the course of the debate, it was predicted that all kinds of disastrous things would ensue if the Company obtained the proposed powers. It was considered that the only way out of the difficulty was for the Council to obtain compulsory powers to purchase the works; and they decided accordingly.

**Wages and Hours of Labour of Leeds Gas Workers.**—An interview has recently taken place between the Chairman of the Leeds Gas Committee (Mr. J. Lowden) and the Deputy-Chairman (Alderman Matthew Walker) and Mr. W. Wood, one of the officials of the Gas Workers and General Labourers' Union, relative to the application of some of the men employed at the gas-works for an increase of wages and a reduction of hours. It was arranged that a special meeting of the new Gas Committee should be called about the middle of November to consider the matter. The application, it may be remarked, first came before the Committee on Oct. 20; but in view of the approaching end of the municipal year, it was the opinion of the members that the best course would be to defer the consideration of the question till after the elections.

**Uttoxeter Water Supply.**—A special meeting of the Uttoxeter Urban District Council was recently held, under the presidency of Mr. A. C. Bunting, to receive the report of the Committee on the water question. The Clerk read the report, in which it was stated that it had been agreed to purchase the spring at Quickshill—on the estate of Lord Edmund Talbot. The Chairman reminded the Council that they had been casting about for some means of augmenting the supply, and had made inspections and testings at Withington, Carry Coppice, and other places, and had also tried boring at Bramshall. They found an excellent spring at Cresswell and another at Quickshill, and had decided in favour of the latter, which had a daily yield of about 260,000 gallons. There were some engineering difficulties in connection with this spring, and a perpetual obligation to supply free 6000 gallons per day to local farms and cottages, with a right for them to take 4000 gallons more if wanted at 6d. per 1000 gallons. They would have to make a reservoir at Prestwood, and then lay five or six miles of pipes to bring the water to the town. It was estimated the cost would be about £6000. The report was adopted.



## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The great scheme for the erection of new gas-works for the Glasgow Corporation was triumphantly carried in the Town Council last Monday. There really was no opposition to it, except the sentimental one, by no means uncommon, of desiring not to have a somewhat objectionable neighbour set down beside you. A gas-works is not a nuisance, if properly conducted; yet there are few who would care to live in the immediate vicinity of a large one. It has not yet been discovered how to make a gasholder, any more than ironwork generally—see Mr. John Ruskin—a work of art; and consequently both sight and smell are offended. But a gas-works is a necessity; and so long as that is so, it must be planted in somebody's neighbourhood. The question of locality is therefore, after that of convenience is disposed of, what amount of resistance is likely to be met with. That there will be objection is almost a certainty; and the problem is how to prevent, allay, or defeat it. In their handling of the subject, the Gas Committee of Glasgow have shown the highest engineering skill. The prevention of resistance was very adroitly accomplished by the short time which there was given for objectors to move; and equally as much by the withholding of the names of other sites which had been looked at. Both these objections were stated on Monday; and they were really the only points upon which complaint could be made. Were the Committee blameworthy for their method of promoting the proposal? I am persuaded, looking to all the circumstances, that they were not. I could cite experience in both ways; and it would all point to the conclusion that large purchases of property for public purposes should be left in the hands of as few persons as possible, and that when a decision has been come to, it should be hurried through. When the public are consulted, there are usually too many advisers; and the suspicion is strong that the advice is not always of a disinterested order. The Blochairn site was selected after the fullest consideration by a Sub-Committee, aided by some competent experts; and when the Gas Committee as a whole were consulted, no one could name a better one. It was the same in the Town Council. Those who did not approve of the Blochairn site did not point to one which would be better. The fact is that they could not. There is scarcely another 100 acres to the east of Glasgow, for many miles, in which there are not underground workings; and to have gone to the west would have meant a higher price for the land, as well as involving heavier charges for the carriage of coal. The elevation of Blochairn was another ground of objection; but it is less than 200 feet above sea-level, and about only some 100 feet higher than the works at Dawsholm. Broomielaw Bridge is, of course, at sea-level; and to send gas there will present no difficulty. To take the case of Edinburgh, gas from the works in New Street rises to the level of George Street, where it intersects Hanover Street—a height of fully 100 feet; and then it goes down to the storage station at Canonmills—a descent of, I should say, over 200 feet. I never heard of any difficulty in the distribution of gas there. The point of the amenity of the district, which was the

weakest in the hands of the objectors, was the one they made most of. It was absurd to say that the neighbourhood of gas-works is detrimental to vegetation. As to the people moving away from gas-works, because of effluvia emanating from them, the case of Edinburgh may again be cited. There the Gas Commissioners, at their last meeting, affirmed an agreement with Mr. Reginald Macleod, C.B., the Queen's Remembrancer for Scotland—that is, the gentleman at the head of the Exchequer Department—under which he has agreed to remain tenant of Granton House, adjoining the site of the new gas-works, and to pay the former rent. On all points the Glasgow opposition collapsed; and there is satisfaction in knowing that, provided a reasonable price be agreed upon, the best possible site has been secured.

The Oil-Gas Enrichment Company, who are the owners of the Peebles oil-gas patents, have held their fifth annual meeting. The times are against the Company, on account of the low price of cannel and the high price of oil. They also suffered last year from the misfortune that the engineers' strike prevented the alterations which it was found desirable to make upon the new plant in the Paisley Gas-Works from being completed; and no revenue is as yet derivable from that source. The plant will be at work soon, however; and it will effect a great improvement upon the finances of the Company, besides being, there is no reason to doubt, the pioneer of a long series of works in which the process will come to be adopted.

In Glasgow, unfortunately, there are more cases of gas poisoning than in any other town in Scotland. This, of course, is to be attributed primarily to the fact that Glasgow is bigger than any other place; but there is, I presume, another explanation, in the absence to a large extent of stopcocks upon service-pipes. Houses which stand empty for some time, or which become uninhabitable or are converted into stores, thus remain with the full pressure of the gas supply in their pipes. Deterioration by time, or perhaps accident, sooner or later leads to a fractured pipe; the apartment gets filled with gas; and then it penetrates the often slender dividing walls, and the residents in the adjoining house suffer. An incident almost of this sort occurred in the south side of Glasgow on Tuesday. In this instance the disused building was absent; but in the house in which the escape took place no gas is used. The house above it is, however, lighted by gas; and a service-pipe is led to it. The inhabitants of the house, it is believed, were in the habit of attaching a cord to the gas-pipe, upon which to hang clothes to dry; and the supposition is that the weight of the clothes broke the pipe. A man, his wife, and daughter occupied the house. Groans were heard proceeding from the apartment early on Tuesday morning; but as the man was ill, they were attributed to him, and no notice was taken of the matter. At seven o'clock in the morning, the sound was repeated; and there being a smell of gas, a plumber was sent for, who, on entering, found the wife and daughter lying on the floor, and the man in bed, all in an almost unconscious condition. They were treated at the Victoria Infirmary, and happily all recovered.

In virtue of the power granted to the Water Committee of the Glasgow Corporation a few weeks ago to accept the tender of Messrs. Maclaren and Co. for water-pipes, owing to the inability of Messrs. Wood and Co.

## GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1024.

| Issue.    | Share | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME.                      | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue.    | Share | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME.                       | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|-----------|-------|-------------------|-------------------------------|----------------------------|-----------------|---------------------|------------------------|-----------|-------|-------------------|-------------------------------|-----------------------------|-----------------|---------------------|------------------------|
| £         |       |                   | p. c.                         | GAS COMPANIES.             |                 |                     | £ s. d.                | £         |       |                   | p. c.                         | GAS COMPANIES.              |                 |                     | £ s. d.                |
| 590,000   | 10    | Oct. 13           | 10½                           | Alliance & Dublin 10 p.c.  | 204-21½         | -1                  | 4 17 8                 | 75,000    | 5     | June 29           | 6                             | Malta & Medn., Ltd.         | 43-5½           | ..                  | 5 14 8                 |
| 100,000   | 10    | "                 | 7½                            | Do. 7 p.c.                 | 16-17           | ..                  | 4 8 3                  | 541,920   | 20    | June 10           | 5                             | Monte Video, Ltd.           | 13½-14½         | ..                  | 6 18 0                 |
| 800,000   | 100   | July 1            | 5                             | Australian 5 p.c. Db.      | 105-107         | ..                  | 4 13 6                 | 617,946   | Stk.  | Aug. 31           | 9½                            | Newcastle & Gateshead Con.  | 230-240         | ..                  | 4 1 3                  |
| 200,000   | 5     | May 26            | 6                             | Bombay, Ltd.               | 6½-7            | ..                  | 4 5 9                  | 252,355   | Stk.  | Jan. 3            | 3½                            | Do. 3½ p.c. Db. Stk.        | 113-117         | ..                  | 2 19 10                |
| 40,000    | 5     | "                 | 11                            | Do. New, £4 paid.          | 4½-5            | ..                  | 4 16 0                 | 150,000   | 5     | May 26            | 8                             | Oriental, Ltd.              | 7½-7¾           | ..                  | 5 3 3                  |
| 880,000   | Stk.  | Aug. 12           | 12                            | Brentford Consolidated     | 275-280         | ..                  | 4 5 9                  | 135,000   | 5     | "                 | 8                             | Do. New, £4 10s. pd.        | 6½-7            | ..                  | 5 2 11                 |
| 240,000   | "     | "                 | 9                             | Do. New                    | 210-215         | ..                  | 4 3 9                  | 15,000    | 5     | "                 | 8                             | Do. do. 1879, £1 pd.        | 12-13           | ..                  | 4 11 5                 |
| 50,000    | "     | "                 | 5                             | Do. 5 p.c. Prf.            | 140-145         | ..                  | 3 9 0                  | 60,000    | 5     | Sept. 29          | 7                             | Ottoman, Ltd.               | 5-5½            | ..                  | 6 6 2                  |
| 159,375   | "     | June 10           | 4                             | Do. 4 p.c. Db. Stk.        | 130-135         | ..                  | 2 19 3                 | 500,000   | 100   | June 1            | 6                             | People's Gas 2nd M.         | 103-108         | ..                  | 5 11 1                 |
| 220,000   | Stk.  | Sept. 15          | 11½                           | Brighton & Hove, Orig.     | 263-268         | ..                  | 4 5 10                 | 848,070   | 10    | Oct. 13           | 6                             | of Chicago f Bd.            | 9-9½            | ..                  | 6 6 4                  |
| 226,320   | "     | "                 | 8½                            | Do. A. Ord. Stk.           | 190-195         | ..                  | 4 7 2                  | 250,000   | Stk.  | June 29           | 4                             | River Plate Ord.            | 99-101          | ..                  | 3 19 3                 |
| 933,500   | Stk.  | Aug. 31           | 5                             | Bristol, 5 p.c. max.       | 125-130         | ..                  | 3 16 11                | 250,000   | 10    | Sept. 29          | 10                            | Do. 4 p.c. Db. Stk.         | 14½-15½         | ..                  | 6 9 0                  |
| 420,000   | 20    | Sept. 29          | 10                            | British                    | 49½-50½         | -½                  | 3 19 1                 | 135,000   | Stk.  | Sept. 15          | 10                            | San Paulo, Ltd.             | 242-245         | ..                  | 4 1 8                  |
| 50,000    | 10    | Aug. 12           | 11½                           | Bromley, Ord. 10 p.c.      | 25-27           | ..                  | 4 5 2                  | 209,053   | "     | "                 | 10                            | Sheffield A.                | 242-245         | ..                  | 4 1 8                  |
| 75,000    | 10    | "                 | 8½                            | Do. 7 p.c.                 | 20-22           | ..                  | 3 17 3                 | 447,427   | "     | "                 | 10                            | Do. B.                      | 242-245         | ..                  | 4 1 8                  |
| 500,000   | 10    | Oct. 13           | 6                             | Buenos Ayres (New) Ltd.    | 9½-10           | +½                  | 6 0 0                  | 5,600,000 | Stk.  | Aug. 12           | 5½                            | Do. C.                      | 242-245         | ..                  | 4 1 8                  |
| 98,122    | Stk.  | June 29           | 4                             | Do. 4 p.c. Db. Stk.        | 98-100          | ..                  | 4 0 0                  | 1,460,000 | Stk.  | July 14           | 3                             | South Metrop., 4 p.c. Ord.  | 138-142         | ..                  | 3 15 1                 |
| 150,000   | 20    | July 14           | 8½                            | Cagliari, Ltd.             | 29-30           | ..                  | 5 10 0                 | 60,000    | Stk.  | Aug. 31           | 12                            | Do. 3 p.c. Db. Stk.         | 102-105         | ..                  | 2 17 2                 |
| 100,000   | 10    | Sept. 29          | 7                             | Cape Town & Dis., Ltd.     | 14-15           | ..                  | 4 13 4                 | 60,000    | Stk.  | Aug. 31           | 12                            | Tottenham and A.            | 280-290         | ..                  | 4 2 9                  |
| 50,000    | 50    | Nov. 2            | 6                             | Do. 6 p.c. 1st Mort.       | 57-59           | ..                  | 5 1 8                  | 182,380   | "     | June 10           | 9                             | Edmonton f B.               | 200-210         | ..                  | 4 5 9                  |
| 550,000   | Stk.  | Oct. 13           | 13½                           | Commercial Old Stock.      | 310-320         | ..                  | 4 4 5                  | 149,900   | 10    | July 1            | 5                             | Tuscan, Ltd.                | 103-11½         | ..                  | 6 1 9                  |
| 200,750   | "     | "                 | 10½                           | Do. New do.                | 247-252         | ..                  | 4 3 4                  |           |       |                   |                               | Do. 5 p.c. Dbs. Red.        | 160-163         | ..                  | 4 17 1                 |
| 200,750   | "     | June 10           | 4½                            | Do. 4½ p.c. Db. do.        | 148-153         | ..                  | 2 18 10                |           |       |                   |                               |                             |                 |                     |                        |
| 800,000   | Stk.  | June 10           | 12                            | Continental Union, Ltd.    | 207-212         | ..                  | 5 13 2                 |           |       |                   |                               |                             |                 |                     |                        |
| 200,000   | "     | "                 | 9                             | Do. 7 p.c. Prf.            | 193-198         | ..                  | 4 10 11                |           |       |                   |                               |                             |                 |                     |                        |
| 51,600    | Stk.  | Aug. 31           | 14                            | Croydon A 10 p.c.          | 805-810         | ..                  | 4 10 4                 | 746,164   | Stk.  | June 29           | 10½                           | WATER COMPANIES.            |                 |                     |                        |
| 168,400   | "     | "                 | 11                            | Do. B 7 p.c.               | 255-265         | ..                  | 4 3 0                  | 150,000   | "     | "                 | 5                             | Chelsea, Ord.               | 813-818         | ..                  | 8 6 0                  |
| 555,000   | Stk.  | Aug. 12           | 5½                            | Crystal Palace Ord. 5 p.c. | 125-130         | ..                  | 4 0 9                  | 160,000   | "     | "                 | 4½                            | Do. 5 p.c. Prf.             | 170-175         | ..                  | 2 17 2                 |
| 60,000    | "     | "                 | 11                            | Do. 5 p.c. Ord.            | 140-145         | ..                  | 3 9 0                  | 175,785   | "     | Sept. 29          | 4½                            | Do. 4½ p.c. Prf. Stk., 1875 | 148-152         | ..                  | 2 19 3                 |
| 496,090   | 10    | July 28           | 11                            | European, Ltd.             | 28-24           | ..                  | 4 11 8                 | 1,720,560 | Stk.  | Oct. 13           | 7                             | Do. 4½ p.c. Db. Stk.        | 155-160         | ..                  | 2 16 3                 |
| 354,060   | 10    | "                 | 11                            | Do. £7 10s. paid.          | 17-18           | ..                  | 4 11 9                 | 654,740   | "     | June 29           | 4½                            | East London, Ord.           | 212-217         | ..                  | 3 4 6                  |
| 5,322,230 | Stk.  | Aug. 12           | 12½                           | Gaslight & Coke, A. Ord.   | 288-293         | ..                  | 4 8 6                  | 390,000   | "     | "                 | 3                             | Do. 4½ p.c. Db. Stk.        | 157-160         | ..                  | 2 18 3                 |
| 100,000   | "     | "                 | 4                             | Do. B, 4 p.c. max.         | 120-125         | ..                  | 3 4 0                  | 700,000   | 50    | June 29           | 7½                            | Do. 3 p.c. Db. Stk.         | 103-105         | ..                  | 2 17 2                 |
| 665,000   | "     | "                 | 10                            | Do. C, D, E, 10 p.c. Prf.  | 308-313         | ..                  | 3 3 11                 | 310,000   | Stk.  | Sept. 29          | 7½                            | G'd Junction, 10 p.c. max.  | 115-118         | ..                  | 3 3 7                  |
| 80,000    | "     | "                 | 5                             | Do. F, 5 p.c. Prf.         | 152-157         | ..                  | 3 3 8                  | 708,000   | Stk.  | Aug. 12           | 14                            | Do. 4 p.c. Db. Stk.         | 138-143         | -2                  | 2 15 11                |
| 60,000    | "     | "                 | 7½                            | Do. G, 7½ p.c. do.         | 230-240         | ..                  | 3 2 6                  | 160,000   | "     | "                 | 7                             | Kent                        | 365-370         | ..                  | 3 15 8                 |
| 1,900,000 | "     | "                 | 7                             | Do. H, 7 p.c. max.         | 195-200         | ..                  | 3 10 0                 | 1,043,800 | 100   | June 29           | 10½                           | Do. New, 7 p.c. max.        | 212-217         | ..                  | 3 4 6                  |
| 468,000   | "     | "                 | 10                            | Do. J, 10 p.c. Prf.        | 308-313         | ..                  | 3 3 11                 | 406,200   | 100   | "                 | 7½                            | Lambeth, 10 p.c. max.       | 300-305         | ..                  | 3 8 10                 |
| 476,000   | "     | "                 | 6                             | Do. K, 6 p.c. Prf.         | 185-190         | ..                  | 3 3 2                  | 350,000   | Stk.  | Sept. 29          | 4                             | Do. 7½ p.c. max.            | 228-233         | ..                  | 3 4 4                  |
| 1,061,150 | "     | June 10           | 4                             | Do. 4 p.c. Db. Stk.        | 131-133         | ..                  | 3 0 2                  | 500,000   | 100   | Aug. 12           | 13½                           | Do. 4 p.c. Db. Stk.         | 138-143         | -2                  | 2 15 11                |
| 294,850   | "     | "                 | 4½                            | Do. 4½ p.c. do.            | 148-153         | ..                  | 2 18 10                | 1,000,000 | Stk.  | July 28           | 4                             | New River, New Shares       | 435-440         | ..                  | 3 0 2                  |
| 958,000   | "     | "                 | 6                             | Do. 6 p.c. do.             | 195-200         | -3                  | 3 0 0                  | 902,300   | Stk.  | June 29           | 6                             | Do. 4 p.c. Db. Stk.         | 138-143         | -2                  | 2 15 11                |
| 70,000    | 10    | May 12            | 8                             | Hongkong & China, Ltd.     | 14-15           | ..                  | 5 6 8                  | 126,500   | 100   | "                 | 6                             | Southw'k & V'xhall, Ord.    | 165-170         | -1                  | 3 10 7                 |
| 3,800,000 | Stk.  | "                 | 10                            | Imperial Continental       | 223-228         | ..                  | 4 7 9                  | 489,200   | Stk.  | "                 | 5                             | Do. do. 7½ p.c. max.        | 160-165         | ..                  | 3 12 9                 |
| 276,400   | 100   | Aug. 2            | 4                             | Do. 4 p.c. Dbs. Red.       | 98-101          | ..                  | 3 19 3                 | 1,019,585 | "     | Oct. 13           | 4                             | Do. do. 5 p.c. Prf.         | 170-173         | ..                  | 2 17 10                |
| 473,000   | Stk.  | Aug. 1            | 3½                            | Do. 3½ p.c. Db. Stk.       | 101-104         | ..                  | 3 7 4                  | 1,155,066 | Stk.  | June 10           | 10                            | Do. 4 p.c. A Db. Stk.       | 138-143         | -1                  | 2 15 11                |
| 560,000   | 100   | Oct. 1            | 5                             | Met. of Mel. 5 p.c. Db.    | 110-112         | ..                  | 4 9 3                  | 200,000   | "     | "                 | 4½                            | West Middlesex              | 295-300         | -5                  | 3 6 8                  |
| 250,000   | 100   | "                 | 4½                            | bourne 4½ p.c. Db.         | 105-107         | ..                  | 4 4 1                  | 200,000   | "     | Sept. 15          | 3                             | Do. 4½ p.c. Db. Stk.        | 162-165         | ..                  | 2 14 7                 |
|           |       |                   |                               | Ex div.                    |                 |                     |                        |           |       |                   |                               | Do. 3 p.c. Db. Stk.         | 102-105         | ..                  | 2 17 2                 |

† Next dividend will be at this rate.



of Philadelphia, to whom the contract was originally given, to guarantee delivery, the order has been placed with the Glasgow firm.

A large extension has just been made at the works belonging to the Alloa Gas Commissioners. The Manager's house, which was situated next to the works, was taken down, and in its stead there is now larger storage accommodation for coke and coal, while part of the space has been added to the retort-house; thus allowing the Commissioners to put in an additional bench. A new engine-house has been erected in the centre of the works, and there has been placed in it a double set of condensers and two exhausters, one of Cowan's patent governors, and exhaust and pressure indicators. Various alterations and improvements have been made on the existing buildings, so that the works are up to date in every respect. The cost of the alterations has been about £3000. The work has been carried out according to the plans and specifications of Mr. A. Yuill. When the Commissioners purchased the works in 1878, the price of gas was 4s. 7d. per 1000 cubic feet, with 2s. meter-rent. This year it is 2s. 6d., without meter-hire.

The Arbroath Gas Corporation on Monday resolved to apply for a Provisional Order empowering them to supply electricity within the burgh. Here, as in nearly every other town, the step has not been taken spontaneously, but has been forced upon the Corporation by the fear that, if they did not move, they would be forestalled by a speculative company. As one Councillor expressed it, they want to be in a position to dictate to a company, and not to be dictated to. So half-hearted were the Corporation in the matter, that in the minds of some of the members the doubt arose that the intention was to keep the electric light out; and an amendment to the motion was proposed and seconded. These gentlemen were, however, satisfied with the explanations which were made; and they withdrew their amendment, and allowed the resolution to be adopted unanimously.

The introduction of acetylene gas into small towns is doubtless being watched by gas managers in many places. It is so much of an experiment that I need offer no excuse for referring to an article which appears in the "Dunfermline Journal" of to-day, relating to the supply of acetylene gas in Cowdenbeath. According to the writer, the venture has not been a success. At this early period in the history of acetylene gas supply it would, however, be unfair to assume that discontent among the consumers means failure of the system. There may be details in the manufacture and distribution which can be easily remedied. All that it is necessary to do in the meantime is to exercise caution, and to watch the course of events in the towns where the new gas has been adopted. Most people will, I suspect, be somewhat staggered to learn that the price charged for acetylene gas is £5 per 1000 cubic feet. Unless this figure can be very largely reduced, when the ignorance and blundering of the public in the use of coal gas is taken into account, it is evident that the accounts of consumers using acetylene gas will remain at a sum so high that the spread of the movement will be slow.

The Corporation of Aberdeen are still exercised about the condition of the brick aqueduct which brings the city supply of water from the River Dee. It is stated that the repairs which have been executed upon the aqueduct have had the effect of preventing contaminating material

getting into it. The apprehensions of the public have, however, been aroused; and the condition of the aqueduct is not the only question at present under consideration. The quality of the water itself has come to be of equal, if not more, importance. The river is often in flood, when, of course, the intake must be closed; but, worse than this, there are sewage effluents discharged into it from various places higher up the river, which have a polluting effect. In order to get beyond these discharges, it would be necessary to go as far as Braemar with the aqueduct—a distance of about 60 miles from the city, or 40 miles further than the present aqueduct. There is also the proposal that cast-iron pipes should be laid. To do all this would, it is estimated, cost over £600,000. An alternative scheme is proposed, and accepted with some degree of favour. It is to bring in a new supply from the River Avon, a tributary of the River Don. This scheme is estimated to cost about £350,000. The Corporation have entered into an arrangement with Mr. G. Gordon Jenkins, of Aberdeen, to test the condition and flow of the water for a lengthened period, and to report. This will take time; and, in view of this, and of the imperative need for pure water, when the matter came before a meeting of the Town Council last week, a motion was made, in opposition to the proposal to proceed with the Avon scheme, that the present aqueduct should be superseded by a line of cast-iron pipes. The Avon scheme was, however, carried by a majority of 21 votes to 7.

"Colliery Enterprise in Scotland" is the heading which appeared in the newspapers yesterday over an article giving an account of a visit by a party of gentlemen connected with coal exporting to a new pit at Glen-craig, near Lochgelly, Fifeshire, which has just been opened by Wilsons and Clyde Coal Company, Limited, of Glasgow. Two shafts have been sunk a distance of 190 fathoms. Four seams of coal have been found—the main, 5 feet thick; the Jersey, 10½ feet; the Lochgelly splint, 8 feet; and the Lochgelly parrot, 4½ feet. The output is at present about 300 tons per day; and it is expected to rise to 1000 tons. Mr. J. Wilson, M.P., the Chairman of the Directors of the Company, stated at a luncheon that in 1870 the whole export of coal from Scotland was not more than 600,000 tons, whereas last year it was 8½ million tons. It had already reached this figure in the present year; and he expected that before its close it would be well up to 10 million tons. Two other speakers, both from Glasgow, made the significant remark that in the West of Scotland the coal supply is waning, and that it is in Fifeshire that there is now the greatest room for development. Gas managers will be interested in knowing where they are to look for their coal supplies in future.

#### CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Nov. 5.

**Sulphate of Ammonia.**—The improved demand, referred to in our last report, has continued throughout the week, and has resulted in advanced prices all round; the closing quotations being £9 16s. 3d. per ton f.o.b. Hull, and £9 18s. 9d. to £10 per ton f.o.b. Liverpool and Leith. The greatest activity has been witnessed in Scotland, where large speculative

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|--------------------------------------------------------------|---------------------|--------------------------------------------|-------------------|
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| WINDSOR STREET WORKS, BIRMINGHAM . . . . .                   | 2,000,000           | MONTREAL . . . . .                         | 500,000           |
| SALTLEY WORKS, BIRMINGHAM . . . . .                          | 2,000,000           | BELLEVILLE . . . . .                       | 250,000           |
| COLCHESTER . . . . .                                         | 300,000             | OTTAWA (Second Contract) . . . . .         | 250,000           |
| BIRKENHEAD . . . . .                                         | 2,250,000           | BRANTFORD (Remodelled) . . . . .           | 200,000           |
| SWINDON (New Swindon Gas Co.). . . . .                       | 120,000             | ST. CATHERINES (Remodelled) . . . . .      | 250,000           |
| SALTLEY WORKS, BIRMINGHAM (Second Contract) . . . . .        | 2,000,000           | KINGSTON, PA. . . . .                      | 125,000           |
| WINDSOR STREET WORKS, BIRMINGHAM (Second Contract) . . . . . | 2,000,000           | PETERBOROUGH, ONT. . . . .                 | 250,000           |
| HALIFAX . . . . .                                            | 1,000,000           | WILKESBARRE, PA. . . . .                   | 750,000           |
| TORONTO . . . . .                                            | 250,000             | ST. CATHERINES (Second Contract) . . . . . | 250,000           |
| OTTAWA . . . . .                                             | 250,000             | BUFFALO, N.Y. . . . .                      | 2,000,000         |
| LINDSAY (Remodelled) . . . . .                               | 125,000             | WINNIPEG, MAN. . . . .                     | 500,000           |
| KINGSTON, ONT., . . . . .                                    | 300,000 Cubic Feet. | COLCHESTER (Second Contract) . . . . .     | 300,000           |
|                                                              |                     | YORK . . . . .                             | 750,000           |
|                                                              |                     | ROCHESTER . . . . .                        | 500,000           |



buying has been done; and improvement has been most marked f.o.b. Leith, where values a fortnight ago were most depressed. Demand at other points has also been good; and all ready parcels have been promptly disposed of. Consumers' ideas have advanced; but they have scarcely kept abreast with the market. In the forward position, there has also been buying at up to £10 per ton f.o.b. Leith, delivery over the spring months; and at the close makers are asking a further advance.

**Nitrate of Soda** is steady, at 7s. 7½d. per cwt. for good, up to 7s. 9d. per cwt. for refined quality, on spot.

LONDON, Nov. 5.

**Tar Products.**—The slight improvement in the value of benzol created quite a sensation in this market after the long period of depression and receding values. Whether the improvement will be maintained, it is difficult to say. But with business for crude naphtha having been done in Scotland at under 2d. per gallon, surely the "rock bottom" must have been reached; while a sale of English crude has been made at 2½d. naked at makers' works. With such prices as these, it is not worth the distiller's while separating it from his other oils, which are of more value. Carbolie acid shows signs of improvement; inquiries from various sources being pressing. No change appears on the surface in respect to anthracene; but it is felt that the time is rapidly approaching when buyers must come in. Naphthalene in its several forms is moving off freely; but prices are unremunerative.

Business of the week may be marked at the following average prices: **Tar**, 14s. to 19s. **Pitch**, east coast, 25s.; west coast, 22s.; **benzol**, 90's, 9d.; 50's, 10d. **Toluol**, 1s. 1d. **Solvent naphtha**, 1s. 2d. **Heavy naphtha**, 1s. 1d. **Crude**, 30 per cent., naphtha, 3½d. **Creosote**, 2½d. **Heavy oil**, 45s. **Carbolie acid**, 60's, 2s. **Creosote salts**, 30s. **Anthracene**, "A," 4d.; "B," 3d.

**Sulphate of Ammonia.**—The slight improvement noted last week continues with a little more force; and business has been done at the following rates: **London**, £9 13s. 9d.; **North East ports**, £9 15s. to £9 16s. 3d.; **Leith**, £9 16s. 3d.; **Liverpool**, £9 17s. 6d.—less 3½ per cent.

### COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—Any change to notice in the coal trade of this district is certainly in the direction of improvement, and generally the outlook is regarded as satisfactory. The only matter which is causing any uneasiness is that the wages question may be again raised with the commencement of the ensuing year. Mr. S. Woods, M.P., the President of the Lancashire Miners' Federation, having plainly intimated that the men are determined to demand a further advance, as soon as the matter can be again brought forward, in January next. It is anticipated that the men will request a further increase of 7½ per cent., which it is not likely the coalowners would be disposed to entertain; and if persisted in, the question would necessarily have to go before a Board of

Conciliation, in accordance with the settlement come to between the Federated Coalowners and the Miners' Federation. The better qualities of round coal are in more active request; and not only are pits being kept on full time, but the output is all moving away. The demand, however, is not yet of any pressing character; and stocks remain practically untouched. Prices are without quotable change from last month, but very firm at full last rates. Steam and forge coals continue in brisk request for inland requirements, but the shipping demand is only moderate. Pit prices for inland sales are firm, with, if anything, a hardening tendency. Inferior sorts of steam and forge coal might be bought at 7s. 6d. per ton, but better qualities range from 8s. up to 8s. 6d. For shipment, ordinary steam coal averages 9s. to 9s. 6d. per ton, delivered at the ports on the Mersey. Engine classes of fuel are also in active demand. Some fairly large quantities have been placed at an advance over last year's rates; and generally collieries are holding for a minimum advance of 6d. per ton upon last year's basis. On current business, prices have in many cases been advanced 3d. per ton on October rates. Common sorts of slack remain without much improvement, and might be bought at 3s. 6d. per ton at the pit; but good medium descriptions range from 4s. to 5s., with best slacks quoted in some cases from 5s. 3d. up to 5s. 6d.

**Northen Coal Trade.**—There is a weaker tone in the Northumbrian coal trade; but that of Durham is stronger. Best Northumbrian steam coals are quoted at 9s. 6d. per ton f.o.b.; and the demand is still sufficient to keep nearly all the collieries fully employed. Second-class steam coals vary from 8s. 9d. to 9s. per ton; and steam smalls, are 5s. 9d. The demand for gas coal is increasing; and there is very great variation in the prices. For occasional cargoes, up to 10s. 6d. per ton f.o.b. is asked. There is little or no change in the price of manufacturing coals. Gas coke is steady in demand; but the production is now increasing, and stocks must be growing at the inland works.

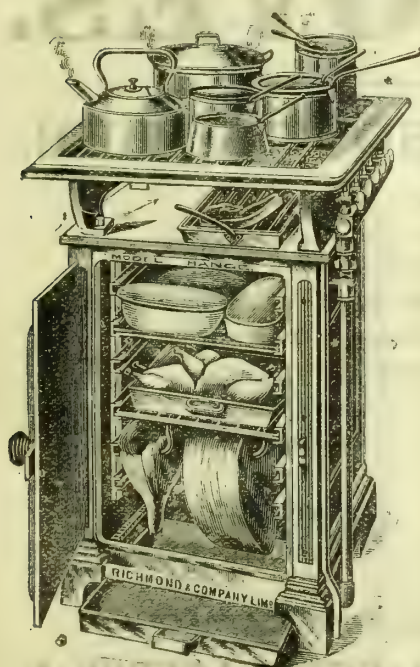
**Scotch Coal Trade.**—Trade is being restricted by scarcity of shipping and of railway waggons, which are both attributable to the great storms of the past two weeks. In some instances collieries are standing idle because they cannot get their output taken away. Supplies of all sorts of coal are plentiful; and, under the circumstances, prices do not improve. The quotations are: **Main**, 8s. per ton f.o.b. **Glasgow**; **ell**, 8s. 9d. to 9s.; and **splint**, 8s. 9d. to 9s. The shipments for the week amounted to 177,408 tons—an increase of 11,313 tons upon the previous week, but a decrease of 12,627 tons on the corresponding week of last year. For the year to date, the total shipments have been 8,196,686 tons—an increase over the same period of last year of 1,436,511 tons.

**Deal Corporation Water Supply.**—The Water Committee of the Deal Town Council report a very successful half-year's working; their income being sufficient to pay off the first instalment of principal and interest on the loan for the purchase of the water-works, as well as all current expenses. Besides being able to get through the first six months without making any demand upon the Council, the Committee have a balance in hand.

# LEADING ARTICLES.

ENGLAND'S

"KITCHENER."

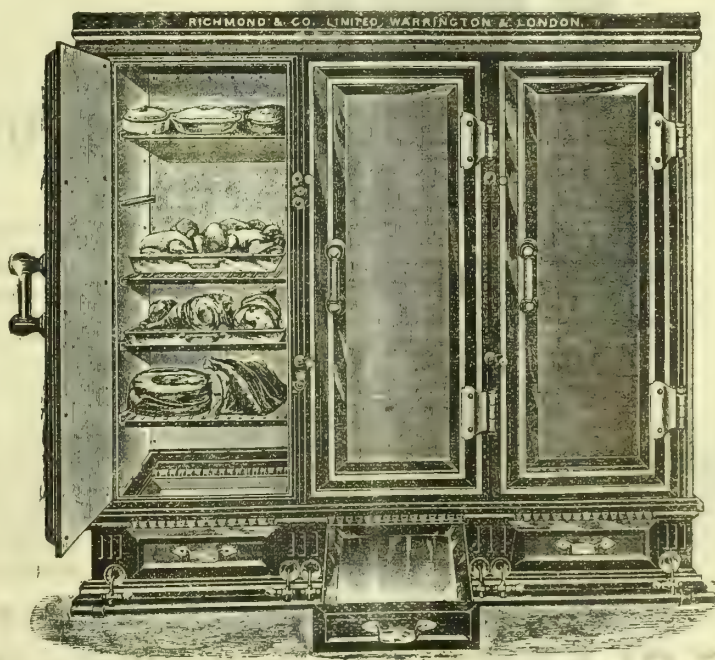


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**The Ramsgate Corporation and the Minster Gas-Works.**—The Gas and Water Committee of the Ramsgate Corporation recommend that an application should be made for permission to increase the borrowing powers of the Corporation for water-works purposes to the amount of £20,000, and for gas-works purposes by £30,000, part of the latter to cover the purchase of the Minster Gas-Works.

**Warrington Water Supply.**—In consequence of the growing demand for water, principally for manufacturing purposes, the Corporation are intending to increase their water-supplying resources. They lately laid certain proposals before Mr. James Mansergh, who advised the construction of a new reservoir in the southern part of the district, and an extension of the works at Winwick. Last Tuesday, the Council directed the Town Clerk to obtain the necessary powers for carrying out the works.

**The Supply of Water in the Out-Districts of Southampton.**—At the last meeting of the Southampton Corporation for the past municipal year, the Parliamentary Committee presented a report containing a recommendation to the effect that, in view of the information reported to them that it is the intention of the South Hants Water Company to promote a Bill in the ensuing session to obtain further and extended powers, the Corporation should promote a Bill for the purchase of the part of the Company's undertaking supplying the areas added to the municipal borough by the recent extension. The recommendation was adopted.

**Slough Gas Company.**—The half-yearly meeting of the Slough Gas Company was held last Tuesday. The report showed that the net profit for the six months enabled the Directors to recommend the payment of the usual dividends. They were also pleased to state that the Act of Parliament confirming the Company's Provisional Order had received the Royal Assent, and that the price of gas had been reduced from 4s. 6d. to 4s. 3d. per 1000 cubic feet in Slough, and from 4s. 9d. to 4s. 6d. at Datchet. In proposing the adoption of the report and balance-sheet, the Chairman (Mr. R. Martin) explained that, in order to provide the necessary capital for new works, they had borrowed £2000 from the bank at 3½ per cent., instead of calling up any of the new shares at 7 per cent.; but they hoped to make a further call on the new shares in about two years' time. The report was adopted.

**Suggested Municipalization of the Rushden and Higham Ferrers Gas-Works.**—The Rushden and Higham Ferrers Gas Company (who have shown much enterprise in meeting a demand which is constantly increasing) are considering the question of promoting a Bill in Parliament during next session, with the view of extending their service. In consequence, several leading public men of both places have come to the conclusion that this is a favourable time to take steps to acquire the undertaking. Last Wednesday a joint meeting of the Higham Ferrers Town Council and the Rushden District Council was accordingly held, when the matter was thoroughly discussed. Eventually the two Councils unanimously decided in favour of the gas supply being in their hands. It was further resolved to at once convene a public meeting in both towns, in order to obtain the consent of the ratepayers to the promotion of a Bill to enable the Authorities to enter into negotiations with the Company.

**The Falmouth Gas and Water Works Purchase Question.**—In the "Editorial Note" on this subject last week, Mr. Silverthorne's estimate of the cost of the Falmouth Gas-Works to the ratepayers in 1896 was, by a typographical error, given as £53,750 instead of £33,750. His estimate now is £36,450—being an increase of £2700. The subject of the supply of carburetted water gas, which was adversely reported upon by Mr. Silverthorne (*ante*, p. 929), has given rise to some correspondence in the local papers; Mr. J. W. Buckley, the Engineer and Manager of the Falmouth Gas Company strongly contesting some of the alarmist statements which have been made on the subject. We shall notice this matter at greater length next week.

**Madeley Water Supply.**—At a meeting of the Madeley District Council on October 26, the Water Committee reported that the work at Harrington had been completed, and that the boring and testing had proved successful. Enough water had been found to supply the neighbouring districts. The boring and testing operations had, however, cost £882—£400 more than was estimated; therefore £300 was required to be raised by loan. The Engineer (Mr. Stooke) said they could supply a million gallons every 24 hours; but it was resolved to put down plant for supplying 250,000 gallons every 12 hours. Analysis showed that the water was excellent, and of moderate hardness. The report was adopted; and it was decided to raise the £300 by loan at 3½ per cent.

**Church Stretton Rural District Council and the Local Water-Works.**—At a meeting of the Church Stretton Rural District Council, last Thursday, a Special Committee appointed to consider the water supply of the area under the jurisdiction of the Council, recommended that valuers be appointed by them and the Church Stretton and Little Stretton Water Companies, for the purpose of fixing a price for the water undertakings, and that, if neither side felt satisfied with the valuers' figures, they should be at liberty to withdraw from the negotiations. The report was adopted. The Church Stretton Company asked £3000 for their undertaking, and the Little Stretton Company £315 when first approached by the Council. The All Stretton Company, who were also requested to state at what price they would be willing to sell their undertaking to the Council, have not yet replied.

**Incandescent Gas-Light Litigation in Melbourne.**—The Australasian Incandescent Gaslight Company are bringing an action in Melbourne against Messrs. Brandt Bros. for an alleged breach of contract in connection with the Welsbach light. According to the plaintiff Company, they supply the defendants with their mantles on condition that their burners are also used by every purchaser of mantles. This contract, they say, the defendants are breaking. The defendants affirm that the burners they affix to the mantles are the same as those used by the plaintiff Company, and that they have been before the public for fifty years. On the 19th of August, Mr. Justice Hodges was asked to grant an interim injunction restraining the sale or use of the mantles, except in conjunction with the Company's burner. After hearing arguments, his Honour refused to make the order sought, but directed the defendants to keep an account of the mantles and burners used by them up to the trial of the action.

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## EDITORIAL NOTES.

## The Proceedings of the Southern District Association of Gas Engineers.

THE Southern District Association met on Thursday last, under the presidency of Mr. R. Beynon, of Torquay, who will be followed in the chair by Mr. A. E. Broadberry, of Tottenham. It is to be hoped that the new President and the Committee will be able to smarten up the proceedings of the Association next year; for it has appeared to well-wishers of the organization that an air of lethargy has crept over it of late which greatly needs shaking off. It is a quiet time just now with the District Associations generally, owing to the fact of there being nothing stirring in the technic of gas manufacture. Inclined retorts, mechanical stoking, and carburetted water gas are old topics now; and gas managers have little left to dispute about. So far as it went, however, the spice of controversy was not absent from Thursday's proceedings.

The so-called "carburation" process for the prevention of naphthalene deposits in the district, as originated and applied at Hastings by the Messrs. Botley, father and son, was brought upon the carpet once more, with the object of proving its practical success by the citation of further experience since the process was described to the Institution of Gas Engineers in May, 1897. The authors are to be complimented on their perseverance; and they cannot be denied the credit for having made out so good a case for their process that the responsibility for not trying it now rests heavily upon gas managers troubled with their own old complaint. The mental attitude of gas managers in regard to the naphthalene evil would afford a curious study for a psychologist. Such of them as are familiar with the nuisance are loud in complaint of the worry which it causes them; but tell them of a remedy, and so far from expressing gratitude, the probability is that they will shake their heads over the suggestion. The moment a gas manager who has been a sufferer claims to have delivered himself by the adoption of some process, all the others turn upon him, and in their hearts revile him for a "quack." The Hastings process is at least a clear and intelligible operation, capable of being described in much simpler language than the authors prefer to indulge in respecting it. Mr. Botley said on Thursday that it consists in "the treatment of the gas going into the district from the outlet of the governors by adding an oil mist to it, enveloping the gas in an oily atmosphere, through which it is protected throughout its canalization, whence it passes to the burners." The description would have been less open to question if it had stopped at the first comma. It is only inviting criticism to talk of enveloping gas in an oily atmosphere. This is contrary to the fact. It is the gas which constitutes the atmosphere, and the oil fog is borne by it, exactly as sea fog is carried by the air. It is Mr. Botley's contention that the result of the addition of this oil fog to the gas in the distributing mains was to soften, and cause to disappear by absorption into the gas, ancient naphthalene deposits wherever found; and further to prevent the deposition of any more naphthalene anywhere. Mr. Botley's sharpest critic—Mr. J. W. Helps, of Croydon—declares his inability to see any reason why the process should effect anything of the kind. The Messrs. Botley rejoin that the fact remains, which is quite enough for them.

Here, it seems to us, they had better rest, and let somebody else make the next step. There is no getting over the evidence that since the process has been in use at Hastings the total number of stoppages in the district has fallen from 4948 in 1893, to 485 in 1898, notwithstanding the increased bulk of gas sold and of consumers' connections. This is a matter of the office complaint-book, which cannot be gainsaid. Mr. Botley ascribes the beneficial result to the operation of the "carburation" process; and this is the strength of his case. When he goes beyond, and attempts to explain how it is done, as by suggesting the creation by the oil mist of an "artificial vapour tension" in the gas-mains, he makes a mistake. We suppose it to be true, by the way, that the oil used is actually a solvent of naphthalene at the ordinary temperatures. Stress was laid, and very properly, upon the phenomenon of the large deposition of water that attends the addition of the oil fog to the gas. Delicate thermometric experiments at this point might throw some light upon what goes on in the



circumstances. Some young student of gas manufacture anxious to "win his spurs" by an original paper, might do worse than address himself to the task of wresting the physical secret from this remarkable phenomenon.

Mr. W. B. Randall's paper was a very useful contribution to contemporary technical literature; and it went to show how valuable the aid of instruments may be in raising the standard of practice in the direction of precision. Two comments are suggested by the paper. The author says: "It is very remarkable how some soils have the 'power of deodorizing the gas.'" This is not a novel observation; but the hint it gives has never to our knowledge been followed up. Is it the fact that certain soils do deodorize coal gas? If so, what is the active principle in the operation? If such a principle were isolated, it might prove effectual in deodorizing the exhaust of gas-engines and the chilled products of combustion which are apt to give so much annoyance when gas-fires are first lit up. There is a use for something of the kind. The other observation refers to Mr. W. A. Valon's point that gas managers had better resign themselves to the steam-roller and the traction-engine, which have "come to stay." It is unquestionably true; and though an audience of gas managers may sympathetically cheer a brother manager's complaint of the cruelty of traction-engines to gas-mains, the wiser among them will see in the moving tale a warning to put their pipes beyond the reach of injury. The laying of small gas-mains in country roads has often been scandalously scamped in days gone by. The local marine store dealer knew more than he was likely to tell about the ganger's "perks;" and the gas manager of the present day has to correct the faults committed in an earlier, but not more guileless era.

#### The Latest Trade Union Ideals.

It is not an uninteresting, while it is often an amusing, occupation to test societies and classes of mankind by their acknowledged ideals. As practice inevitably falls short of profession in the individual, so achievement never amounts to 100 per cent. of a Party programme. If it did, there would be nothing left to fight and organize for. Of all the militant societies that exist by virtue of the Englishman's inherited reforming spirit, and his growing preference for having his work in this kind done for him, there are very few that would not regard with dismay the immediate realization of their declared objects. Where would the estimable Peace Society be if the sword everywhere were actually converted, if not into the reaping-hook—these implements being superseded by machinery—at least into the British policeman's staff? In order to keep a reforming society going, a good serviceable ideal is necessary—something not too remote to arouse enthusiasm, but not in urgent risk of realization. It is understood among a certain section of the public that the cause of Trade Unionism is a great and good one. They profess to see in it the only hope for Labour (with the capital letter); and it is therefore incumbent upon students of their own times to ascertain what are the ideals of this kind of organization. It should not be open to question that the most trustworthy intelligence in this regard is to be procured from the official declarations of the Parliamentary Committee of the Trade Union Congress. Mr. S. Woods, M.P., the Secretary of this Committee, has just issued a "manifesto"—precious word!—in which the latest Trade Unionist "charter" is formulated. Consequently, we now know what organized Labour wants.

Its requirements are: The reduction of the qualification for voters to the lowest possible point; the removal of the cost of registration to the public funds; that parochial relief shall not involve disfranchisement; the abolition of plural voting; and the payment out of the public funds of returning officers' fees in parliamentary elections. This is enough for one mouthful; but it is difficult to see where "Labour" comes into such a hack politicians' hotch-potch. Next comes the demand for a Bill providing for the separate valuation of land and improvements, for the assessment of taxation and rates upon the full true yearly value of land, whether in use or not. "Labour" not yet in sight! The next point is the payment of members of Parliament, "as in most other countries." Now we are "getting warm," as the children say. In the following claims, we eventually reach the spot. These are for the extension of the Workmen's Compensation Act, so as to include all trades and industries on land and sea, and to remove the safeguard

of the first fortnight. Also, for a "better administration" of the fair wages resolution passed in the House of Commons in February, 1891, so as to provide for a "minimum wage of 24s. a week for labourers in the 'various Government Departments,'" for compelling the Government contractors to pay "standard" wages; for a miners' Eight-Hour Bill; for Board of Trade investigation into cases of alleged victimization of railway services; for the passing of Mr. Samuel's Steam-Engines and Boilers (Persons in Charge) Bill. Well may the most perfervid Press advocates of the Trade Union cause feel they have been "sold" over this paltry trifling with the issues of Labour politics. What has become of the forty-eight hour week; the hours of labour of women and children; the shortcomings of the Truck Act; old age pensions—and a hundred other things that the organized British Workman is supposed to be in need of? Said we not truly the other week that an extra quarter of an hour for breakfast would be worth more to British workmen than all the "resolutions" of all the Trade Union Congresses that have ever been held? In this manifesto of Mr. Woods, M.P., the cheap professional politician is first, and the working man, who actually works, is nowhere—to say nothing of the woman and the child. Why, the old Trade Union cry for the "Three Eights" was immeasurably beyond it in every respect. If this proclamation gives the ideals of Trade Unionism, then its prophets had better "step down and out."

#### Mr. J. B. Crockett on the American Gas Industry.

THE Presidential Address of Mr. J. B. Crockett, President of the San Francisco Gas and Electric Company, to the American Gaslight Association, on the occasion of the recent meeting at Niagara Falls, was briefly mentioned in last week's "JOURNAL." The different conditions under which the gas industry of the United States is carried on, as compared with those prevailing in this country, have often been the subject of comment in these columns. Mr. Crockett's address was a luminous exposition of some of the most important of these differences. The question of municipal ownership of gas undertakings, for example, has bearings of a totally different nature in the two countries. Mr. Crockett shows his perspicacity as a man of business by brushing aside the cobwebs of pseudo-scientific analysis of the question, from the American standpoint, and placing in the forefront the evidence, gathered from our news columns, that gas consumers in English cities where the gas-works are municipalized are not getting their light any cheaper than those in cities of the same size supplied by Gas Companies. This is a hard nut for the theorists of municipalization to crack. At the present juncture, when even Municipalities in the United Kingdom are being very much exercised over the prospects of cheap electric power transmission, it is interesting to hear what Mr. Crockett has to tell us on the subject. Speaking within sound of the Falls of Niagara, and coming from California, where long-distance electric power transmission plant is at home, Mr. Crockett uttered words of reassurance and comfort. He freely admitted that these large systems have, in some instances, inflicted a very great deal of hardship on small local Companies, but stated that "the cost of equipping 'and maintaining an electric plant for long transmission, the high initial voltage required, the line and 'converter loss sustained, and the high cost of constructing storage dams to ensure a full supply of water during 'a dry season, have caused this system of lighting to be 'looked upon with more or less disfavour." Mr. Crockett's conclusion is "that long-line transmission will not at 'present hurt the gas business." Descriptions of these power-transmission plants look formidable in technical literature; but "the Receiver" is a very real bogey in the American industrial world, although engineers do not often mention him. As regards the effect of the trolley-wire system of tramway working upon gas mains and services, Mr. Crockett again speaks with the authority of all the experience there is—which is the American. When the first electric trams got to work, the distribution plant of the San Francisco Gas Company began to suffer from electrolysis. Steps were taken to prevent the mischief; but it is the President's deliberate judgment that the process of deterioration from this cause is still likely to go on. He does not take an alarmist tone in regard to the danger, but is quite resigned to its existence. Let the electric tramway be never so well laid and bonded, there will be



leakage of current in places. The comparatively great mass of the gas and water pipes will attract some of the return current at these weak places, and corrosion will take place even when the voltage of the escaping current is so low as not to deflect the needle of an ordinary station voltmeter. This is the prospect which British gas engineers in their turn will have to face, if other objections to the overhead trolley-wire system are overcome. Mr. Crockett is to be congratulated on his excellent address.

#### The Origin and Development of the Prepayment System.

IN another part of the "JOURNAL" will be found the first of a short series of articles on the above subject, by Mr. E. W. T. Richmond, the appearance of which in our columns seems to call for a few explanatory remarks. In common with everybody engaged in the business of gas supply, Mr. Richmond had been struck with the extraordinary development of the prepayment system since the introduction of Mr. Brownhill's meter placed in the hands of gas managers another means of extending their business; and a few months ago it occurred to him that an interesting article might be written tracing the gradual adoption of the now popular "penny-in-the-slot" arrangement in connection with the sale of gas. But, as in the case of other historians, he found that the writing was the smallest part of the work; the difficulty lying chiefly in the collection and arrangement of material. However, starting with all the published matter available, and encouraged by the cheerfully rendered assistance of gas managers on all hands, he commenced his task; and as he proceeded he found that the work grew under his hand. He nevertheless went steadily on; and the result of his labours will come before our readers in this and succeeding issues. With regard to the form in which the matter is presented, it was, of course, open to the author to make his story a dry record of facts and figures. He preferred to adopt a much lighter style; and however foreign it may be to the columns in which it appears, we venture to think the author's data will be none the less interesting from the fact that they are interspersed with evidences of research in another field than that of strictly technical literature.

#### The Reform of Company Promotion.

THE Lord Chief Justice of England took advantage of the ceremonial introduction of the new Lord Mayor to Her Majesty's Judges on Wednesday last for the delivery of an eloquent—even impassioned—diatribe against the evils of the joint-stock company system. This is no new fancy on the part of Lord Russell of Killowen, who has on former occasions declared himself to be an enemy of the fraudulent company promoter and all his works. This last pronouncement began with due acknowledgment of the good effected by the principle of trading with limited liability. It has enabled that to be done by honest co-operation of the many which could not be done by the unaided efforts and resources of one or a few; but it has been abused by the unscrupulous few. The chief abuses of the system enumerated by the Lord Chief Justice are over-capitalization, misrepresentation as to the value of the property concerned, going to allotment on insufficient capital, and the "one-man company" fraud. Much of the evil done under these categories could not happen if directors were what the law supposes and intends them to be—namely, honest, independent, and capable men of business. The mischief of over-capitalization is one of degree; and some degree of it is probably unavoidable from the very nature of the joint-stock company system. The promotion of companies is not a missionary enterprise. Somebody must undertake the work, and be paid for it. The curious thing is that this business remains unrecognized. You shall look long in a Directory before you discover the name of anybody so classified. Yet, why not? One can sympathize with the artless young foreigner, Charles William Siemens, who, when he brought over his and his brothers' first invention—the water-meter, that bears the family name—walked into the office of an "undertaker" in the belief that this was a place where his business would be done. Why should not those men of affairs who "undertake" the flotation of joint-stock enterprises hang out their sign to this effect? It would at least be open and above-board. A prospectus might bear the notification that the company was being promoted by Mr. Blank, at whose office every information that intending investors might reasonably ask for would be supplied. The investing public might as well pin their faith to Mr. Blank as to the name of anybody else

seen upon the front page of the prospectus. The British public have paid dearly for their experience of the secret promoter. They might try the overt plan in a few instances. Something will have to be done to help in the curing of the great and crying evils described and discussed by the Lord Chief Justice. The joint-stock system is part and parcel of the industrial and commercial life of the community; and great as have been its effects, there are even greater results to follow, so soon as the co-operation of the small investor is recaptured. It should not be beyond the wit of man to devise some means of working the system without the fraudulent promoter and his dummy directors at one end, and the venal financial Press at the other.

### WATER AND SANITARY AFFAIRS.

THE Royal Commission on the London Water Supply held two sittings last week, and a third yesterday; the subject under consideration being that of intercommunication between the works of the different Companies. We referred last week to the statement by Mr. Pope, Q.C., that the Companies were prepared to undertake the duty of promoting a Bill next session for the purpose of connecting the different systems of supply in the Metropolis. According to the evidence of Mr. Ernest Collins, the Distributing Engineer to the New River Company, the cost of carrying out the scheme was estimated at about £307,000; but there was another plan, in which, by utilizing certain works intended to be abandoned by the Southwark and Vauxhall Company at Battersea, and laying a main to Battersea from Hampton, a very good centre of distribution could be obtained, possessing certain advantages. The total cost of the mains and connections in this case would be about £255,000; but, in addition, there would be the cost of purchasing or renting the Battersea works. This scheme had not then been considered by the Boards of Directors, but it was said to have the support of all the Engineers. At the sitting of the Commission the following day, Sir Henry Knight, the Chairman of the Southwark and Vauxhall Company, said he did not consider either of the plans put forward on the previous day to be absolutely necessary; and he suggested a more modest scheme, capable of being carried out at a cost of £25,000 or £30,000, which would meet all the needs of the East London Company. Sir Henry explained the general attitude of the Water Companies by saying they felt it necessary to adopt some scheme of intercommunication such as that which was to cost £307,000, in order to "satisfy the public outcry." Other witnesses officially connected with the Water Companies gave very similar evidence—approving of a large plan for linking up the mains, but intimating that it was not really wanted, and would seldom or never be used. It was simply devised to meet the popular cry. Lord Llandaff remarked that the result of the evidence went to show that nobody wanted the works, and so nobody should bear the cost of them.

The position in which the London Water Question now presents itself is assuredly singular to the extent of being absurd, and we may even say mischievous. Popular clamour, excited by a party in the County Council, has taken such effect on the Companies that the latter come forward with a proposal to expend £300,000 for something which is entirely unnecessary, and which they know to be so. The Distributing Engineer of the New River Company offers evidence in favour of such a project, and then gives it as his private opinion that the works are not wanted. The Chairman of the Commission thereupon observes that, according to the evidence, the Companies have pledged themselves to go for a Bill in Parliament to carry out works which are "absolutely superfluous." It is evident that the East London Company can have their wants supplied with a very moderate addition to the expenditure which has already taken place. But a demand has been put forth that all the systems of supply shall be connected; and there is to be a clause to carry out this view in the Purchase Bill which the County Council are about to bring into Parliament. The Council refused to promote a separate Bill for the purpose of connecting the mains of the several Companies, but tacked this project to their purchase scheme; the certainty being that no relief could be afforded to the East London district by such a plan, till after the expiration of the coming summer, when no such relief would be wanted. The Companies are providing that East London shall be secure against any restriction



of its supply when the summer heats are again prevalent. Beyond this they propose a larger scheme, costly in itself, but simply on all-fours with that which the Council desire to carry out when they take the place now occupied by the Companies. At this juncture, what says the organ of the Progressives to the action of the Companies? As a primary argument it is declared that the Water Companies should not be allowed to spend more capital while the prospect of purchase is so near at hand. Of course, nothing is to be done to improve the water supply, or in any way to satisfy public feeling concerning it, so long as the Companies remain in possession. The very operation which the Council have advocated, and for the non-execution of which the Companies have been blamed, is now condemned in so many words as an obstructive measure intended to support Lord Onslow against the Council. One feature in the plan proposed by the Companies is very distinctly objected to, though it may prove to be of great value at particular times. It is proposed that the Local Government Board shall have power, in case of emergency, to authorize any of the Companies to take more water from the Thames than they are now allowed to draw. This seems a very reasonable provision, and one quite in accordance with the interests of the public. If London wants more water for a brief period, is London not to have it? Would not such a denial be a worse restriction than that of which so much complaint has been made in respect to East London? What will the County Council do to meet London's demand for water during the ten or fifteen years which are to intervene before the Welsh aqueduct is in operation? With respect to the Welsh supply, our information of a few weeks ago, that the mountain streams are seriously affected by the deficient rainfall, is thoroughly supported by a letter in "The Times" of yesterday, the communication being evidently from a writer well qualified to speak. It is stated that during the recent drought the stream principally relied upon to supply the reservoir of the County Council's Welsh water scheme "was completely dried up for a month." In another letter Sir A. Binnie is stated to have told the Select Committee on the Staines Reservoirs Bill that "no new water power" was required for the present supply of London.

The question of connecting the different water systems in the Metropolis has now assumed a magnitude which few outside the official circle of the Companies could have anticipated. When the Commission resumed its sittings last week, the Chairman showed his sense of the situation by saying he proposed to deal first with "the separate and small subject of the inquiry—namely, intercommunication between the different Water Companies." It now appears that, if all the supplies are to be connected, the "small subject" will be a matter of debentures to an extent exceeding a quarter of a million. If this occasions surprise, we may also suppose the County Council to be caught unawares, by being placed third in the race on the subject of intercommunication. Their project for connecting the different systems is practically strangled by the dead-weight of the purchase scheme. The Companies come forward with a Bill which is free from any entanglement, while over and above all there is the evident determination of the Local Government Board that there shall be prompt legislation of some kind or other to connect the different systems of supply, even if they bring in a Bill of their own. The County Council must now contemplate the risk of being superseded on all that relates to the East London question, for it is utterly unlikely that the Government will allow a Bill to pass which couples with that subordinate topic the actual purchase of all the water undertakings of the Metropolis, unless, indeed, meanwhile there comes a report from the Royal Commission adopting the County Council's view that inter-communication between all the Companies is necessary for East London's sake, and can only be accomplished by letting the Council buy up all the concerns. Such a conclusion, if arrived at by the Commission, would be exalting the "small subject" into a position commanding the entire field. After all, the mountain might well bring forth a mouse; the result being the adoption of a plan something like that proposed by Sir Henry Knight. This would suffice for the passing hour, and perhaps for a little longer. Yet there is the risk that even the Commission and the Government may be so pushed as to feel, like the Companies themselves, that it is necessary to do something big, in order to "satisfy the public outcry."

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1118.)

THE markets in the Stock Exchange opened last week still dominated by the shy feeling which marked the close of the week before. Caution was the order of the day; and business remained very quiet. Gradually, however, a better state of feeling crept in; and after the delivery of the Premier's speech at the Guildhall on Wednesday, a pronounced sense of relief was felt. Prices rose freely as operators found it expedient to buy back. Apart from home politics, the defeat of the silverites in the United States elections gave the American market a fine lift. The Stock Exchange settlement was light and easy; so that influences were favourable all round. The Money Market was easier; and Stock Exchange requirements were too slight to create any demand. Business in the Gas Market has at last shown a little more animation; and transactions approached something more resembling a normal level. Changes in quotations were not numerous or considerable; but the general tendency indicated was in the direction of easier prices. In Gaslights, the "A" was fairly active on most days of the week. Opening at 290, it soon began to show symptoms of shrinking, which ruled till the close, when the last mark was 287½, and the quotation had lost a couple of points. The secured issues too were not very firm; but the only actual decline was in the 10 per cent. preferences. South Metropolitan was moderately dealt in at rather easier prices; but the quotation stood still. Nothing to speak of was done in Commercials. The Suburban and Provincial was only noticeable for a few dealings in issues which are not often in the market. Good prices were commanded; but quotations did not move. Business in the Continental Companies was unimportant. Imperial was most in evidence; and the tendency was not quite so strong—the quotation being a point weaker, after allowing for the dividend. But the 3½ per cent. debenture gained a point. There was nothing calling for particular remark in connection with other undertakings. Water was quite stagnant; transactions being of the slightest, and quotations not undergoing any change.

The daily operations were: The opening day was not very brisk for Gas. Transactions were mostly in Gaslight "A" at the old figures; and the quotations did not vary. Tuesday's business was more evenly distributed over the list; but it was not heavy. Prices ruled easier—Gaslight "A" and Imperial receding 1 each; and Hong Kong, ½. Wednesday was quite a quiet day (owing partly to the Lord Mayor's Show), and nothing moved. Activity revived to some extent on Thursday. Gaslight "C," "D," and "E" fell 1; but the actual price marked showed no falling off. Friday brought a further shrinkage of 1 in Gaslight "A." Saturday's business was of its usual proportions; and no changes were marked.

### ELECTRIC LIGHTING MEMORANDA.

Reappearance of Mr. Tesla—Power Transmission Without Wires—The Theory—The Objections.

AFTER a prolonged interval of silence, Mr. Tesla has broken out again, and the newspapers were last week once more charged with high-tension articles inspired by the projected triumphs of this Austro-American "wizard." For, indeed, Tesla seems to have quite superseded Edison in the capacity of the great medicine man of electricity. It is so long since the "Wizard of Menlo Park" was heard from, that he must be supposed to have retired from the wonder-working branch of his business. The magazines even have ceased to find the name of Edison attractive of stray sixpences and threepennies. It was very different once upon a time, and that not a great while ago. Mr. Edison was understood to be prepared to abolish war according to the old ways of fighting; and when the almost forgotten difficulty about Venezuela was in its acutest stage, he was widely reported to be perfecting a system whereby the President of the United States should be able to destroy the British fleet wherever it might be, by the simple process of pressing a button in his cabinet. The United States have actually been at war since then, although not with this country; and it must have been a disappointment to the students of Edison prophetic literature, to discover that after all the war had to be finished by fighting in the crude old bloodthirsty manner. There was none of the button-pressing trick in the Cuban business; but the rough, earnest fighting men simply fought and died just as though Edison had never existed. Now that there is no more fighting to be done, Mr. Tesla takes the opportunity for announcing that he has a system of electrical power transmission whereby everything in this line that Mr. Edison, wizard (retired), did not do can be easily accomplished, "and more too."

A more sober account of Mr. Tesla's method appears in the current number of the "Electrical Review." It turns out to be a proposal to transmit electric power without the intervention



of any metallic line conductors, by taking advantage of the conductivity of the layer of rarefied air existing in the higher regions of the atmosphere. In order to effect this purpose, special apparatus has been devised for the production and conversion of exceedingly high electrical pressures. Tesla accordingly claims to have accomplished, with safety and ease, the generation of electrical pressures measurable by millions of volts. In the course of these investigations, certain unforeseen ancillary facts were discovered. Among them is the discovery that with electrical pressures of the magnitude and character which Tesla has been able to produce, the atmosphere becomes in a measure capable of serving as a true conductor for transmitting current. Also, the conductivity of the air increases so materially with the increase of electrical pressure and the degree of exhaustion, that it becomes possible to transmit through even moderately rarefied strata of the atmosphere electrical energy up to practically any amount and to any distance. In order to carry out his system of power transmission, Tesla begins by employing special apparatus capable of generating electrical pressures vastly in excess of anything previously heard of. By way of showing that such apparatus exists, our contemporary publishes a view from a photograph of a model Tesla transformer or "oscillator" in action—very much so, in fact, inasmuch as it is the originating centre of "luminous streams," or sparks, covering a width of 16 feet and of the "estimated" pressure of  $2\frac{1}{2}$  million volts.

The transmitting arrangement for use in connection with this artificial lightning apparatus would be a balloon, maintained at an elevation where the atmosphere would be sufficiently rarefied to be capable of conducting freely the particular kind of current produced. At any distant point where the energy is to be utilized, a corresponding terminal is provided at the same elevation, which would receive the current for conveyance to earth and suitable conversion there to useful purposes. Of course, the whole thing is very prettily demonstrated "diagrammatically," and all the essentials have been worked out, upon paper. The phenomenon of transmission in this way is one of true conduction, and is not to be confounded with the phenomena of induction or of electrical radiation which have heretofore been observed and experimented with, and which, from their very nature and mode of propagation, would render practically impossible the transmission of any considerable amount of energy to such distances as would be of practical importance. This is all very clear and plain. The first criticism that suggests itself is as to whether the scheme differs from any other of the electric firework devices with which the name of Tesla has been associated. Our electrical contemporary admits that the suggestion rests upon a basis of fact which is sound enough so far as it goes. It is true, that is, that the resistance of air to the passage of electricity gradually decreases, with diminution of pressure, until a minimum is reached; and then there is an increase, possibly to infinity, as the exhaustion of the air approaches absolute vacuum. Since the pressure of the atmosphere diminishes with elevation, there must be a height at which the conductivity for electricity is at the maximum. What Tesla is actually proposing is to utilize the stratum of greatest conductivity for his outgoing lead; the earth being employed for the return.

The first question to be asked is, Where is this desirable stratum of the atmosphere, and how is it to be reached? The reply to the inquiry is not encouraging. Schultz has measured the conductivity of air at different pressures, and found that the maximum conductivity existed at a pressure of about 0.1 mm., when it was about a thousand times that of air at the ordinary pressure. A stratum of air at a pressure of 0.1 mm. does not exist naturally nearer than 30 miles above the earth's surface, where it is obviously out of reach. But Tesla claims that with his high tension currents the air behaves differently; which would absolve him from the necessity of going to the region of greatest conductivity. But wherever he goes, the vertical height must be very much less than the horizontal span; and there must thus be a tendency of the current to travel by the shortest road, which in this case would be in the vertical direction. Whatever else Mr. Tesla may be able to do, he can hardly expect to make electricity travel otherwise than along the line of least resistance. However, the prospect held out by this latest announcement is a fascinating one, and not to be dismissed as wholly chimerical. If Mr. Tesla keeps on long enough, he is likely to do something practical at last; and if he turns his attention from artificial lighting without wires to power transmission under the same condition, his goal may be nearer.

**Experiments on Mixtures of Acetylene and Air.**—We have received from Mr. F. Grover, Assoc. M. Inst. C.E., M. Inst. M.E., of Leeds, a copy of a pamphlet giving particulars of some experiments carried out by him on the pressures and explosive efficiency of mixtures of acetylene and air. He explains that in cases where acetylene gas has been employed as motive power, the proportions of air to gas have been calculated from the cylinder volumes and the volume of gas which passed the meter. This method might lead to erroneous conclusions; and it was with the object of examining more closely the behaviour of acetylene gas applied to explosion engines that Mr. Grover made his experiments.

## THE STRIKES AND LOCK-OUTS OF 1897.

THE report of the Chief Labour Correspondent of the Board of Trade on the Strikes and Lock-Outs of 1897 was briefly mentioned in a paragraph in last week's "JOURNAL." It has furnished the newspapers with matter for reflection which has been utilized in a variety of characteristic ways. Last year was troubled by some very serious labour disputes, the chief of which was the outbreak of the Society engineers. It has become the rule of the Labour Department of the Board of Trade to determine the importance of an industrial dispute by multiplying the number of workpeople thrown idle by the number of working days over which their idleness extends. This is probably the best way of measuring the disturbance; and if it is systematically carried out year after year, it furnishes statistics of real relative and approximate actual value. Tested by this means, 1897 was a bad year as regards the aggregate duration of disputes, but one of the lowest as regards the number of workpeople involved. Looking back over these strike statistics for several years, it is possible to draw certain inferences respecting the industrial movement. For the last five years, no disputes of any magnitude were reported among agricultural labourers, seamen, or firemen; and it is impossible to dissociate this quiescence from the total collapse of the Trade Union movement in these classes of workpeople. On the other hand, the occupations in which there is most organization—mining and quarrying; metal, engineering, and shipbuilding; and textile trades—furnished by far the largest number of disturbances. These statistics may be commended to the notice of those public speakers and newspaper writers who affect to believe that Trade Unions do not encourage strikes. Yet, after all, the number of workpeople involved in disputes is very small as compared with the total numbers employed, "except, perhaps, in the case of coal mining." When politicians and others talk about the danger to British trade supremacy through the prevalence of strikes, they should be reminded that even last year, with the engineers out on the war-path, not more than 2 per cent. of the working population was involved in dispute with employers.

An interesting point brought out by an analysis of these strike statistics is the great magnitude of a few of the trade disputes in this country in recent years. For several successive years there was one great strike, in one trade or another, every year. In 1893, it was the federated miners; in 1894, the Scottish miners struck to the number of 70,000; in 1895, the boot and shoe trade was in revolt; 1896 was void of such exciting incidents; but in 1897 came the turn of the engineers. Statesmen have a habit of saying that in matters political the English people can only attend to one thing at a time; and this national trait appears in connection with industrial outbreaks. It might be a curious inquiry as to what would happen if all these workpeople went on strike simultaneously. Such, we know, has been the dream of the professional agitators of the impractical German socialistic school, who have more than once tried to bring off the stupendous phenomenon of a "universal strike." But the trick has been too artificial. The British workman is not averse to striking when it suits him to "play" instead of work; but he does it on his own account, and it somehow happens to come "turn and turn about."

Most industrial disputes, as this report again shows, are over questions of rates of wages. Disputes over hours of labour come next for the past year, because of the inclusion of the engineering strike under this head; but ordinarily it is a minor source of trouble. The engineers' strike might also have been included under the heading "Working arrangements." As regards wages, 1897 was a good year for trade, and consequently for pay. On the whole, the disputes were settled in the majority of instances in favour of the employers. Small strikes, for increases of wages, went generally in favour of the men; labour being in great demand, especially in the building trades. A melancholy exception to the general rule is the case of the Welsh tinplate manufacture. The value of tinplates and the volume of the trade reached their maximum in 1891, since when there has been a heavy decline in both. Meanwhile, the men have endeavoured to maintain the list of piece prices settled in 1874; while the masters have tried to increase the output or else reduce the rates of pay. The result has been continually recurring disputes, accompanied by the closing of many mills "more or less permanently." Thus it is shown once more how difficult it is for trade societies to accommodate themselves to bad trade conditions.

The chief interest of the report naturally centres in the special account which it gives, in nine pages, of the great engineering dispute. Knowing the Trade Union proclivities of the Department, which confessedly draws all its figures from Society sources, we were curious to see how the official chronicler, himself an ex-Secretary of the Amalgamated Society of Engineers, would treat this catastrophic chapter of the history of his old Society. The story commences by admitting that for some time back the relations between the organizations of employers and employed in the engineering trade "had been unsatisfactory, and it was becoming evident that, at almost any moment, serious complications might arise." Then it is recounted how trouble originated through the arbitrary conduct of the Amalgamated Society of Engineers with regard to the employment of men belonging to other Societies to attend to machine tools. The movement for



obtaining a general eight-hour day in the London district was started early in the year; and in its earlier stages it was confined to this one object. But when the parties found themselves engaged in a struggle for mastery, however, other and more real questions came to the front; and the dispute involved the settlement of workshop control and the limits of Trade Union interference. It has never been known how far the effects of the strike extended. Even now the report declares it is not possible to give precise information as to the number of men directly and indirectly affected by it. The aggregate number of days lost is computed at 6,849,000; and perhaps 50,000 workmen in all lost time over it. The full text of the settlement signed on Jan. 28 are given. The chronicler passes over without comment the failure of the Board of Trade to conciliate the parties. The report certainly gives the impression that the work of the Department has now subsided into a purely statistical groove.

## MECHANICAL TRAMWAY TRACTION.

### SECOND ARTICLE.

THE prospects of gas-power tramway working should be brightened by what has immediately transpired upon the publication of Mr. J. Allen Baker's report. We cannot complain of Mr. Baker's guarded observations upon the system; but it is imperative that his comments, which carefully stopped short of a conclusion, should be read in connection with the letter of Mr. T. C. Hersey in the "JOURNAL" of the 1st inst., and Mr. Howard Lane's letter which appears in our Correspondence columns to-day. We are content to rest the case for gas traction, at present, upon Mr. Lane's weighty observation, that "if a self-contained motor tramcar is ultimately forthcoming which will be efficient, economical, and unobjectionable in its working, there are most important reasons why the question of its adoption should receive favourable consideration from all municipal authorities." Mr. Lane confesses that the unfavourable report of the Birmingham Corporation deputation is not conclusive, which is all that need be said about it. The chief considerations to be borne in mind by anyone who would undertake to judge the relative and absolute claims of the various systems of mechanical traction now before the world, are fairly indicated by Mr. Lane. It may not be superfluous to state that the origination and progressive development of gas-power tramway traction have been chronicled in the "JOURNAL" for several years past.

It must be counted as meritorious in Mr. Baker that, although he allows it to appear that he does not think there is much in gas-power tramway working—or he would surely have discussed the idea at greater length, and illustrated his story with at least a drawing of a car and its mechanism—he does not, as already acknowledged, pronounce judgment against the system even as he knows it. Mr. Baker does so condemn steam and oil motors as applied to tramcars, which may appear rash if regard is had to the desperate contemporary attempts to place motor vans upon the streets in France and England. In the "Engineer" of the 28th ult., there appear illustrations and descriptions of heavy motors cars of four different types, examples of which actually participated in the second annual road trials just held in the vicinity of Paris. It is a little hazardous for even the most confident believer in electrical traction to disregard this evidence that the steam and oil road motor is not yet dead. He may be justified in regarding these things as already condemned to failure; but unhappily for him those who are interested in the road motor business do not submit to his judgment. The plain man, who is no expert, may be pardoned for feeling bewildered when Mr. Baker assures him, on the one hand, that steam tramcars are "out of the race," and that oil tramcar motors have proved both "unsuccessful and unpopular;" while, on the other hand, there are the Automobile Association and others to assure him that this is a complete mistake.

A pause may be conveniently made here in order to introduce a consideration that should not be lost sight of—that is to say, the question of the road surface. A steel rail such as is used for a tram-line is only a small piece of very hard, smooth, and easy road surface. If the whole road surface were similar to it, physically, most of the difference between a tramcar and a common road car would disappear. As matters exist for the present in regard to road surfaces, this consummation is not to be compassed. But it is a little remarkable that just when, as Mr. Baker says, steam and oil power haulage are being abandoned on the easy tram-line, they should be forced more than ever into prominence for service on the more difficult common road. Is all the "Automobile" movement of the day mere imposture and advertisement? Is the road motor car, heavy or light, really coming into use upon its merits? If the latter query can be truly answered in the affirmative, there must follow a revival of the experimental application of the same methods of traction to tramways. If the "Leyland" road van proves itself a success, why not a "Leyland" tramcar?

It would unduly expand these articles to examine such questions thoroughly; and we shall therefore dismiss them for the time being with the mere expression of opinion, offered for whatever it may be worth, that the motor road car has not yet "arrived," as the French say. With all the good-will in the

world, we cannot take the "Automobile" performances seriously, nor believe that it is in these machines to supersede horse haulage. Let us then return to the consideration of tramway working, with faith in Mr. Baker's dictum that steam and oil are out of the running. There is nothing in what this authority advances, to show that gas power is in the same case. Of course, the electricians, whatever their own particular predilections, are unanimous in dismissing "gas-trams" as impossible. Thus the "Electrician" inquires "wherein has gas power shown its superiority over electric traction?" and supplies the answer, "Certainly not in point of numbers of lines, mileage of track, commercial success, or popular approval." It is magnanimously conceded that "gas-trams will work, after a fashion," and they might even be made to pay; "but in no respect can they be regarded seriously as a possible competitor of the electric car." This is all very well as an exercise on the theme "there's nothing like leather;" but it is very little more. Electricians need reminding over and over again that English people will not be "bull-dozed" into accepting the overhead trolley wire, because it happens to be the system of tramway working with which American cities by the score have had to put up. The "Electrical Review" is far more candid in recognizing the strength of the case for gas traction that has been put forward in consequence of Mr. Baker's report. It observes that "the gas traction system would undoubtedly move ahead rapidly, were it not that the public are in an expectant mood as regards electrical working, and the way is being blocked by the municipalities." This is very much to the point. The enormous expansion of electric traction in the United States has had the effect of creating the impression that in this kind of mechanical power lies the tramway working "of the future"—just as in the department of artificial lighting, electricity has for twenty years been going to provide the "light of the future." And, similarly, as the Belfast Corporation and others were afraid of making sufficient provision for the growth of their gas undertaking, lest it should all be waste of money and pains, so the tramway interest of the United Kingdom has been frightened away from everything besides the trolley wire. Nobody likes the trolley-wire system—not even the electricians; but it is advertised as the best that electricity can do, and therefore the world is expected to be content with it. Electricians need persuading that this is no recommendation. Tramway and electricity supply companies cannot buy British municipalities as they bought the city authorities of the United States. This is the chief feature of the actual situation. The reason why the overhead trolley-wire system of electric traction for tramways has not yet achieved its thousands of miles of line in the United Kingdom is that it has to come in here, if at all, upon its merits; and these are not numerous or good enough to carry it very far, or into good neighbourhoods.

It may here be remarked, in passing, that Mr. Baker's report notices "compressed air" among possible sources of mechanical power for working tramways. It is obvious that a compressed air motor car must share many of the advantages and disadvantages of a gas-car, with the addition of several drawbacks peculiar to itself. Cable trams are *sui generis*; and need not be discussed at length by us. Mr. Baker hurries over all these "provisional" systems of tramway working, and arrives at electric traction as offering the most acceptable solution of the mechanical problem. This is precisely what is to be proved, not taken for granted. Mr. Baker follows the partisan, not the natural method of demonstration. He announces his conclusion first, as where he says: "I think there can be no doubt that in solving the problem of the haulage of our tramways, we must look to some form of electric traction." And again: "There can be no doubt that the best and cheapest mode of tramway traction to-day is electric." The natural way would be to establish the facts first, and draw conclusions from them afterwards. His method only provokes criticism. Why, it may be asked, should the world accept the blessed word "electric" as closing the chapter of tramway working in the current chronicle of mechanical achievement? Should not the expediency of electrical as of other kinds of tramway working or machine driving be proved in the usual way? Let us test the case presented by Mr. Baker as though the word "electric" were exchangeable, say, for "hydraulic" power.

Mr. Baker's first claim runs: "It has been proved in scores of cities in America and on the Continent, as well as in this country, that the cost of operating by horse traction is from 50 to 100 per cent. greater than by the electric system; while the latter has been proved to be more economical than any form of mechanical haulage." This should follow, not precede, the proof. If it were done in the former way, it would be a demonstration; as it stands, it looks more like a prejudice. Mr. Hersey, in his letter above referred to, has dealt with the specific advantages put forward for electric traction, without regard to system, by Mr. Baker; and he shows that these either do not exist, or are not peculiar to the method of working. We shall not follow Mr. Baker in his digression from the question of system to the subject of fares. It is more to the point to see what he has to offer in the shape of description or comment upon the various forms in which electric traction can be realized. These are four in number, and comprise (1) accumulator, (2) surface contact, (3) overhead wire with trolley or slide connection, and (4) underground conduit with sliding or rolling connections.

With regard to traction by accumulators, there is now little



to be said. The endeavour to drive tramcars by means of stored electricity has broken many hearts and blighted many prospects. Mr. Baker says "theoretically the accumulator system has much in its favour, inasmuch as there is no underground construction in the streets required nor any overhead wires, while each car carrying its own electric energy is an independent unit." He might have said as much for the gas-car, with more hope of realization. When it is seen, however, that a duly equipped accumulator tramcar of the ordinary size weighs 10½ tons without passengers, the theoretical beauty of the principle becomes obscured by cold practical considerations. Moreover, even so the accumulator car will not always go. Actually, the best that has been done with accumulators in this way is to enable trolley-wire trams to cross busy centres of traffic which could not otherwise be negotiated without the humiliation of hitching on a team of horses. This makeshift arrangement is in operation in Brussels, Berlin, and some other Continental cities; and it is doubtful whether it is to be esteemed as complimentary to the accumulator principle, or scandalizing to the trolley wire.

This leads us to the second, or "surface contact" system, which must be reserved for another article.

### THE "ROBERT HUNTER FUND."

#### First List of Contributions.

IN response to the appeal made in last week's issue of the "JOURNAL" (p. 1027), contributions to the amount of £72 11s. 0d. have been received—as per list below—and we trust that during the present week the sum will be considerably added to. It will be remembered that this fund is quite distinct from that being raised by the Manchester District Institution of Gas Engineers, who are receiving contributions from their own members only; and it was started to give those outside this limited circle an opportunity of testifying their regard for one who was for many years widely known and greatly respected apart from his professional friends of Lancashire and Cheshire with whom he had been more particularly identified during recent years.

#### FIRST LIST.

|                                                                                                  | £  | s. | d. |
|--------------------------------------------------------------------------------------------------|----|----|----|
| Cross, Mr. Samuel, Abergavenny . . . . .                                                         | 1  | 1  | 0  |
| Donald Macpherson and Co., Limited, Manchester . . . . .                                         | 10 | 10 | 0  |
| Helps, Mr. George, Bath . . . . .                                                                | 1  | 1  | 0  |
| King, Mr. Walter, Bolt Court, E.C. . . . .                                                       | 5  | 5  | 0  |
| Livezey, Mr. Frank, South Metropolitan Gas Company . . . . .                                     | 3  | 0  | 0  |
| Macpherson, Mr. D. D., Manchester . . . . .                                                      | 10 | 10 | 0  |
| Mildred, Mr. Matthew, Bankside, S.E. . . . .                                                     | 21 | 0  | 0  |
| Randall, Mr. James, Tottenham . . . . .                                                          | 2  | 2  | 0  |
| Richmond, Mr. E. W. T., Warrington . . . . .                                                     | 5  | 5  | 0  |
| Sainsbury, Mr. H., Trowbridge . . . . .                                                          | 10 | 0  | 0  |
| Smith, Mr. G. (late Reporter for the Manchester District Institution of Gas Engineers) . . . . . | 1  | 1  | 0  |
| Southern District Association of Gas Engineers and Managers . . . . .                            | 5  | 5  | 0  |
| Thomas, Mr. Hanbury, Sheffield. . . . .                                                          | 5  | 0  | 0  |
| Wadson, Mr. James, Windsor . . . . .                                                             | 1  | 1  | 0  |

£72 11 0

[Contributions may be forwarded to Mr. WALTER KING, at the Offices of the "JOURNAL"]

### PERSONAL.

Mr. J. C. HALE, of Ruthin, has been appointed Manager of the Goring and Streatley Gas-Works.

Mr. ROBERT M. COUPER, who for some years has been Manager of the Newbury Corporation Gas-Works, has tendered his resignation, and intends, it is believed, removing with his family to Scotland.

Mr. J. H. LLOYD has been appointed Chairman of the Gas Committee of the Birmingham Corporation, in succession to Mr. Alderman Pollack, who has vacated the position under circumstances which will be fresh in the recollection of our readers.

Mr. G. B. TONGE, Secretary of the Driffield Gas Company before the undertaking was transferred to the Urban District Council, has been presented with a testimonial in the form of a solid silver salver, in recognition of his gratuitous services as Liquidator of the Company.

Mr. T. GREAVES, who has retired from the management of the Melton Mowbray Gas Company, has been presented by the employees, who were recently entertained by him at dinner, with a writing-desk, accompanied by a drawing-room timepiece for Mrs. Greaves. The presentation was made by the Chairman of the Company, Mr. J. Glover.

Last week it was announced in this column that Mr. ALEXANDER ALLAN had been appointed Engineer and Manager of the Chester Gas-Works, in succession to the late Mr. Robert Hunter. We now learn that Mr. Allan has since reconsidered

his decision to go to Chester, and has withdrawn his resignation of the position he held at Sheffield as Superintendent of the Neepsend Gas-Works.

Among the new Provincial Aldermen just elected are Mr. J. LOWDEN, Chairman of the Gas Committee of the Leeds Corporation, and Mr. T. SPEIGHT, the retiring Mayor of Bradford, who holds a similar position in the Corporation of that town. In connection with aldermanic elections, we notice that Alderman GARNETT, the Chairman of the Gas Committee of the Clitheroe Corporation, has retired into private life. The loss of his services in this capacity to the town are referred to regretfully by a local paper.

The list of Mayors for 1898-9 contains, as those for previous years have done, the names of several gentlemen closely connected with gas and water undertakings. The new Mayor of Bacup, Mr. BEN SMITH, is Vice-Chairman of the Water Committee of the Corporation. Mr. C. G. BEALE, who has been re-elected Lord Mayor of Birmingham, has done good work on the Gas and Water Committees. Mr. J. LEWIS, the new Mayor of Carmarthen, has been a Director of the Gas Company for several years. Dr. R. PARRY, who has been again chosen for the Mayoralty at Carnarvon, is Chairman of the Gas Committee of the Corporation; and Mr. F. GEEN, who fills a similar position at Stoke-upon-Trent, has also been re-elected. At Falmouth, Mr. C. DEEBLE, who has taken a conspicuous part in connection with the gas and water works purchase question, will continue to hold office. At Honiton, Mr. R. H. MATTHEWS is a Director of the Gas Company. Mr. J. MARSHALL THOMAS, the Engineer of the Penryn Gas Company, retains the mayoralty. The Mayor of Shrewsbury, Mr. T. P. DEAKIN, has for a long time presided over the deliberations of the Gas, Water, and Lighting Committee of the Corporation. At Swansea, Mr. R. MARTIN took an active part in the negotiations for the purchase of the gas-works, and has been closely identified with the new water-works at Cray, the commencement of which was noticed last week. The new Mayor of Wakefield, Mr. G. H. ROBERTS, is a Director of the Gas Company, as well as of the Ardsley Gas Company. Mr. R. H. HODGSON, who has been elected Mayor of Workington, is Chairman of the Water Committee of the Corporation and also of the Workington Joint Water Committee.

### OBITUARY.

The recent death is announced of Mr. R. BIRKETT, one of the founders, and up to the last a Director, of the Morecambe Gas Company.

We regret to record the death last Friday, at Boulogne, in his 48th year, of M. GUILLAUME T. P. J. MERTENS, Manager of the Roubaix Gas-Works. Deceased was a member of the Société Technique de l'Industrie du Gaz en France, having been admitted in 1884.

The death is announced of M. DE MERITENS, whose name will be familiar to some of our readers in connection with his magneto-electric generator, which was tried about twenty years ago in many French and several English lighthouses for illumination purposes. He was 65 years of age, and died in very reduced circumstances.

The death occurred on the 27th ult. of Herr OTTO REISSNER, the Engineer of the Municipal Gas-Works at Berlin. He was in his 67th year, and had been in the municipal service for upwards of forty years, and for more than thirty years had charge of the gas-works, in the growth and success of which he took the deepest interest.

A well-known German gas engineer—Herr CARL BRANDT—died recently at Magdeburg, in his 73rd year. The earlier part of his life was spent in several branches of engineering; but from 1853, when he constructed the Magdeburg Gas-Works, onwards, he devoted himself almost exclusively to the construction of gas-works. He designed and erected those supplying many of the small towns in Germany as well as in neighbouring countries.

The last number of the "Journal des Usines à Gaz" contains a notice of the life-work of M. EMILE COZE, of Rheims, whose death has lately taken place. He entered the service of the Continental Union Gas Company in 1857; but two years later he was appointed Superintendent of the St. Mandé station of the Paris Gas Company. He left the city in 1893, at the request of M. Vautier, to take the management of the gas-works at Rheims, which he reconstructed. He carried out, in conjunction with friends, an amalgamation of the Soissons and Epernay Gas Companies, and thus formed the nucleus of a group of thirteen works constituting the Société Anonyme des Usines à Gaz du Nord et de l'Est, of which he was Managing Director. Leaving to his son, M. André Coze, whose name is so well known in connection with the inclined retort system, the management of the works at Rheims, he devoted himself to the development of the Company he had formed. He found time, however, to attend to outside matters, and constructed for the Ottoman Bank the gas-works at Beyrout. He was one of the early members of the Société Technique du Gaz en France, and served on the Committee in 1874-5. He was also on the quinquennial Gas Commission nominated in the year 1885 by the Minister of the Interior.



## NOTES.

**The Conditions of Working Under High Air Pressure.**

A curious example of the way in which the new law of employers' liability for compensation to workmen injured in the course of their employment is likely to develop strange working conditions, is afforded by certain proceedings at Brussels. An international conference has been sitting there to settle the limits of safety working under compressed air—a matter of great and growing importance for all modern engineering constructors, seeing how largely the method is used in sinking in wet ground. Both engineering and medical science were represented at the conference; and as a result several leading principles were laid down. It was decided that men over 50 and under 20 years of age are unfitted for working under a high air pressure; while in any case medical certificates should be required as to the condition of the heart, lungs, and vascular system. An ear affection, a temporary cold, or a gastric attack, should be obstacles to this employment. The limit of air pressure under which men can safely work is fixed at 75 lbs. per square inch, corresponding to a depth of 170 feet of water. In such extreme cases, it is necessary to give ample time for returning to ordinary atmospheric pressure—say, one minute for every  $1\frac{1}{2}$  lbs. of maximum pressure. It is suggested that when going through an alteration of air pressure, men should suck sugar, which ensures the swallowing of the saliva, and prevents injury to the tympanum.

**Blast Furnace Gas as a Motive Power.**

It is often stated that a blast-furnace is a typical gas-producer, and that if the gas thus made could be fully utilized, the pig iron simultaneously produced would be a bye-product. In order to procure reliable data as to the power of blast-furnace gas for working engines, the Cockerill Society placed at the disposal of Professor Witz their furnaces and a 200-horse power "Simplex" gas-engine, of the make of Delamare-Deboutville and Malandin. This motor had a single cylinder 31.5 inches diameter and 3.28 inches stroke, and was adjusted to work with a charge compressed to 108 lbs. per square inch. The trial run lasted for 24 hours; and the gas was taken from blast-furnaces running in the ordinary way. The engine was kept running at a velocity of 105 revolutions per minute, developing 181.16 brake horse power. The load was so disposed that 10.7 per cent. of the possible ignitions were missed, so as to have a margin of power in hand. The consumption of gas was after the rate of 117.6 cubic feet per brake horse power per hour. The calorific value of the gas worked out on the average to 110.2 British thermal units per cubic foot; so that it was to be regarded as fair but rather poor producer gas. The temperature of the exhaust ran up to 896° Fahr., although there was a flow in the cylinder jacket of 15.87 gallons per horse power per hour; the water leaving the jacket at a temperature of 92.7° Fahr. It is evident from this test that there is a large available supply of power in this form in localities where iron is made; and the French and Belgian ironmasters are likely to take full advantage of the circumstance.

**Steam Raising from Dust-Bin Refuse.**

Mr. George Wilkinson writes to the "Engineer" a long letter from Harrogate upon steam raising from the combustion of towns' ash-bin refuse. He begins by challenging the general method at present in vogue for burning this refuse, by the agency of so-called "destructors," which he characterizes as very inefficient for producing useful steam power from the resultant heat, and involving a capital outlay out of all proportion to the useful return. Owing to the sluggish operation of destructors, they are unwieldy; and by reason of the impossibility of controlling the rate of combustion, they are inapplicable to the purpose of steam raising where the demand is variable. Attempts have been made, says Mr. Wilkinson, to obtain the necessary flexibility of adjustment by the addition of an expensive and complicated system of "thermal storage;" but he is responsible for the statement that at Shoreditch (the most notable example of the kind) the results have not been satisfactory, and the apparatus is not being used. The author describes a destructor which is claimed to be the fruit of extended trials and experience. The chief feature of this apparatus is a long iron chamber forming a prolongation of the boiler-flues, in which the screened refuse is exposed to the heat of the furnace gases. Here it is dried and prepared for burning in the enlarged grates of ordinary Lancashire boilers. Thus treated, the dust of a North of England town was found to have an evaporative power of 3.06 lbs. per pound of the dry and prepared fuel portion of it. Mr. Wilkinson claims that with this system, as a mean of experiments made with refuse from different towns, 1 lb. of water was evaporated per pound of crude refuse; while in brick-built destructors, the consumption varies from 3.3 lbs. of refuse at Oldham to 9.7 lbs. at Eastbourne per pound of steam generated.

**More New Elements.**

At the British Association meeting, there were several introductions of new comers into the list of the elementary substances of which the earth and its atmosphere is known to be composed. The President (Sir W. Crookes) had the honour of performing the first of these interesting functions. He stated in his address that M. and Mme. Curie have discovered a new constituent of the uranium mineral pitchblende, which in a

400-fold degree possesses uranium's mysterious power of emitting a form of energy capable of impressing a photographic plate and of discharging electricity by rendering air a conductor. It also appears that the radiant activity of the new body, to which the discoverers have given the name of polonium, needs neither the excitation of light nor the stimulus of electricity. Like uranium, it draws its energy from some constantly regenerating and hitherto unsuspected store, exhaustless in amount. Is "the light of the future" to be procured from the same source, when its nature is ascertained. Sir W. Crookes thinks that something of the kind is possible, for he remarks that "the store drawn upon naturally by uranium and other heavy atoms only awaits the touch of the magic hand of science to enable the twentieth century to cast into the shade the marvels of the nineteenth." Sir W. Crookes himself followed this speculation by announcing his discovery of a new body belonging to the rare earth group, which he calls monium. Though only caught by the searching rays of the spectrum, this element offers a direct contrast to the recently discovered gaseous elements, in possessing a strongly marked individuality, and a readiness to enter into any number of chemical alliances. Before the Chemical Section Professor Ramsay and Mr. Morris W. Travers described how they found the new gases neon, krypton, metargon, and a still heavier gas not previously described, which exists only in minute quantity, and is named by the authors xenon.

## COMMUNICATED ARTICLES.

**SLOT COOKERS AND ALL ABOUT THEM.**

By E. W. T. RICHMOND.

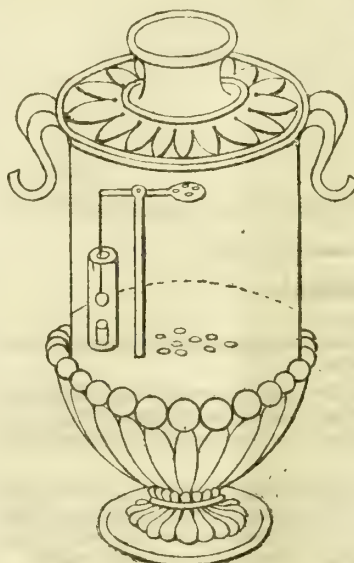
"An age when all our daily wants,  
Whether they be but few or many,  
Will be sufficiently supplied,  
By merely dropping in a penny."  
"Truth," April 14, 1898.

Although the system of supplying various commodities automatically on a deposit of a coin in a receptacle—commonly known as the "penny-in-the-slot" system—is regarded by many as essentially a *fin-de-siècle* product, we must go very much farther back than the present century to find the first instance of its employment. It was supposed by some to have been

introduced by a certain free-thinking publisher—one Richard Carlile—who lived between 1790 and 1843; but, in fact, it existed hundreds of years before that. Indeed, it was known some time before the Christian Era; and its invention may be attributed to Hero of Alexandria, in whose "Pneumatics" is described a sacrificial vessel which flowed only when money was introduced. Truly there is nothing new under the sun. It appears frequently to be our lot to

adapt to our present needs, and give precision to, what after all are the inventions of the ancients. In truth—  
"Our inventions meet and jump in one."

"Taming of the Shrew,"  
Act I., Sc. I.



HERO'S VASE.

Rumour has it that centuries before Hero, the prepayment system was introduced by priests in the Eastern temples to bring tears to the eyes of their gods. This they accomplished in the following ingenious manner: When the devotee placed his offerings upon some portion of the image (or upon the altar or platform upon which the image stood), the weight of the offering acted as a lever, and opened a valve in one of the cellars of the temple. This cellar contained a sort of apparatus for hot water; and the action of the valve caused steam to ascend, through metallic or bamboo tubes, to the eyes of the image, and, condensing there, the steam became transformed into tears—the object, no doubt, being to impress the devotee, and probably induce him to increase his contributions to the temple.



In more recent times, the "penny-in-the-slot" arrangement was most frequently seen with working models at industrial exhibitions, and at some of the popular seaside resorts. Not a few of those who read these lines will probably remember the childish curiosity aroused when they were told, somewhat in the language of the world-renowned librettist, that

"If you want to move the lot,  
Put a penny in the slot;"

and the intense delight with which they keenly looked for the movement of the figures as the result of parting with the coin, as illustrated below.

BEFORE!



A ROW OF AUTOMATIC MACHINES ON FOLKESTONE BEACH,  
SUPPLYING CIGARETTES, SCENT, SWEETMEATS, ETC.



AFTER!

We have only to look around, and we at once see to what a variety of purposes the penny-in-the-slot arrangement has been applied. The supply of sweetmeats, cigarettes, cigars, matches, eau-de-cologne, postage stamps, post cards, or writing paper, are among the most common; while toothpicks, miniature playing cards, hair-pins, and hot water, &c., from lamp-posts, are the most recent developments in this connection. The very latest was announced in the "Daily Mail" of the 10th inst., when Mr. Alfred J. Faulding, of Abchurch Lane, London, stated his intention to instal 1000 "penny-in-the-slot banks" throughout London—in the principal streets, at railway stations, factories, and schools—his idea being that thousands of persons, who at present have no convenient means of "fastening up" their odd coppers, will drop them into the "Slot Bank," and obtain a receipt by turning a lever in the usual way. These receipts can, when required, be presented at a Central Bank, and left on deposit at 2½ per cent. interest, or they may be realized at any time.

MR. BROWNHILL  
AND MR. F. LIVESLEY,  
1888.

pennyworths. Mr. Brownhill's invention was encouraged by Mr. Frank Livesley by the ordering of a number of sample meters, which were fitted in some new houses in course of erection close to the Old Kent Road offices of the South Metropolitan Gas Company. They were, however, not a success. John Stewart Wallace, however, a year previously—in 1887—first patented (No. 1620) the essentials of the present system, but in a crude form,

MR. J. S. WALLACE,  
1887.

although it has been held by experts that he did not contemplate the supply of gas in his invention.

MR. W. E. PRICE,  
HAMPTON COURT.

Within six months of Brownhill's patent came Mr. Price's invention, which has been considered as one of the few master patents governing the remarkably fine family of apprentices that sprang up anxious to do their master's work in some other, and,

if possible, better manner. Twelve months after the date of Mr. Price's specification, he read a paper, entitled "Some Hindrances to the Sale of Gas," at the Southern District Association meeting in November, 1888, and followed Mr. Brownhill's example in the Midlands, by exhibiting his early prepayment meter effort. This paper will repay perusal; it has proved prophetic. The deposit system is severely handled, and the remedy shown. "We have no reason to suppose," says Mr. Price, "that the artisan has any hereditary love for the fallow dip or paraffin lamp," and provided that gas is supplied on the "pay-as-you-go" plan, he predicts an enormous increase, perhaps "too sudden to be yet appreciated."

The discussion on the paper proved that a veritable Daniel had "come to judgment;" Mr. W. H. H. Broadberry, of Tottenham, being distinctly "down" on deposits. Mr. G. Lane, Aylesbury, and Mr. C. Gandon both introduced the "temperance question" by stating that publicans were the worst payers, and welcomed prepayment meters for their use. Strange to say, eight years later, we find in Lille over 40 per cent. of the automatic meters are fixed at "wine-shops;" so that these engineers' experience appears to have a Continental counterpart. Mr. Price is to be congratulated on his pioneer work. Let us hope he has reaped a rich reward.

The success of the prepayment supply system has been simply marvellous in connection with automatic meters; and it is the aim of the writer to sketch in a cursory manner the history of the growth of the system, and the gradual manner in which gas cookers have become the indispensable auxiliary, and the best-paying portion of the automatic installation.

The position which the penny-in-the-slot supply has now secured may be readily gathered from the statements made, and accounts submitted, at the various meetings of Metropolitan Gas Companies, and throughout the country at the conferences of members of the several Gas Associations. A search through the published records of their proceedings forms most interesting reading; and one at once remarks the rapidity with which public references to the system increase.

1888.

Thus, in 1888, which may be considered the first year of its introduction, we find some half-dozen references, and these include the description of Brownhill's, Price's, and Cowan's prepayment meters.

MR. J. T. LEWIS,  
WELLINGBOROUGH.

A paper by Mr. J. T. Lewis, of Wellingborough, read at the meeting of the Midland Gas Association in May, 1888, weighs the *pros* and *cons* of the weekly collection plan and the Brownhill prepayment meter. He states: "I have no doubt a great deal could be done to increase this [summer consumption] by introducing small cooking-stoves." Mr. Lewis is doubtless agreeably surprised by now at the extent of the "much" which has been done in following out his enterprising suggestion. At this time the "JOURNAL" devoted an article to "Prepayment for Gas;" and Mr. Lewis's paper was referred to as being particularly opportune. We shall, however, see that it was five years or more before any considerable results followed. Mr. Lewis writes me, under date Sept. 20, 1898:

We have now abandoned weekly collections (see "JOURNAL," March 1, 1898). The system of fixing cookers with prepayment meters at — is giving the greatest satisfaction. Out of 250 consumers, 100 have prepayment meters and cookers. 18s. per meter has been collected for the last three months; and without cookers it would not have been one-third this amount. You are quite right in recommending large-sized cookers. Again, the price of gas should not be much in excess of the ordinary price.

MR. J. M'GILCHRIST,  
DUMBARTON.

Another important public pronouncement was the very excellent paper read by Mr. J. M'Gilchrist, of Dumbarton, at the meeting of the North British Association of Gas Managers on July 26, 1888, in which, to quote his own words, he referred to the use of oil as "another Richmond in the field," and foretold in truly prophetic style of an "ideal gas company" which would canvass for business on commercial lines, and introduce weekly payments or coin meters to meet the needs of those who could best pay by instalments. The subject-matter of this paper produced a discriminating leading article in the "JOURNAL," which expressed loss of patience with the gas industry for always agreeing that the supply of fittings on hire was desirable, but never seriously adopting this system. It was at this meeting that Messrs. W. & B. Cowan exhibited one of the earliest automatic meters.

1889.

MR. W. A. VALON,  
RAMSGATE.

The year 1889 advanced the subject but little. The chief interest centred round Ramsgate, with Mr. W. A. Valon's prepayment by collection, as distinguished from the penny-in-the-slot system. The credit of practically removing the barriers raised round those in receipt of a weekly wage, and who might burn gas, by the deposit and quarterly collection, undoubtedly belongs to Mr. Valon; and it must afford him considerable gratification to see the developments of the last ten years, although not exactly on his lines. In a letter to the "JOURNAL," under date Jan. 15, 1889, Mr. Valon makes the first move in suggesting the fitting up of houses complete with fittings at a small and inclusive extra charge on the gas. It is the general adoption of this system—so successful at Ramsgate—that has really made the automatic meters so popular; and Mr. Valon deserves the highest credit for his enterprise, which has profited not only the gas industry, but our



HOUSES FITTED WITH SLOT COOKERS BY THE GASLIGHT AND COKE COMPANY.

NUMBER OF SLOT COOKERS FIXED BY THE COMPANY, ABOUT 80,000.



BETTER-CLASS HOUSES, GLYN ROAD, HOMERTON, LONDON, N.

|                                                                    |          |
|--------------------------------------------------------------------|----------|
| Rentals average per week . . . . .                                 | 14s. 6d. |
| Number of cubic feet of gas for 1d. . . . .                        | 22       |
| Extra charge per 1000 cubic feet to prepayment consumers . . . . . | 9½d.     |

HOUSES SUPPLIED WITH SLOT COOKERS BY THE SOUTH METROPOLITAN GAS COMPANY.

NUMBER OF SLOT COOKERS FIXED BY THE COMPANY, OVER 57,000.



BETTER-CLASS HOUSES, ILBERTON ROAD, BERMONDSEY, S.E.

|                                                                    |              |
|--------------------------------------------------------------------|--------------|
| Rentals average per week* . . . . .                                | 12s. to 15s. |
| Number of cubic feet of gas for 1d. . . . .                        | 27           |
| Extra charge per 1000 cubic feet to prepayment consumers . . . . . | 9d.          |

\* Some of the larger houses have two families in the house.



CHEAPER-CLASS HOUSES, HOLMBROOK STREET, HOMERTON.

|                                    |      |
|------------------------------------|------|
| Rentals average per week . . . . . | 10s. |
|------------------------------------|------|



CHEAPER-CLASS HOUSES, HYDE STREET, DEPTFORD, S.E.

|                                    |             |
|------------------------------------|-------------|
| Rentals average per week . . . . . | 8s. to 10s. |
|------------------------------------|-------------|

whole working-class population. Indeed, with Buckingham, we agree that—

“The benefit thereof is always granted.”

1890.  
THREE B'S  
AND  
LIVERPOOL.

Liverpool, where they are most popular, and the demand exceeds the supply; the applications in 1893 coming in at the rate of 100 per week. Then we have the paper read by Mr. J. Lees, on “Maintaining and Increasing the Popularity of Gas,” at the Eastern Counties Association, in which he referred to the prepayment consumption as likely, if encouraged, to reach the importance of our third-class railway traffic.

1891.  
MR. R. ROSS,  
DUNGANNON.

Association Meeting at Belfast. He, however, seven years later, referred to the matter again, and approved it most heartily, and, as will be seen in the concluding article, he boldly gives a ½ cubic foot per 100 more to prepayment than to ordinary consumers.

1892.  
MR. G. I. GOUGH,  
CALNE.

reference is made to the excellent methods adopted by the

pioneer of the weekly prepayment system, Mr. W. A. Valon, of Ramsgate; but the coin meter is discounted.

1893.  
MR. G. KEILLOR,  
NAIRN.

In 1893, there were two or three public references, one again north of the Tweed, at the North British Association meeting, by Mr. G. Keillor, of Nairn. This time there was a division of opinion—some commending the system, others “damning with faint praise.” This division of opinion is fairly reflected in a leading article in the “JOURNAL” for Aug. 8, 1893, in which the difficulties attending the early pattern meters and various other points, such as “What shall we do with our coppers?” are raised for discussion, and they produced various replies.

MR. F. LIVESEY.

One was from Mr. Frank Livesey, who, in a calm, deliberate manner, disposed of the difficulties raised, and nailed the colours of automatic gas-supply to the South Metropolitan mast. “The first South Metropolitan public reference,” Mr. G. Livesey writes me, under date Sept. 20, 1898, “was in the report ending June, 1893; and then at the meeting on Aug. 22. We began in 1892 with a boiling-ring, which never approved itself to me; and in 1893 we discarded it in favour of a stove.”

MR. F. T. C. LINTON,  
LEITH.

The late Mr. F. T. C. Linton, of Leith, in November, 1893, prepared a report dealing with the question, and pointed out by means of the table given on the opposite page that Glasgow had less than 5 persons to each consumer, and Edinburgh 5½ persons, while Plymouth had 8½; Bristol, 10; London, 14½; and Dublin, as many as 21.







or not. Those who have the meter only soon ask for the stove. At the present time we have 1800 prepayment consumers, and are continually increasing. No need to push it; it recommends itself."

Mr. J. W. HELPS. Mr. Helps remarked that among their prepayment consumers there were "a great many who wished to be supplied with gas-cookers;" and this seems, even in this early stage, to have also been the experience of the President (Mr. Smythe), who said—and the experience is really valuable—"the average consumption without cookers was 1000 cubic feet per month; but this doubled with the use of a cooker, and came out to about 24,000 cubic feet per annum." He, too, has now (October, 1898) adopted a 14 inch by 12 inch oven and a three boiling burner cooker.

In the last week of November, 1894, we find the interest in prepayment meters had spread from the charmed circle of the gas industry to that of the Manchester Association of Engineers—a valuable paper on the subject being read by Mr. Nasmyth, in which, as also in the discussion, the merits of the various pattern meters then on the market were candidly canvassed. Mr. Nasmyth appeared inclined to give the palm at this time to Braddock's patent. He, like Iago, is "nothing if not critical."

Thus ends 1894—a year which saw the system everywhere debated, and much seed sown, which has borne abundant fruit in the four years following. Great improvements were made in existing patterns of meters, and every month saw fresh patents put upon the market. This year, too, may be considered the one in which the question of fixing cookers with slot meters was fully established—first, by the remarkable business done in them by the South Metropolitan and Brentford Gas Companies, and, secondly, by the decision of The Gaslight and Coke Company to connect a cooking-stove where possible to their slot supplies.

Up to this time there were not many provincial towns which had adopted stoves, and most of them charged a small rental in addition to increasing the price of the gas. The writer's view is that, judging by the conversions to cancelled rentals, and supplying stoves where boiling-rings or grillers had previously existed, we shall speedily see the use of cookers fostered more and more by all enterprising engineers, until the dream of smokeless towns may be within the range of this generation's vision. Then to "Truth's" rhyming question in April, 1898—

"Will penny-in-the-slot machines  
Supply not teas, but dinners?"

we may answer boldly "Yes."

\* \* \* \* \*

The views in this article, and the three following ones, are, where possible, contrasted—the poorest and best in a town being shown; illustrating the wide field to be cultivated between and including these two extremes. The majority of the houses in each view are fitted with cookers.

(To be continued.)

### SUDDEN EXTINCTIONS OF ARTIFICIAL LIGHT.

By NORTON H. HUMPHRYS, Assoc. M. Inst. C.E., F.C.S.

The extent to which the public business and pleasure are dependent upon the supply of artificial illuminating agents from central stations, is never more apparent than when, by reason of accident or otherwise, a sudden and unlooked-for stoppage or failure occurs, and the brilliantly lighted places of business or of amusement are instantly in darkness. In the ordinary household, the inconvenience is bad enough, though substitutes are usually not far off. In shops or places of assembly, however, there is not only the temporary annoyance, but also a very real element of loss and personal danger to be reckoned with. It therefore behoves all who are in any way responsible for the distribution of lighting agents, to resort to every possible device that science or skill can suggest as a means of insuring continuity and regularity of supply. As regards electricity, failures are so frequent that the public have come generally to understand that they must not expect too much in the way of reliability from this mysterious form of energy; and an occasional extinction is taken in good humour, as a matter of course, and excites but little comment. But with gas the case is different. The fact that gas is used more generally and to a greater extent, not for lighting alone but also for many other purposes, and that therefore the effects of a sudden extinction are more widely felt, may have some influence; but the public have learnt to expect a greater degree of reliability from gas than from electricity. Any failure in respect to gas supply attracts much more attention, is more fully discussed in the papers, and is regarded as a more important thing, than half-a-dozen similar accidents with the electric current. Only within the last few weeks, a failure of the gas supply at a well-known seaside resort was considered sufficiently important to receive prominent positions in the London daily papers. If electricity had been the delinquent, a bottom paragraph on an inside page would have been the limit of the attention bestowed on it. The fact of a gas failure being such an extraordinary occurrence as to excite so much notice, is a compliment to the reliability of gas supply in general.

That failures teach more than successes, is a common aphorism; but for several reasons it is difficult to get to the real bottom of all the facts connected with a failure. Few delinquents have the necessary moral courage, or if they have, it frequently happens that they cannot afford to come forward and pose before their employers and the public in the position of the "dreadful example" we sometimes hear of in connection with temperance platforms. Anyone with an average knowledge of the ways of the world is aware that a blunder is generally regarded (and required) as being worse than a crime, and also that there is a general disposition to make a scapegoat of someone or other; and therefore a willingness to come forward and publish the whole of the details for the benefit of the profession at large is not to be expected. But, speaking broadly, there is a noticeable difference in the causes that lead to failure of gas supply, as compared with those concerned in the stoppage of the electric current. The arrangements for the distribution of gas are of an extremely simple character. They commence with the holder itself, and are quite independent of the manufacturing or the purifying apparatus. The gasholder outlet is controlled by a valve; and beyond the valve there is an automatic pressure regulating apparatus. All the mechanical parts involved are plain levers, pulleys, racks, &c., that are not at all likely to get out of order, or to spontaneously stop the supply of gas. But there is always more than one gasholder; and for various reasons the supply must be diverted from one to another perhaps once or twice every day. The drip-boxes also require to be emptied regularly, which is a very simple operation indeed, involving no risk of danger or stoppage. But the human agent is liable to occasional lapses or momentary oversights; and these are the cause of the majority of gas supply failures. One valve is shut off before another is turned on, or the holder is forgotten and allowed to run to ground. The known instances of the failure of gas supply that are due to really unavoidable causes—such as the sudden collapse of a gasholder, valve, or governor—are so few that they could be counted on the fingers of one hand. The arrangements for the supply of electric current are diametrically opposite in character. The generating apparatus is usually a part and parcel of the distributing system, which comprises machinery of such a complicated and delicate character as to call for high appreciation. While the gas engineer relies upon his valvesman to take care of the varying circumstances of the supply, the electrician depends upon his automatic cut-off and other mechanical devices. When a gas explosion occurs, there is usually the satisfaction—such as it is—of ascribing the accident to somebody's recklessness or ignorance; and the same is the case with the failure of the gas supply. With electricity, however, both accidents and failures are of a more unavoidable nature.

One peculiar feature in connection with sudden extinctions may be noticed in passing. Sunday evenings appear to be the most unfortunate period. This is probably due to the special arrangements that are necessary, in order to enable Sabbath rest to be observed at the works to the utmost extent that is possible. But, according to popular report, it happens that hymns and texts appropriate to the unexpected event about to take place have been previously selected. Many preachers go further than this, and adopt the remark they are making at the moment to some sort of harmony with the event. The number of instances of this remarkable circumstance go far beyond the bounds of mere coincidence, and appear to suggest the desirability, in the event of an officiating minister finding that references to "light" are prominent in the various details of the coming service, of sending an advance notice to the gas-works, so that extra care against mishap may be observed. These premonitions do not invariably come true. A few weeks ago it happened that the writer, having fitted up a large church with new Welsbach burners while under repair, attended the reopening service, and references to "light" were made very frequently throughout the proceedings. The new burners, however, kept steadily at work, without even a kick. Probably the real explanation is to be found in the extraordinarily large demand on the part of the public for news items of an extravagantly incredible kind, and also in the fact that the subject of "light" is so very suitable for illustrative purposes in connection with religious subjects that almost every service held would furnish ample matter of this description for the ingenious and imaginative reporter.

In regard to about a dozen instances of failure of gas supply, sufficient to plunge an important part of the district in darkness, the circumstances of which have come to the personal knowledge of the writer, the majority were the result, not of culpable negligence, but of inadvertence. It is easier to make "cock-sure," than to apply a test or examination; but at the same time this common practice is not an indictable offence. The faulty syphon-pump, referred to by Mr. Douglas Hall (*ante*, p. 977), has been responsible for one failure; and the excellent plan of sounding the drips, as advocated by this gentleman, should be adopted. Pumps are apt to fail for more reasons than one; or the man who uses them daily may, in the course of time, get into slipshod ways. There is the syphon that "never has anything in it," and is therefore left alone, or is tested in an absent and perfunctory manner, and all goes well for years together. But one day the unexpected happens, and the syphon is found to be full of liquid. I prefer to go a step further, and not only gauge the drip-boxes, but also book the results. It is not much trouble,



and the records have at times proved extremely useful; while the mere fact of having to enter the result, and knowing that the entry will be examined, renders the operator more careful. If the drip does not fill at the normal rate, or fills more rapidly than usual, there is something going wrong that should be discovered and promptly remedied.

As to gasholder outlet-valves, a plan similar to the "staff system" used in working single railway lines for traffic in each direction, may be adopted. The "staff" in this case may consist of a small notice board bearing some such inscription as—"This label must always be on an open outlet-valve;" and a standing order is made to the effect that it is not to be touched except for the purpose of moving it to another open outlet-valve. Compound valves of the dry-faced type, so constructed that it is impossible to shut off the supply—one holder coming on while the other is passing off—are serviceable and reliable. A bye-pass direct from the main-inlet to the main-outlet is useful at times of specially large demand, and for temporary employment when the outlet-valves are under repair. This bye-pass may with great advantage be fitted with a safety bye-pass governor, adjusted to come into action at one or two tenths below the pressure given by the highest holder. Two or three holders of adequate capacity are preferable to a battery of smaller ones; but where the latter have to be worked, the inconvenience and risk may be modified by coupling up two or more together, either by loading the lighter one till the pressure of each is equal or by fixing stops on the upper end of the guides of the lighter holder, so adjusted as to prevent it from blowing. The two can then be worked as one holder, of a capacity equal to their combined content. These plans are particularly suitable for small country works, where no special valveman is employed. I remember that the chairman of a small village gas company called on me some years ago, and said that the gas from his works was in the habit of "going out" suddenly in the evenings, perhaps once every three months. As he observed that this was not the usual experience, he thought there must be a remedy. Inquiry elicited the fact that two small gasholders, and a working manager who liked his drop of beer in the evening, were concerned in the difficulty. As one of the holders alone was unequal to the evening's requirements, the other had to be brought into use about 9 o'clock; and it was in connection with this simple operation that a slip occasionally happened. Coupling up the holders, and thus avoiding the necessity for changing or any interference with the valves in the hours of darkness, proved a complete remedy.

Of the few failures due to unavoidable causes, one is worth relating in detail. The drum of the station meter had got out of truth, on account of the wearing of the journals; allowing the axle to bear, and to grind upon the spout. This went on until the metal was rubbed nearly through at that particular place. During the small hours of one morning, a large portion gave way, allowing a sudden rush of water down the inlet. The meter-valve, the main-outlet, and the main-inlet, all drained into one common drip-box; and by this means the water reached the main-outlet, rushed down the outlet of the holder in use—which happened to be the only one on a lower level—sealed the syphon, and stopped the gas. I have described this as a failure; but, as a matter of fact, it was not the cause of the slightest inconvenience in the district, as a safety bye-pass governor formed a part of the distributing plant. When the foreman came on duty at 6 a.m., he found the safety governor in full operation, and the other governors grounded; and the pressure diagrams showed that this took place about 4.30. The only evidence was a diminution of the supply pressure from the usual 16-10ths to 14-10ths. No complaint was received from the district, and nothing at all was known of the accident outside the gas-works.

The foregoing are a few examples of what may be done in the way of guarding against inadvertence or oversight on the part of the foreman in charge; and the safety bye-pass governor will take care of failures due to mechanical causes.

**The Laws of the Flow of Water through Pipes and Mains.**—M. Georges Dariès, of the Service des Eaux de Paris, has performed a useful work for engineers engaged in water supply by reviewing the formulæ proposed and used in hydraulic calculations. Commencing with the various problems arising out of the flow of water in pipes of uniform and constant diameter, M. Dariès has supplied a small handbook on the general subject to the "Encyclopédie Scientifique des Aide-Memoire." Many of the formulæ relating to the flow of water in pipes are so exceedingly complicated and difficult, that they are never used. There are examples showing a fairly approximate agreement between the results of actual experiment and those derivable from the formulæ of Darcy and Flamau; and the formulæ recommended by Manning and Unwin have also been attended with considerable success. With good distribution, the velocity should not exceed 2.64 feet per second—especially in districts with sharp gradients—where there will be difficulty in getting the water to flow out of the trunk main into the branches and services. M. Dariès concludes that for towns of fairly good size and population, a supply of 33 gallons per head per day is sufficient for all proper purposes, including road watering, which he reckons to take 3 pints per square yard.

## TECHNICAL RECORD.

### SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The General Meeting of the Association was held last Thursday at the Holborn Restaurant, under the presidency of Mr. R. BEYNON, of Torquay. Compared with the meetings of the last year or two, there was a good attendance of members.

The minutes of the previous meeting having been taken as read, the members at once proceeded to the

#### ELECTION OF OFFICE-BEARERS.

The PRESIDENT said it was his duty to nominate the President for the ensuing year. He had great pleasure in proposing Mr. A. E. Broadberry, of Tottenham, for this important office. That gentleman was known to all the members. He was an old member of the Association, and had served on the Committee several times; and he (the President) thought he was in every way suitable for the position.

Mr. C. E. BOTLEY (Hastings) had pleasure in seconding the proposition. The matter had, he said, been fully considered by the Committee; and they felt that, in nominating Mr. Broadberry as President, they were recommending a gentleman who was well qualified to carry out the duties of the office.

The proposition was unanimously adopted.

Mr. BROADBERRY, in thanking the members, said he was deeply sensible of the great honour they had done him in electing him President for the ensuing year; and he felt confidence in accepting the position because he knew they would support him. Otherwise he should have felt some diffidence. He trusted that during his year of office the Association would lose none of its lustre.

Mr. W. D. CHILD (Romford) said he had the pleasure of proposing that Mr. D. Irving, of Bristol, be elected the first Vice-President of the Association. He was an old member not only of the Southern Association, but also of the South-Western. He had served on the Council of The Gas Institute with Mr. Irving; and he need not say how zealously and earnestly he worked in every way for the good that might be done by these Associations.

Mr. F. F. FARRAND (Ryde) seconded the motion, which was heartily agreed to.

On the motion of Mr. W. J. HICKS (Ascot), seconded by Mr. W. B. RANDALL (Waltham Cross), Messrs. S. Y. Shoubridge and F. W. Cross were elected members of the Committee.

Mr. CHARLES GANDON said he had been asked to propose the re-election of their Honorary Secretary and Treasurer (Mr. J. W. Helps, of Croydon). He did so with very much pleasure. Those gentlemen who had been members as many years as he (Mr. Gandon) had been would recognize the very great service which had been rendered to the Association by Mr. Helps.

Mr. W. A. VALON (Ramsgate) seconded the proposition. The services of the Honorary Secretary had, he said, been such as to fill the members with gratitude; and he for one was personally glad to find Mr. Helps was going to continue in office.

The PRESIDENT thoroughly agreed with the remarks that had fallen from the two preceding speakers. During the nine months that he had been in office, he had found Mr. Helps a valuable aid, and had seen how much he had the affairs and well-being of the Association at heart.

The proposition was cordially agreed to.

On the motion of Mr. F. W. CROSS (Lea Bridge), seconded by Mr. G. W. ANDERSON (Kenley), Messrs. W. H. H. Broadberry and C. E. Botley were elected to the position of Auditors.

#### NEW MEMBERS.

The following names were added to the roll of the Association: Mr. C. F. Botley, of Hastings; Mr. J. Dougall, of Margate; Mr. W. Littlewood, of Tiverton; and Mr. J. Young, of Norwich.

#### THE LATE MR. ROBERT HUNTER.

The PRESIDENT said there was one matter which he desired to bring before the members at this stage. They all knew that the gas world had of late suffered a loss by the death of Mr. Robert Hunter, of Chester; and in the last issue of the "JOURNAL OF GAS LIGHTING" it was announced that his family were very badly provided for. The matter had been brought before the Committee; and the result was that he had now to propose that the Association subscribe £5 5s. towards the fund which had been started on behalf of the widow and family of the late Mr. Hunter. They had very deep sympathy with them in their distress; and what the Association were doing as a body need not debar any member subscribing individually to the fund.

Mr. CHILD seconded the motion, which was unanimously passed.

Mr. C. E. BOTLEY (Hastings) then read the following paper, describing

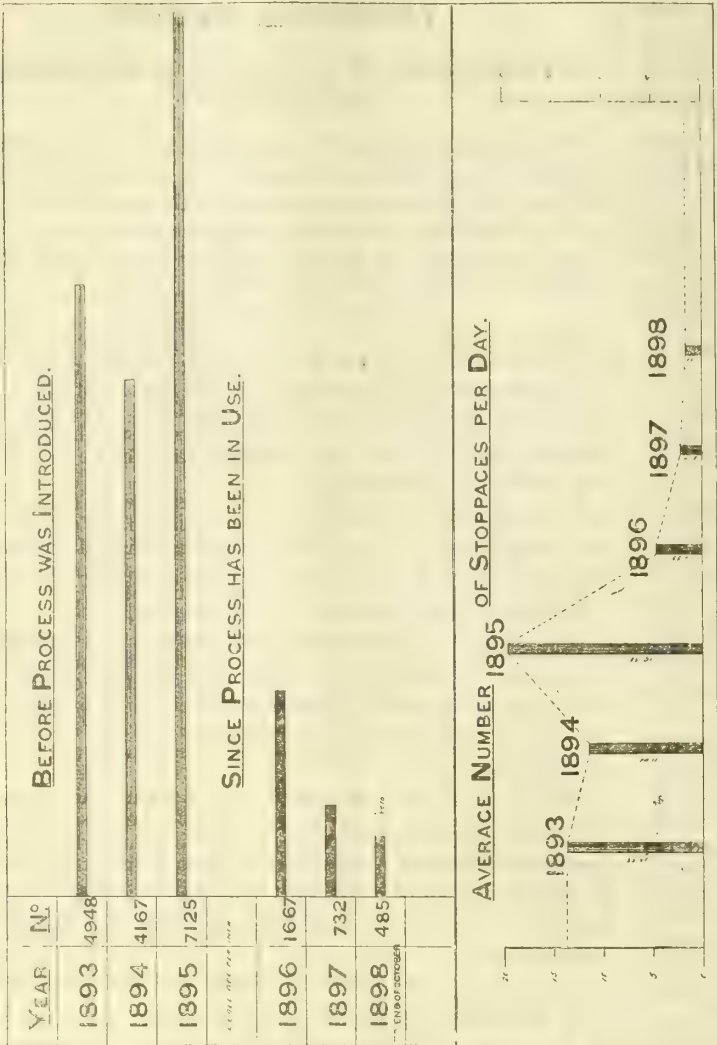
EXTENDED EXPERIENCE WITH THE HASTINGS CARBURATION PROCESS, FOR THE PREVENTION OF NAPHTHALENE DEPOSITS IN THE DISTRIBUTING MAINS AND SERVICES.

At the request of the Committee, I have consented to bring before this meeting, the further and extended experience we have



DIAGRAMS REFERRING TO THE CARBURATION PROCESS AT THE HASTINGS GAS-WORKS.

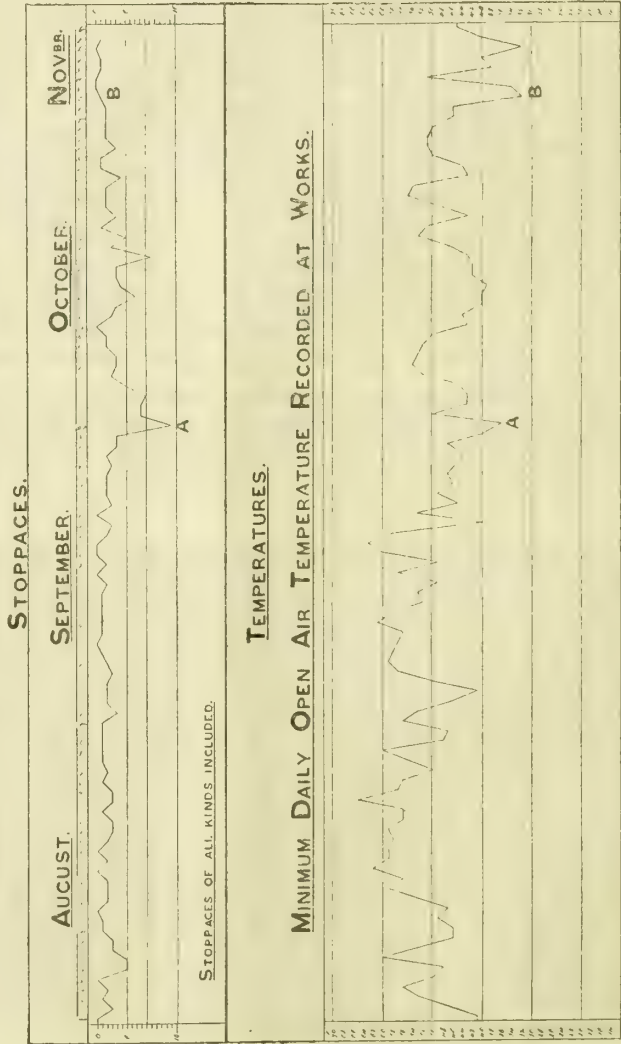
TOTAL NUMBER OF STOPPAGES PER ANNUM.



INCREASED NUMBER OF CONSUMERS AND QUANTITY OF GAS SOLD.



NAUPHTHALENE AND TEMPERATURE DIAGRAM, AUG. 1 TO NOV. 1, 1898.





had at Hastings with the carburation process for the prevention of naphthalene deposits in the mains and service-pipes during the distribution of the gas over the whole canalization.

It will be remembered that a paper on the subject was read before the Institution of Gas Engineers at the May meeting in 1897, when a full account of the naphthalene difficulties at Hastings was presented, and a complete statement given of the various means tried with a view of curing them—all of which had proved failures until this system of carburation had been invented. The effect that this system had had in reducing naphthalene stoppages to an enormous extent, was then described; but criticism was directed to the possibility of the results achieved being fallacious, owing to the time over which the carburation had been employed—viz., sixteen or seventeen months—being considered too short. This contention was not accepted at all by the authors; and the further experience since gained shows their belief to have been well founded.

It may here be well to briefly describe the process, as some present may be unacquainted with it. It is the treatment of the gas going into the district from the outlet of the governors, by adding an oil-mist to it, enveloping the gas in an oily atmosphere, through which it is protected throughout its canalization whence it passes to the burners. This atmosphere, or mist, or fog, is produced by mechanically breaking up a hydrocarbon oil (non-volatile at ordinary temperature) into minute atoms, so finely divided that the mist thus created will float away in the air like smoke from a cigar, and yet have an oily humidity. The production of this oily mist and its application to the gas is accomplished as follows.

A shunt or bye-pass main, with the necessary valves, is fixed on the outlet main from the governor, at one end of which atomizers of special make are placed, and suitable means provided for observing their correct action. A compressing-engine draws gas from the main, and compresses it in a cylinder to a pressure of about 75 lbs. on the square inch. This compressed gas is used for two purposes, at a reduced pressure of 25 lbs. First, to force oil from a cylinder to the atomizers; and, secondly, to supply force at the same point to split the oil up and form the mist. One or more atomizers are used as required, according to the flow of gas. The working is quite automatic otherwise, and can be applied to as many outlet-mains as required with the same compressing plant.

It will now be interesting to record the action of carburation in this manner, as experienced at Hastings. When the system was started, the mains and services were largely charged with naphthalene, which was reduced or increased according to the temperature, but never wholly absent. After the process had been started a month or two, the naphthalene found was much softer, and had an oily appearance. Then, as this gradually disappeared, oil in very minute quantities was found in the governors of the public lamps, which caused a little trouble, but was of very little consequence compared with the naphthalene stoppages. When this had been carried on for a considerable time, the quantity of hydrocarbon oil turned into mist was reduced considerably; and an examination of the mains in various parts of the district showed they were clean, so that, with all vicissitudes of weather and temperature, it was found that 1 gallon of hydrocarbon oil was required for every 166,000 cubic feet of gas to keep clear of naphthalene. The cost of this, including all charges, was 0.100d. per 1000 cubic feet of gas sold, or 1d. per ton of coal carbonized. Full particulars and the details will be found in the "JOURNAL OF GAS LIGHTING" of July 26 this year (p. 202), which included the figures to the end of 1897; and the results thus obtained were more than sustained up to the time of stopping the plant for general repairs to the engine, &c., on Aug. 15 of this year. These results I have diagrammatically illustrated.

It is here necessary to mention that carburetted water gas had been introduced, and the proportion added had been gradually increased. Up to the end of 1897, it was only 8 per cent. for the year; but during this year it has been about 20 per cent. The author has contended that carburetted water gas is no remedy for naphthalene directly, though indirectly, of course, it does help; as if you are using 20 per cent. of a gas depositing no naphthalene in distribution, you have that much less to deal with in the total gas. Opportunity was therefore taken of the stoppage of the carburation process to try the effect of distributing the mixed gas as regards naphthalene deposits. The plant had hardly been stopped a week, when one or two small lights were noticed in some duplex-burner public lamps which had originally given trouble, and which had the hole in the plug of the burner-cocks rather smaller than usual. These failures were reported to me as being caused by naphthalene; but the cocks were cleaned and tried again. In a day or two the same thing occurred. One of the cocks was then taken off, and brought in for examination, which proved conclusively that the cause was our old bugbear—this light flaky naphthalene just covering over the gas-way in the cocks.

As we had no complaints from the house services in the district, we let the experiment go on. But we gradually got a few complaints again; and an examination showed that the naphthalene had begun to find its way into the services, while the outdoor foremen concerned begged us to get the carburation plant on again, so as to save the increasing number of complaints. The stopping and re-starting of the apparatus has, however, given opportunity of again following the action of the carbura-

tion on the naphthalene; and the observations made confirm this action as originally observed.

Although the apparatus was only stopped for seven or eight weeks, investigation of the mains and services showed that naphthalene had again begun to collect; and the first action of the carburation was to apply it in such a manner that the deposits were moistened with the oil-mist and gradually loosened and dispersed, and positive proof was furnished that this naphthalene was to some extent taken along with the gas to the burner and there consumed. The public lamps presenting the least resistance to the flow of the gas, naturally proved this the most. Observation has shown that the amount of condensation found in the street-syphons is, if anything, more in quantity; but it is partly of an oily nature, and of a most pungent smell, which entails the necessity of pumping it into a small tank and bringing it back to the works, where it is disposed of by mixing it with the coal to be carbonized.

It may be interesting to state that it takes about a fortnight in cold weather for the oil-mist to spread through the whole canalization of about 90 miles, when it can be plainly seen on opening a lamp-cock or taking a plug out of the main. It should also be mentioned that a considerable quantity of water is deposited at the point where the gas is first of all treated, which is drawn off from the syphon on the 24-inch separating main. During the whole time that the process has been at work at Hastings, the same description of coal has been in use, and no alteration has been made in the manufacturing plant; the only change made being the gradual increase in the quantity of carburetted water gas mixed with the coal gas. Another matter noticed which is of considerable importance, is that the carburation process protects the gas right up to the dead ends of the mains in all directions, so that the illuminating value is better maintained up to these points. The importance of this is more apparent in a place like Hastings, or other sea-side towns, where there are long lengths of main with dead-ends, than in inland towns where the mains can all be connected up together.

The cost of applying the carburator and necessary apparatus to a 24-inch main would be about £300 or less; and the extra cost for each additional main connected to the same apparatus would be about £100 or less. It is hardly necessary to point out that the cost of the apparatus and of the working is paid for over and over again by the saving effected in the labour in clearing the services, besides avoiding the annoyance to consumers, and the mitigating effect on the using of gas appliances generally, owing to the uncertainty engendered when these stoppages occur.

The theory that has been considered as the most probable one to account for the action of the carburation process in preventing the forming of naphthalene deposits is that an artificial vapour tension is created, and that the naphthalene contained in the gas is mostly taken to the burner and consumed; but that if any should leave the gas, it cannot crystallize—i.e., deposit in a solid form—in the presence of the oil-mist, but simply falls and is carried into the syphons with other condensation. This accords very much with the remarks made in the discussion at the meeting of the Institution of Gas Engineers, when the paper was read.

Calling attention to the diagrams during and after the reading of the paper, the author pointed out that in 1893, before the process was adopted, the number of stoppages per annum was 4948, and in 1895 they had risen to 7125. The first year after the process was in use (1896), the number was reduced to 1667, falling to 732 in 1897, and to 485 in 1898, to the end of October. This point was as low as he could hope to attain to. In 1893, the number of consumers was 6084; and the gas sold was 322 million cubic feet. In 1897, the figures were 7626 consumers and 367 million cubic feet; while up to the end of October this year, they were 8000 and 300 respectively. Although the consumers had increased so very much, the rate of stoppages was reduced to quite a minimum now. Incidentally, this illustrated another point—that was the result of introducing prepayment meters. The diagram indicating the number of consumers and the quantity of gas sold showed that the gas sold corresponded up to a certain point fairly well with the number of consumers. Since they had taken on prepayment consumers, the lines did not so correspond. The consumers had over-lapped the gas sold—showing that, although they had a larger number of consumers, owing to the prepayment meters and incandescent lighting, the quantity of gas had been reduced proportionally very considerably. Directing attention to the naphthalene and temperature diagram, the author said this was perhaps the most interesting. The line in the upper part of the diagram showed the number of stoppages of all kinds since Aug. 1 up to that very morning. It would be seen that, when the apparatus was stopped, the increase in the naphthalene corresponded with the fall in the temperature. When the sudden fall in temperature occurred on Sept. 30, the stoppages at once increased. After the apparatus was at work again, there was, on Nov. 2, a similar drop in temperature; but the line showing the stoppages was maintained practically level—they had no increase whatever. This showed very strongly—in fact, it conclusively proved—as he had contended all along, that the process did prevent the stoppages occurring, under similar conditions of rise and fall of temperature.



*Discussion.*

Mr. J. W. HELPS (Croydon) said that, as Mr. Botley had mentioned in the early part of the paper, it had been considered by some that, at the time he brought his paper before the Institution of Gas Engineers, a sufficient period had not elapsed to give the process a fair trial. He (Mr. Helps) was perhaps responsible for a remark to this effect at the meeting of the Institution. After a considerable lapse of time, Mr. Botley now presented them with his further experience; and he (Mr. Helps) thought he had practically proved his case—that what he had been doing with this process had, to a very great extent, abolished the naphthalene bugbear. It was naturally very difficult in discussing the paper to speak of it any way but from the naphthalene standpoint; and it would be difficult for those who did speak not to wander a little from the path. It was very evident that at Hastings Mr. Botley must be accomplishing his successful methods in one of three ways: Either he must, in his process of manufacture and purification at the works, be treating his gas in such a way that he did not make naphthalene; or he deposited it on the works; or he must, by his process, be doing something that either prevented the naphthalene falling out, or, if it did fall out, some hydrocarbon dropped out in the liquid form, dissolved the naphthalene, and carried it forward to the syphons. He (the speaker) was not an agnostic; he did not believe in those who stated that they did not believe in anything they did not understand. At the same time, he thought it was the duty of every man who accomplished something to look into that which he accomplished, and try to find out the reason for his faith; and what he had to find fault with in this case was that Mr. Botley had not so far given to gas engineers any very good theory as to the way in which the process produced these results. He told them, in perhaps the most interesting portion of his paper, that they were brought about by creating an artificial vapour tension, which was something he, for one, did not understand; and he hoped that Mr. Browne would have a word to say on this point. Anyone who followed the interesting discussion that took place between Mr. Browne and Mr. William Young would, he thought, have come to the conclusion that it was almost impossible, by the addition of any hydrocarbon to gas, to so alter the average vapour tension as to prevent the deposition of naphthalene. Now Mr. Botley had practically, in his paper, made a comparison between the effects produced on naphthalene by the use of the process and by the use of water gas. In what he (Mr. Helps) was going to say, it might perhaps be considered that he was giving away certain secrets, and he might be looked upon as somewhat of a heretic. In Croydon, they had for the past nine or ten months been using a large proportion of water gas. He might say that, when they commenced supplying water gas, the results were so very pleasing that he thought they had discovered something which would for ever do away with the naphthalene bugbear. Here he would point out that Mr. Botley, in describing the last diagram, stated that he found the number of complaints of stoppage had a distinct ratio to the drop in the temperature. Now, this was not, he (Mr. Helps) must say distinctly, his experience. He found—and he had taken pains to get out figures to prove what he was asserting—that it was not so much the lowest point of temperature experienced during the 24 hours that caused the deposition of naphthalene, as the difference between the highest and the lowest temperatures. He would first refer to the figures for the month of January, when probably the lowest temperature was experienced; at any rate, it was much lower than later on in the year. He found in January, 1897, the difference in the shade temperature throughout a day (he had averaged it over a week) amounted to  $7.7^{\circ}$ ; and during that month they had a weekly average of 32 complaints. In the same month this year, they had an average difference in the temperature of  $10.6^{\circ}$ ; and they had a weekly average of 45 complaints. Then he passed on from January (which might be taken as a fairly typical month) to July. In that month, they had an average difference in temperature of  $22.6^{\circ}$ ; and the average weekly complaints rose to 194. The same month this year, the average difference of temperature was  $22.3^{\circ}$ ; and the number of complaints had averaged 201 weekly. These corresponded fairly well when the increased number of consumers was taken into account. In August, 1897, the average difference was  $19.3^{\circ}$ , with a weekly average of 145 complaints. This year in August  $21.2^{\circ}$  represented the difference in temperature; and they had 189 complaints. In September this year, as they all knew, the difference of temperature was very great. He was not only talking of shade temperature, but the sun temperature was so high that the gas in the holders was heated enormously, but was no doubt quickly cooled again when it reached the mains. The difference in temperature in September, 1897, was  $15^{\circ}$ , with a weekly average of 96 complaints. In the same month this year, the difference of temperature was  $22.4^{\circ}$ , and a weekly average of 235 complaints. That was a sad state of affairs to speak of as happening in connection with what he looked upon as a fairly well-managed Company. (Laughter.) He knew it was more by their failures than by their successes that they hoped to learn and arrive at the goal they were all striving for. He believed, when the members came to look at these figures, they would find that the number of complaints bore a ratio to the difference between the average highest and the lowest temperatures

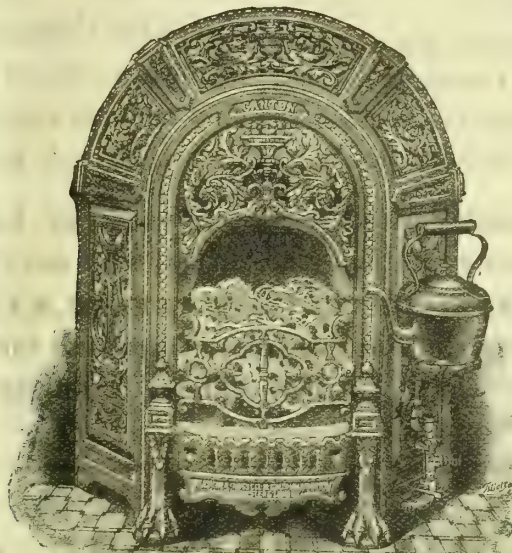
during a week or day as the case might be. As to water gas, at Croydon they put 25 to 30 per cent. into a cylinder which was common to the inlets of the holders. He took it in the light of what appeared in the discussion between Mr. Browne and Mr. Young that the coal gas as it entered the holders was, at a temperature at which it then existed, practically saturated with naphthalene. The addition of 25 to 30 per cent. of water gas practically formed a compound, which in itself—water gas having no naphthalene—was in an unsaturated condition; and in that condition the mixed gas passed on to the holder. In very hot weather (being heated up in the holder to a considerable extent), as it left the holder, it came into contact with previous depositions of naphthalene, and undoubtedly it picked up a large quantity. And so at this high temperature (he might say above  $100^{\circ}$ ), it issued in an unsaturated condition; and in this state it went out into the town. What happened? Was it possible to cool steam below a certain temperature without reducing it to water? Was it possible to cool gas saturated with naphthalene without the naphthalene dropping out in some form or another? He said “No” distinctly. They might have the day temperature very high and the night temperature low; and it seemed to him impossible to prevent, by the use of water gas, the deposition of naphthalene. If they were to put the water gas on the outlet of the holder, they would make the mixing a much more difficult matter; and then it was quite possible they would send out a gas in an unsaturated condition, which would pick up any naphthalene already deposited. In winter, when the holders contained gas in a cooler condition than it might be in the mains, it was quite possible then for an absolutely opposite effect to be produced. The gas itself came out cool, and became heated in the town; and consequently, by the heating, it was raised to a condition in which it was unsaturated. He thought one remark might prove this. During the hot weather when the gas was tested at the works, they would find that the illuminating power was (say)  $15\frac{3}{4}$  candles; and if it was tested 2 miles from the works, it would be found to be  $15\frac{1}{2}$  candles. In cold weather, when the gas in the holder was cooler than in the mains, they would find the opposite; it might be only  $15\frac{1}{2}$  candles at the works and  $15\frac{3}{4}$  candles a distance away. He thought this was a fairly distinct proof that there was something in what he was asserting; and he could not help thinking that Mr. Botley even now had not got to the true reason for the results he had obtained. If he (Mr. Helps) might be allowed, he would suggest one little point. Mr. Young, in his arguments with Mr. Browne, practically stated that the deposition of aqueous vapour from the gas really had nothing to do with the deposition of naphthalene in the mains. It was possible perhaps that, from the chemical point of view, it might have nothing to do with it; but, from a mechanical point of view, it had, in his (Mr. Helps's) opinion, a great deal to do with it. He believed Mr. Botley had said that in his process he found, almost immediately after the mixing cylinder, a considerable deposition of aqueous vapour. Was it not quite possible that at the exact moment that this aqueous vapour was thrown down that this fine mist or fog took the place previously occupied by the water vapour. The result was that this oil vapour would not be thrown down by the cooling of the gas afterwards in the mains, and the mechanical effect caused by the deposition of what would be otherwise aqueous vapour was prevented from acting on the gas so as to produce the naphthalene deposits. He thought that those who had suffered (as gas engineers had done in London during the past summer) from an immense number of naphthalene complaints would adopt this process if Mr. Botley would prove to them that he had (as he bid fair to prove) found out a means by which they would be saved further difficulty.

Mr. A. F. BROWNE (Rotherhithe), called upon by the President, said that unfortunately he arrived when the paper had been partially read; and it placed him at some disadvantage. He did not feel he had much to say on the subject of naphthalene when he entered the room. He thought he gave some of them an overdose of it a few years ago, even if he did not take one himself. Mr. Helps's remarks had practically covered the whole ground; but the more he (Mr. Browne) heard of the process of Mr. Botley's, the more it appeared to him that he had proved his case. Theory was one thing; practice another. Mr. Helps had rather fallen foul of Mr. Botley, because he had not been able to produce a theory which was satisfactory to everybody. He thought perhaps Mr. Botley would say he had not produced a theory that was satisfactory to himself. That was probably a very difficult thing to do; and he did not think they ought to quarrel with a process because they did not know how it was done. They were, of course, anxious to know, and would be glad if some day the whole method was made clear to their understanding. He thought, however, that all Mr. Helps had contributed to the discussion with regard to the probable causes of these effects was very interesting, and very likely it might be true. As to Mr. Botley's statement that, at the point where the oil was atomized into the gas, there was constantly found a considerable deposit of water, that struck him (Mr. Browne) as a notable fact. Mr. Helps had, he thought, followed that up all right, and had drawn from it the same conclusion that he (Mr. Browne) would have been disposed to have drawn from it—that, in some way or other, a gas which was carrying one liquid in a very finely divided form was unable to carry two at the same time. It dropped one to take up the oil mist, and the oil mist



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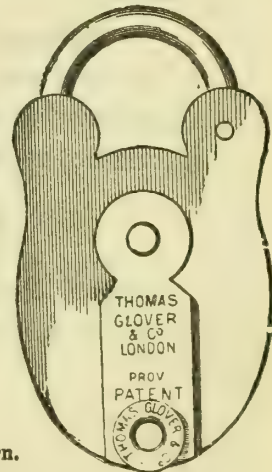
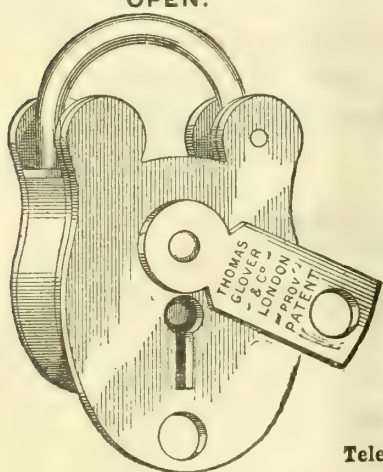
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acted probably mechanically, and, being in a very fine state of division, had an extraordinary vitality (so to speak) in its travel in the gas. He believed he understood Mr. Botley to say that he found the light vapour still maintaining itself in the gas even at the remotest ends of his mains. That being so, they must admit that the light vapour had an astonishing vitality; and it seemed to him, failing a better theory (and he thought he was practically saying what Mr. Helps had already said), that, in some way or other, this light oil carried the naphthalene. He also agreed with what Mr. Helps had said as to the result of the correspondence he had a few years ago with that great authority on this matter (Mr. Young). It did appear to him that in some way or other this light oil mist was able mechanically to carry these small particles of naphthalene—partially, he supposed, they were dissolved. They would naturally suppose that, if the minute drops of oil dissolved up naphthalene, they would fall; some would fall, and some would survive. The process, however, had most certainly delivered Hastings from the naphthalene nuisance. Mr. Botley had applied the best experience to the other side of the question. For a certain period, he told them, in order to put the matter to the test, he discontinued the process of atomizing the oil into the gas, and then the complaints began to increase in number. That being so, they need hardly be surprised that Mr. Botley cut the experiment short; but perhaps he would try it again at another time. He did not think they ought to grudge Mr. Botley their admiration and approbation of his scheme. It was perfectly true that it might be that he did not now produce the naphthalene at his works, even if he produced it before. They could not settle that question; it was impossible. He, however, believed the success of the process was established; and he could heartily congratulate Mr. Botley upon that success. He was not surprised that he had been unable to find a theory that would put the method of its working beyond a doubt. Like Mr. Helps, he (Mr. Browne) did not quite understand what was meant by an artificial vapour tension being created. He had not studied naphthalene much lately, though he had had more than usual on his works.

Mr. A. E. BROADBERRY (Tottenham) remarked that, when he first saw the process at Hastings, he was struck with the fact that there was a large quantity of water deposited in the syphon; and it had occurred to him that this did justify Mr. Botley in making the claim he did for his apparatus. With regard to carburetted water gas, Mr. Helps had dealt with that pretty fully. At Tottenham, they had certainly found more advantage from carburetted water gas than either Mr. Helps or Mr. Botley had done.

Mr. HELPS: You use more of it.

Mr. BROADBERRY said that probably it was due to the fact that these gentlemen sent out the carburetted water gas in the proportion of 1 to 3; while at Tottenham they sent it out in the proportion of 1 to 1. There was one other point in the paper which neither Mr. Helps nor Mr. Browne had mentioned. He saw that Mr. Botley dealt with the gas at the outlets of the governors. It would be interesting if he would tell them whether he had come to the conclusion that it was not applicable on the inlet of the governor. The pressure at which the oil was injected—75 lbs. on the square inch—was so high that surely it could not make any difference, with two or three inches variation in the pressure of the gas, whether it was on the inlet or outlet of the governor. He should like Mr. Botley to inform them the reason for the treatment being applied at the governor outlet.

Mr. C. F. BOTLEY (Hastings) said, in making a few remarks, he would endeavour somewhat to relieve his chief by replying to some of the remarks already made. First of all he should like to make clear the point raised by the last speaker. The only object in putting the apparatus on the outlet of the governor was this: That excessive friction meant an excessive deposition of oil from the gas when it was supersaturated. At certain hours of the day the consumption of gas varied wonderfully. At one hour at Hastings, it might be as high as 240,000 cubic feet; while at another it might be down to 15,000 or 20,000 cubic feet; and they did not want to be "fiddling" about with the atomizers all the time; and so they simply set the apparatus and allowed it to go on. The consequence was they got supersaturated gas, and this they partly recovered with the water in the syphons on the main. They always got a certain amount of water in the syphons; and they afterwards separated the oil from that water. Up to a certain specific gravity the oil was used over again. This he thought would answer what Mr. Broadberry had said. It had nothing whatever to do with pressure, though it was better to work with the town pressure than the holder pressure; and the process could be applied anywhere they liked. Now looking at the paper which was read before the Institution of Gas Engineers, it would be found stated there that carburated gas would not carry water, which was possibly a powerful clue to the action on naphthalene. The words in the paper were: "Carburated gas is permanent under ordinary conditions, and will pass through water without alteration. This is probably a clue to its powerful effect on naphthalene, in the formation of which moisture is an important agent." He was perfectly well aware that this had been much questioned by an authority with whom he would not wish to class himself; but at the same time, from his (Mr. Botley's) experience, he believed it to be true. "Carburated

gas will not apparently carry water any more than oil-sheets will absorb water." That was what was written in the Institution paper; and it showed that the point as far as water was concerned had been dealt with. Now he came to the question of the highest and lowest temperature; and he thought Mr. Helps must have rather misunderstood the paper. The point in the diagram which showed a sudden rise in the number of stoppages had been referred to as being the actual result of a drop in temperature; and he believed Mr. Helps would find in that case that it was quite independent of the difference in the mean temperature or cold. It would be seen that the apparatus was off in one case of a sudden drop in temperature, and on in another; and the diagram was really got out to show that, when the apparatus was in operation, fluctuation in temperature did not affect the results. When it was not in use, the effect was seen on the diagram. As regarded naphthalene on the works, he need scarcely assure Mr. Browne that there was no difference in this respect. They produced naphthalene on the works practically the same as they had always done. But they knew perfectly well that, if they did not use the apparatus, or if they did not use it efficiently, they got naphthalene all over the town. This was to his mind sufficient proof of its utility. With other things to do, he could not go looking about for a theory when he was relieved of all difficulty by simply keeping this simple apparatus at work. If Mr. Helps would only give him the opportunity, he should be pleased to show what could be done with the apparatus at Croydon.

Mr. S. W. DURKIN (Southampton), in response to a call from the President, said he was not in a position to discuss Mr. Botley's paper; but on the general question of naphthalene, he might say it was a difficulty he had not yet been able to overcome. If Mr. Botley's system was so successful at Hastings, he did not see why it should not be tried elsewhere, so as to ascertain if it would get rid of the horrible naphthalene nuisance under varied conditions. He had noticed that, in certain parts of his district, there was a deposition of naphthalene in the mains, which appeared to him to rise after the gas had deposited a certain amount of moisture; but in mains going out 5 or 6 miles from the works, they got very little as a rule, so that apparently a drying process went on which prevented the deposition of naphthalene. If this process tended to hold the naphthalene in suspension and carry it on, so much the better for the illuminating power of the gas. He hoped that some other engineer would take up this process, and try it in a different district to Hastings. He might add that, when the temperature varied very rapidly after a warm day, then he found that the naphthalene trouble came on very quickly. It had been so more or less all the summer, because they had had some very wintry nights; and he attributed the difficulty to decrease in the temperature bringing on the deposition, especially in the public lamps.

Mr. P. THOMAS (Wellington) said managers of small works could scarcely hope that their Directors would spend £400 or £500 on an apparatus of this kind, in order to deliver their managers from the naphthalene difficulty. Stoppages of service-pipes had been his trouble for years, especially in cold winters. He did not have much trouble last winter; but there had been times when he had had 43 lamps stopped out of 140. The best remedy he had found for dealing with the stoppages both in public lamps and consumers' services was simply to remove the tap and pour in  $\frac{1}{2}$  gill of naphtha. They were much indebted to Mr. Botley for his paper; and the only question he had to ask him was as to the class of coal he used.

Mr. W. H. H. BROADBERRY (Tottenham), having congratulated Mr. Botley on the progress he had made with his invention, said this question of naphthalene had always been a bugbear; but he hoped it would not always be so. For the last 45 years, he had been troubled more or less with it in one shape or another. At one time, gas engineers were satisfied if they made something like 8500 cubic feet of gas per ton of coal. Then they did not know what naphthalene was. By-and-bye, however, they had to make 9000 cubic feet per ton, then 9500, 10,000, 10,500, and so on, with the result that they had naphthalene in all directions. He understood Mr. Botley to say that he used petroleum. They all knew that for years past naphtha had been spoken of as a remedy for stoppages. He remembered a paper being read before one of the societies in which the author recommended the sprinkling of each tier of the purifiers with naphtha. He (Mr. Broadberry) was silly enough to try it. For the first few days after starting the purifiers, they did not have much naphthalene; but afterwards they had as much trouble as ever. He agreed with Mr. Helps that the deposition of naphthalene in the mains had more to do with the variation of temperature from day to night than anything else. Before they adopted the water-gas process at Tottenham they were troubled with just as much naphthalene as anybody ought to be. But on water gas being used, the naphthalene began to clear away; and practically they had had no trouble since. A short time ago, they were troubled with a deposition in the pipes that looked very much like naphthalene; and they thought it was. They had formerly been using Russian oil, but had got away to the American oil. With the latter oil they had been working at the same heats as with the Russian oil; and they found that it would not do. The trouble they had was not naphthalene; and, on altering the heats in the saturator, they found that the difficulty ceased. They had lately been re-laying 40 or 50 feet of 2-inch pipe with  $\frac{1}{4}$ -inch; and in the 2-inch pipe they had



had frequent stoppages. They had always given naphthalene the credit for this; and so, when they took up the pipe, they carefully disconnected it, with the result that they found some very fine iron rust had collected in it. Since the 4-inch pipe had been down, they had not had any trouble. He was very pleased with Mr. Botley's apparatus; and he hoped that, by the next time the author read a paper on the subject, he would have made a perfect apparatus of it, if it was not already so to be regarded.

The PRESIDENT said he did not think he could amplify any of the remarks that had been made; the ground seemed to have been covered most thoroughly. There was one question he should like to ask, and that was as to the state of the naphthalene question at Hastings before Mr. Botley put his process in—whether he got naphthalene in all districts alike; or whether he suffered from it in some places and not in others. At Torquay, they had houses from which they had never had a complaint ever since he had been there, no matter what the temperature might be; while the adjoining houses were continually suffering, and the Gas Company's man had to blow out the pipes perhaps once a week. Mr. Botley deserved a great deal of credit for having produced this process. He (the President) had been down to Hastings, and seen it at work; and it seemed to have met with great success there in doing away with complaints. The question had exercised him as to whether he should adopt it at Torquay to get rid of the naphthalene nuisance there.

Mr. BOTLEY, in reply, said he was very pleased with the tone the discussion had taken. Mr. Helps, who described himself as his great antagonist, but he (Mr. Botley) did not look upon him as such, had raised a number of questions; but to some extent he had been treading on ground which was covered in the paper read before the Institution of Gas Engineers. The same arguments that he had now used were considered at that time. He (Mr. Botley) was told that he advanced no theory as to what occurred in this process. Mr. Browne had to some extent answered that for him. It was most difficult to raise a theory in a matter of this kind. The question had given him a great deal of thought and consideration. His son and himself had discussed it, and had tried to discover what really took place; and to the best of their belief that which did occur was what was stated in the paper. With regard to the remarks which had been made as to the term "artificial vapour tension," there was a possibility, he thought, of the vapour tension being artificially increased. A question had been put as to whether there was any alteration in the naphthalene on the works. They had never had much trouble on the works with naphthalene. It had not increased; it was exactly the same. They did get naphthalene on the works, and had to clear out the apparatus periodically; but they had no particular trouble, as they looked after it in time. Mr. Browne's suggestion that they did not produce naphthalene was covered by that statement. They used the same description of coal now, worked at the same heats, and practically sold the same quantity of gas per ton of coal carbonized as formerly. For the last thirty years, they had used New Pelton and Pelaw Main coals. These coals in working did produce naphthalene; but they were good coals in all other respects.

Mr. BROWNE remarked that he did not suggest that Mr. Botley did not produce naphthalene on his works.

Mr. BOTLEY said he understood Mr. Browne to say that there was the possibility that at the present time they were not producing naphthalene. In regard to Mr. Durkin's remarks, if the gas had a long way to travel in the pipes, and naphthalene had been deposited for some distance, of course at the extreme ends they would find none. One point which he hoped was noticed in the paper was this: That, by enveloping the gas with an oil mist, they carried the illuminating value of the gas right to the end of the district. There was no question about that—in fact, the improvement in the light at the far ends of their area had been commented upon. In the days before the adoption of the process, the gas had been very thin sometimes at the extreme ends; but now it looked as good there as it did close to the works. Mr. Thomas had raised a question about the cost of an apparatus of this kind. He had given the cost of applying the process to a 24-inch main; but if it was only for a 6-inch main a very simple thing would accomplish the same purpose. He might mention that, although they had naturally protected themselves in regard to this process, the patent had not been taken out with the view of making a lot of money. He could not say anything fairer than this: That he would give anyone present permission to try the process by arrangement with him, and see for themselves what the results were. Mr. Broadberry had spoken of the formation of naphthalene being largely owing to increased heats. This was no doubt the case. Now they had to get all they could out of the coal, which they would not do if they worked at the old temperature. With regard to the oil employed in the process, they used the ordinary tea-rose oil of commerce, which could be bought at 6d. per gallon. The President asked whether he had had districts in which there was no naphthalene before the process was started. He could answer that in the negative. His experience was like that of the President, that the action of naphthalene was most erratic. As to particular houses suffering more from naphthalene than others, from what he had been able to gather, he had come to the conclusion that it was merely due to the extra facility afforded by one pipe over another for naphthalene

passing in. He was satisfied that what had been accomplished at Hastings anybody could do by the same means.

Mr. W. B. RANDALL (Waltham Cross) read the following paper on—

#### LOCALIZING LEAKAGES.

The subject of localizing leakages will occur to most gas engineers in the routine of business, being so closely allied to that "Will o' th' wisp" unaccounted-for gas, which so largely determines the success of gas undertakings. Dividends are truly said to be made or lost in the retort-house; but according to the annual Parliamentary Returns, it must be conceded that in many cases good manufacturing results are marred by a weak distribution system, and the dividend thereby lessened.

I do not propose to quote statistics on the amount of leakage, &c., as they are already well known, but simply to submit a method of localizing leakages which I have found to be both economical and satisfactory. The usual plan pursued in testing distributing mains, services, &c., is to take a length of main, &c., drill holes, and insert bladders at both ends; then connect up with a testing-meter, and note the amount passing through the meter to supply the main under observation. One bladder at each end is not reliable, as they are apt to pass a certain amount of gas and spoil the value of the test. The safer method is to have two bladders close together, filling the space between them with water from a short stand-pipe; or to cut out and plug off the main at each end, having first shut off all main, lantern cocks, &c., on the particular length under observation. Another method is to have syphons which, by means of a diaphragm or midfeather, reach within a few inches of the bottom of the box, which can be sealed by water, and so ensure gas only passing by the midfeather through the arranged connections and meter.

The principal objection to these methods is that they are liable to cause a certain amount of inconvenience to consumers, through having to shut off their main tap during the tests. Also that in bladdering and meter connections considerable time and labour are expended, and the main weakened by the necessary holes. Again, the main taps and lantern cocks may bye-pass or leak; and after ascertaining the exact amount of leakage, the actual source remains to be discovered.

These objections do not exist in the following system, which depends upon using a leakage indicator. This consists of a porous diaphragm, through which any mixture of gas and air can percolate, and which is so arranged that the percentage volumes are indicated by a pointer on a graduated dial. The instrument operates through the well-known law of diffusion of gases—viz., the velocity of diffusion of gases is inversely proportional to the square roots of their densities. Thus four volumes of hydrogen will pass through the diaphragm in the same time as one volume of oxygen is able to do, oxygen being sixteen times as heavy as hydrogen.

In the case of a district where plans, notes, or records are not obtainable as to the size and position of the gas-mains, Ordnance maps are procured and copies of the thoroughfares are transferred on an enlarged scale to a suitably ruled note-book. All new mains when laid are duly noted as to their sizes, position, &c., and a plan and section of the ground showing the main is made as required. The service layers also note the depth and position of the main whenever they excavate to lay or repair a service; and as other opportunities occur—such as excavations to sewers or water-pipes—notes are made of the same and recorded.

The method of procedure must, of course, be governed by the locality; but, as an instance, let us presume that we start from the outlet of one of the district governors, and that for 100 yards the main is laid in a straight line under a macadamized road, and has about 2 feet cover. Having ascertained the exact position of the main, a searching rod is driven down on alternate sides of the main at each end. The space between is marked off into distances of about 3 yards each; then another rod is driven down near the side of the main, so that as nearly as possible the search-holes run diagonally, and in the trench originally excavated for the main when laid. It is hardly necessary to add that discretion must be used so that the rod does not cause damage to any water, sewer, or drain pipes, or the gas-main itself. Having driven a rod down to about the level of the underside of the main, a little sand is placed round the top of the hole, to secure an even surface. The rod is then withdrawn, and the indicator immediately placed over the search-hole. If the pointer on the indicator remains at zero, it may safely be assumed that the main within some yards of that spot is sound. The search-hole is then filled in, the bar driven down at the next point, and so on; the testing being continued until the pointer moves and indicates a leakage. Then the value of the instrument is apparent, because you can drive down rods and note the readings until the maximum is indicated, when on excavating at that spot the actual leakage will be discovered. After a little experience, the operator becomes remarkably accurate in successfully localizing the leakage. Where the mains are laid under the footpaths, which may be paved with Victoria stone, Granolithic or York stone, the rod is driven down in the angle of the nearest joint. Tar or asphalt paving offers no such chances; but the hole made by the rod



| Year and Quarter.         | Half Year. | Year. | Gas Made.  | Gas Sold.                | Used on Works.     | Leakage.  |           | Gas Made Per Ton. | Gas Sold Per Ton. | Miles of Main. | Number of Consumers. |
|---------------------------|------------|-------|------------|--------------------------|--------------------|-----------|-----------|-------------------|-------------------|----------------|----------------------|
| 1892.                     |            |       | Cub. Ft.   | Cub. Ft.                 |                    | Cub. Ft.  | Per Ct.   | Cub. Ft.          | Cub. Ft.          |                |                      |
| Michaelmas                | ..         | ..    | 4,498,800  | 3,253,500                | ..                 | 1,245,300 | 27'03     | 10,684            | 7,727             | ..             | ..                   |
| Christmas                 | ..         | ..    | 8,846,400  | 7,890,900                | ..                 | 955,500   | 10'79     | 10,645            | 9,495             | ..             | ..                   |
|                           | Dec. 31    | ..    | 13,345,200 | 11,144,400               | ..                 | 2,200,800 | 16'48     | 10,671            | 8,901             | 15             | 500 (250 P.L.)       |
| 1893.                     |            |       |            |                          |                    |           |           |                   |                   |                |                      |
| Lady-day.                 | ..         | ..    | 7,714,500  | 6,910,100                | ..                 | 804,400   | 10'42     | 10,570            | 9,469             | ..             | ..                   |
| Midsummer                 | ..         | ..    | 4,319,800  | 3,469,700                | ..                 | 850,100   | 19'67     | 10,664            | 8,567             | ..             | ..                   |
|                           | June 30    | ..    | 12,034,300 | 10,379,800               | ..                 | 1,654,500 | 13'75     | 11,094            | 9,569             | ..             | ..                   |
| Michaelmas                | ..         | ..    | 4,805,800  | 3,789,900                | 47,000             | 968,900   | 20'01     | 10,562            | 8,329             | ..             | ..                   |
| Christmas                 | ..         | ..    | 9,022,500  | 8,348,000                | 93,000             | 581,500   | 6'44      | 10,334            | 9,562             | ..             | ..                   |
|                           | Dec. 31    | ..    | 13,828,300 | 12,137,900               | 140,000            | 1,550,400 | 11'20     | 10,411            | 9,140             | ..             | ..                   |
|                           | Dec. 31    | ..    | 25,862,600 | 22,517,700               | 140,000            | 3,204,900 | 12'38     | 10,718            | 9,332             | 15             | 539 (247 P.L.)       |
| 1894.                     |            |       |            |                          |                    |           |           |                   |                   |                |                      |
| Lady-day.                 | ..         | ..    | 7,934,700  | 7,170,100                | 86,000             | 678,600   | 8'54      | 10,254            | 9,263             | ..             | ..                   |
| Midsummer                 | ..         | ..    | 4,849,200  | 3,778,900                | 42,000             | 1,028,300 | 21'20     | 10,252            | 7,989             | ..             | ..                   |
|                           | June 30    | ..    | 12,783,900 | 10,949,000               | 128,000            | 1,706,900 | 13'36     | 10,662            | 9,131             | ..             | ..                   |
| Michaelmas                | ..         | ..    | 5,796,000  | 4,907,800                | 52,000             | 836,200   | 14'42     | 10,165            | 8,861             | ..             | ..                   |
| Christmas                 | ..         | ..    | 9,992,300  | 9,285,400                | 106,000            | 600,900   | 6'01      | 10,527            | 9,782             | ..             | ..                   |
|                           | Dec. 31    | ..    | 15,788,300 | 14,193,200               | 158,000            | 1,437,100 | 9'11      | 10,504            | 9,443             | ..             | ..                   |
|                           | Dec. 31    | ..    | 28,572,200 | 25,142,200               | 286,000            | 3,144,000 | 11'00     | 10,574            | 9,305             | 18             | 762 (271 P.L.)       |
| 1895.                     |            |       |            |                          |                    |           |           |                   |                   |                |                      |
| Lady-day.                 | ..         | ..    | 9,144,000  | 8,369,700                | 97,000             | 677,300   | 7'40      | 10,228            | 9,362             | ..             | ..                   |
| Midsummer                 | ..         | ..    | 5,374,500  | 4,423,800                | 48,000             | 902,700   | 16'80     | 10,527            | 8,589             | ..             | ..                   |
|                           | June 30    | ..    | 14,518,500 | 12,793,500               | 145,000            | 1,580,000 | 10'88     | 10,924            | 9,735             | ..             | ..                   |
| Michaelmas                | ..         | ..    | 6,036,000  | 4,977,700                | 111,000            | 947,000   | 15'68     | 11,095            | 9,187             | ..             | ..                   |
| Christmas                 | ..         | ..    | 10,656,000 | 10,210,500               | 223,000            | 223,000   | 2'09      | 10,602            | 10,258            | ..             | ..                   |
|                           | Dec. 31    | ..    | 16,692,000 | 15,188,200               | 334,000            | 1,170,000 | 6'41      | 10,774            | 9,869             | ..             | ..                   |
|                           | Dec. 31    | ..    | 31,210,500 | 27,981,700               | 479,000            | 2,750,000 | 8'81      | 10,840            | 9,719             | 21             | 880 (293 P.L.)       |
| 1896.                     |            |       |            |                          |                    |           |           |                   |                   |                |                      |
| Lady-day.                 | ..         | ..    | 8,998,000  | 8,800,900                | 97,000             | 100,100   | 1'11      | 10,561            | 10,388            | ..             | ..                   |
| Midsummer                 | ..         | ..    | 5,539,000  | 4,829,200                | 48,000             | 661,800   | 11'95     | 10,431            | 9,934             | ..             | ..                   |
|                           | June 30    | ..    | 14,537,000 | 13,630,100               | 145,000            | 761,900   | 5'25      | 10,511            | 9,855             | ..             | ..                   |
| Michaelmas                | ..         | ..    | 5,994,000  | 5,577,700                | 83,000             | 333,300   | 5'55      | 10,608            | 9,872             | ..             | ..                   |
| Christmas                 | ..         | ..    | 11,028,000 | 10,399,300               | 167,000            | 461,700   | 4'19      | 10,335            | 9,746             | ..             | ..                   |
|                           | Dec. 31    | ..    | 17,022,000 | 15,977,000               | 250,000            | 795,000   | 4'67      | 10,430            | 9,790             | ..             | ..                   |
|                           | Dec. 31    | ..    | 31,559,000 | 29,607,100               | 395,000            | 1,556,900 | 4'93      | 10,467            | 9,820             | 23             | 865 (299 P.L.)       |
| 1897.                     |            |       |            |                          |                    |           |           |                   |                   |                |                      |
| Lady-day.                 | ..         | ..    | 10,253,000 | 9,565,600                | 200,000            | 487,400   | 4'75      | 10,486            | 9,783             | ..             | ..                   |
| Midsummer                 | ..         | ..    | 6,201,000  | 5,636,500                | 100,000            | 464,600   | 7'49      | 11,152            | 10,137            | ..             | ..                   |
|                           | June 30    | ..    | 16,454,000 | 15,202,100               | 300,000            | 952,000   | 5'79      | 10,726            | 9,910             | ..             | ..                   |
| Michaelmas                | ..         | ..    | 7,141,000  | 6,531,800                | 133,000            | 476,200   | 6'66      | 11,037            | 10,095            | ..             | ..                   |
| Christmas                 | ..         | ..    | 12,949,000 | 11,387,500               | 267,000            | 1,020,500 | 7'87      | 10,701            | 9,411             | ..             | ..                   |
|                           | Dec. 31    | ..    | 20,090,000 | 17,919,300               | 400,000            | 1,496,700 | 7'46      | 10,819            | 9,649             | ..             | ..                   |
|                           | Dec. 31    | ..    | 36,544,000 | 33,121,400<br>In store + | 700,000<br>274,000 | 2,448,700 | 6'69<br>* | 10,776            | 9,767             | 25             | 910 (311 P.L.)       |
| 1898.                     |            |       |            |                          |                    |           |           |                   |                   |                |                      |
| + In store, Dec. 31, 1897 | ..         | ..    | 274,000    |                          |                    |           |           |                   |                   |                |                      |
| Lady-day.                 | ..         | ..    | 10,861,000 | 10,256,700<br>In store + | 200,000<br>78,000  | 600,300   | 5'39      | 10,807            | 10,283            | ..             | ..                   |
|                           | ..         | ..    | 11,135,000 |                          |                    |           |           |                   |                   |                |                      |
| + In store, Mar. 31, 1898 | ..         | ..    | 78,000     |                          |                    |           |           |                   |                   |                |                      |
| Midsummer                 | ..         | ..    | 6,381,000  | 6,113,200                | 100,000            | 182,800   | 2'83      | 10,706            | 10,256            | ..             | ..                   |
|                           | ..         | ..    | 6,459,000  | In store +               | 63,000             |           |           |                   |                   |                |                      |
|                           | June 30    | ..    | 17,242,000 | 16,369,900               | 300,000            | 783,100   | 4'46      | 10,769            | 10,225            | 25             | 940 (312 P.L.)       |
| + In store, Dec. 31, 1897 | ..         | ..    | 274,000    |                          |                    |           |           |                   |                   |                |                      |
|                           | ..         | ..    | 17,516,000 | In store +               | 63,000             |           |           |                   |                   |                |                      |

\* Increase partly explained by inflation of new gasholder and laying  $1\frac{1}{2}$  miles of 12-inch main.

is only  $\frac{3}{4}$  inch diameter, so that it is easily and immediately repaired to avoid any possible complaint.

The instrument is extremely sensitive; and the pointer will indicate very minute leakages. As an evidence of this, I may mention that in some cases when the leakage was exposed it was so small that it would not burn continuously; and in other instances, when the conditions admitted a light was applied on drawing out the bar, and it would not show the small blue flame so often found in main and service leakages. Some of the curiosities unearthed through the use of the indicator are submitted for your inspection, as well as one of the search-rods and an indicator.

It is very remarkable how some soils have the power of deodorizing the gas, so that in the case of broken mains in frequented places no idea of their condition was entertained until discovered through using the indicator. Also in some

instances leakage had occurred to the mains and services through persons having seriously damaged them, and, instead of notifying the fact to the gas company, had driven in rough wooden plugs, and bound up other places with sacking and white lead and various other subterfuges, to cover up the damage. One of these cases was caused by an irresponsible agent which is among the curiosities—viz., a root of ivy. This had run under a 2-inch cast-iron main, moulding itself as it grew to the shape of the pipe, and when it gained sufficient strength causing a fracture in the main. But as punishment should always fit the crime, the escaping gas retaliated and killed the ivy.

The question will naturally arise as to whether the saving effected justifies the outlay incurred; and it may be taken for granted that where the unaccounted-for gas equals about 8 per cent., the expenditure on some such system is well warranted.



The actual cost of (say) two of the indicators and six searching-rods will not exceed £4; and if the exact position of the mains is known, the actual time in testing is reduced to a minimum, as compared with any plan of metering the leakage and stripping the mains.

Many remarkable instances of difficulties caused through the elusive nature of gas leakages will have occurred to all the members; and I venture to hope that the system which I have had the pleasure to bring before your notice may save some of the trouble and expense in localizing leakages.

The figures given on p. 1099 will probably prove interesting as an instance of reduction of leakage. In submitting them, please allow me to state that they are not advanced to claim the total reduction being caused directly through the leakage indicators, because we have relaid some mains and services. Neither do I wish to make any claim to have originated this particular system, or to have reached the irreducible minimum, as regards leakage. But if I have succeeded in laying before you a method which may prove of some service to the members, and help the gas industry to strengthen a weak point, I shall feel well repaid for the time given to the writing of this paper.

#### Discussion.

Mr. J. L. CHAPMAN (Harrow) said that, having been connected with Mr. Randall for some years, he should like to say a few words to open the discussion. With reference to the general question of unaccounted-for gas, he was sorry to say that at Harrow they had been progressing backwards—they had gone from a very small leakage to a large one. The only way he could account for this was that he had had a new district added on to his old one. During the time Mr. Randall was with him, they had a leakage of 4 per cent. year after year; but this had increased considerably. As to the instrument with which Mr. Randall had been testing at Waltham Cross, he (Mr. Chapman) had tried one that Messrs. Aird lent him. He used the instrument for testing the mains; but found that, after a time, it was not so effective as when he first applied it. Mr. Randall was a very clever mechanic; and possibly he had improved upon that one, or had constructed an entirely new one. But his (Mr. Chapman's) experience was that after a time the instrument was not so sensitive as at first—the diaphragm seemed to get affected in some way, and the gas did not appear to have the same power upon it to show leakage that it had when he first used it. Mr. Randall had evidently given a great deal of attention to the instrument, and had thoroughly tested its value. He (Mr. Chapman) did not know whether other members in the suburban districts round London had found, as he had done, that the leakage in their districts had tended to increase of late. In his own case, he had no less than sixteen Rural District Councils to deal with, where before they had only one Council, who, with a great district, did not go to the expense of maintaining the roads in the country places. But now steam-rollers were being used everywhere; and this was one reason why the leakage was greatly on the increase in these small localities. He could not see why in a district like Harrow, although it ran about 10 miles from east to west and from north to south, the leakage should have increased as it had done in the last four years since the passing of the Local Government Act which brought into existence these District and Parish Councils. In the Malvern Link arbitration, Mr. Alfred Colson stated that he should advise the taking-up of all the mains, and laying them at a lower level. It seemed to him (Mr. Chapman) that, where they had mains only 2 feet below the surface, they should certainly now put them at least 2 ft. 3 in. or 2 ft. 6 in., to prevent injury by steam-rollers.

Mr. S. W. DURKIN (Southampton) said he had had some rather extraordinary experiences with leakages in his district at different times; for the town had been in a state of chaos, owing to new sewerage works, and the laying of telephone wires and electric light culverts and ducts. While this work was being carried out, the men came across gas-mains and service-pipes pretty freely. It was all very well while the dry weather lasted; but he expected, and was not disappointed, that, when there had been heavy rain, they would find out some of their difficulties. Since Oct. 28 up to Nov. 5, they had broken mains reported every day. This had caused a great deal of trouble. He did not know the instrument Mr. Randall had been employing; but he (Mr. Durkin) had been using a gas indicator about 3 inches in diameter, and had found it uncommonly useful. Especially was this so in one case, where a leakage of gas found its way into the electric light conduits, and travelled on until it got into the electric light works. The street in question was very complicated as far as the gas connections were concerned. They found a broken main under the tramway; and also a leakage on the main close to the trench opened by the electric light people. There they stopped two leakages; but still the smell of gas continued in the electric light works. Therefore they went further afield. There was a main on both sides of the street. They tested one side first; and, detecting gas about, they opened the ground, but could not find any trace of it whatever. After completing the one side, they examined the other. One of the inspectors went along the line of the electric light conduits with a detector; and at different points he found gas in the chambers. They followed the clue up, isolated the main, and put on a test-meter to try and localize it as closely as possible. At last they found a service pipe that

had been tapped into the side of the main. A short time before, the steam-roller had been at work there; and the ground being of a spongy nature underneath the pipe, the roller had drawn the pipe out of the main. So this "Will o' th' Wisp" was at last unearthed by the detector and test-meter. At Southampton, they had frequently used these indicators and found them of great service, even without the searching-rod which Mr. Randall drove down by the mains. Leakages were constantly cropping up in streets disturbed by public authorities; and gas managers had to deal with them in the safest possible way. His experience was that detectors were invaluable.

Mr. W. B. MIMMACK (St. Mary Cray) wished to accord his tribute of praise to this instrument, which he had been using for a considerable time. The necessity for something of the kind in his case would be seen when he mentioned that they had about 32 miles of main with a consumption of no more than 60 million cubic feet of gas. It would thus be understood that they had a large area, and a great length of main; and consequently leakage was a very important point with them. It had been at a very high figure, which he should hardly like to mention there. He made several attempts to get hold of an apparatus that would give the percentage of leakage rapidly and easily. He had a thermometer brought to his notice, in which there were two bulbs and stems. One of the bulbs was surrounded by a chemical compound which was stated to be a secret of the inventor. Coal gas would raise the temperature of this compound, and cause the thermometer to go up rapidly; while the other bulb was only acted on by atmospheric temperature, and remained stationary. But there seemed to be some peculiar characteristic about the chemical compound; and at times it did not appear to act with anything like the celerity that it did on other occasions. Then this apparatus working on the law of the diffusion of gas was brought under his notice; and he tried it at once. But on one occasion when an inspector was using it, some of the local authorities peered over his shoulder; and, finding out what it was, became possessed of one. Now they went about the district lifting the manhole lids; and, if a little gas had collected in the sewers, and showed itself on their indicator, they would run down to the gas-works, and say there was an explosive mixture in the sewers, and the matter must be attended to at once. Consequently, they had found out that this instrument, although it had been a blessing to them, had been the cause of a great deal of trouble. By driving down the bar, they could arrive at the percentage of leakage, and whether they were near the seat of it. The nature of the soil into which the bar was driven made a very important difference. Some soils were very porous; and if there was a leakage in the main, it would percolate through the soil very rapidly. On the other hand, if the main was in a clay soil, there might be a considerable leakage, and the detector would not show much of it; and it would be necessary to get almost on the spot to find it out. With regard to traction-engines, matters seemed to be getting worse and worse. In his town they had now a 15-ton roller; and Kent, he thought he was right in saying, was the only county in England where traction-engines were allowed to run riot without having to pay a licence or something of the kind. One morning he stood at the corner of a country lane while a procession of 22 traction-engines went by. After the procession had passed, to his astonishment, he saw a 2-inch gas-main "standing out" of the ground. The side of the road was literally forced out; and the main, in more places than one, stood out about 3, 4, and 5 inches. He was surprised to find the leakage was so small as it turned out to be; but the matter had to be attended to at once. He could not help thinking that it was a pity more severe restrictions were not imposed upon these traction-engines; so that they should not be allowed to run down streets one after the other in any number. As to the 15-ton roller, in nearly every instance where roads had been newly made up, and this heavy roller had been put upon them, they had to attend to serious leakages. Particularly in suburban districts, this matter of localizing leakages was an important one.

Mr. C. E. BOTLEY (Hastings) said he had had some experience with these instruments, and they had been extremely useful in determining the presence of coal gas. He had not, however, found that they always indicated the exact locality of a leakage in some grounds. He had had instances of a strong indication of gas; and the leakage had been at least  $\frac{3}{4}$  mile away. Where this happened, the leakage was most difficult to localize. The instrument had been useful in a case where a man said he had gas leaking into his cellar. They took one of the instruments there, and found there was no leakage of gas, but a sewage smell. By the aid of the instrument they convinced the person complaining that it was not gas; and it was afterwards found that it was a drain that was defective. The instrument had also been found useful in large towns where there was wood or asphalt paving. In one case it was decided that The Gaslight and Coke Company were liable for a leakage of gas which was occasioned by some operations—not their own—on an asphalt road, because this instrument was in existence, and would have informed them of the leakage. He certainly agreed that the instrument was a valuable one.

Mr. F. G. COCKEY (Newport, Isle of Wight) regarded this system of testing as a very satisfactory one, especially for long lengths of main. Starting from one end of a main, and going to the other, very often an indication of a leakage was obtained;



and if the main was followed up with the rod and indicator, as Mr. Randall suggested, the strongest point was almost bound to be discovered. Often indications would be obtained at the top of a hole, but the leakage would be found half-way down.

Mr. D. IRVING (Bristol) remarked that the instrument was well and generally known; but he was sure they were all obliged to Mr. Randall for the example he had brought before the members, which showed what could be done with the instrument, *plus* painstaking energy and application. Mr. Randall had succeeded with this instrument; and his energy in reducing the leakage from 16½ per cent. down to 4½ per cent. was a splendid example of what could be done. He had great pleasure in congratulating him; and what he had accomplished at Waltham Cross could be done elsewhere.

The PRESIDENT observed that Mr. Randall's paper was one well worthy of attention; and the criticisms made upon it were, on the whole, very favourable to the author.

Mr. RANDALL, in reply, said, in answer to Mr. Chapman, that he certainly experienced some difficulty in starting the instrument—it was very sensitive at first, but after a little use it gradually deteriorated. He went to the trouble of taking it to pieces to find out why it deteriorated. There was simply one tap on the instrument to allow the mixture of gas and air to escape; and he came to the conclusion that, if they had two taps instead of only one, they could have a free current of ordinary atmospheric air to clear the instrument, and start *de novo*. Since then they had had no difficulty whatever—they had had no difficulty regarding the sensitiveness of the instrument. What he had been able to accomplish was due to the fact that they had systematically gone over the entire district to discover leakages. Several of the defective pipes which were found were quite eaten away; and the members might well wonder why it was they were not reported before. Some of them were in places where perhaps 2000 or 3000 people passed every day. There must have been a large quantity of gas escaping, but it was never noticed. By this instrument, they were able to "spot" the exact position of the leakage whatever the nature of the soil. Even if they were dealing with ashes (than which he did not think there could be anything more porous), and could get a hole down and were able to keep it open, by putting the indicator on the top, they would most certainly come across the actual leakage, as it would be sure to pass up the hole. It would travel up that sooner than along the bed of the main. After detecting the leakage they seldom had to open more than a yard or two of main. This showed that, where they had to deal with Macadam or wood paving, costing 25s. per yard, the outlay on the instrument would soon be returned—frequently in less than a week.

#### VOTES OF THANKS.

Mr. CHAPMAN proposed a vote of thanks to Messrs. Botley and Randall for their excellent papers.

Mr. W. A. VALON (Ramsgate), in seconding the motion, said they had to congratulate Mr. Botley upon the success which his process had achieved. But there was something more to be said upon it than had been said—there was something more to be discovered, but that would come in time. As far as Mr. Randall was concerned, he had produced a discussion which was interesting to all gas engineers. Complaints had been made with regard to the breaking of mains by steam-rollers and traction-engines. This kind of thing was no doubt very bad; but steam-rollers and traction-engines had come to stay; and therefore the only thing gas engineers could do was to put their mains down deeper, and not lay them in the slipshod way that some of the older men knew had been done in the past.

The motion was heartily agreed to.

Messrs. BOTLEY and RANDALL having returned thanks, the proceedings terminated.

The members afterwards had tea together.

#### THE ACETYLENE CONGRESS AT FRANKFORT-ON-THE-MAIN.

The Congress of Calcium Carbide and Acetylene Gas Specialists, which was convened, as already briefly mentioned in the "JOURNAL" of the 18th ult., for the 27th and 28th of September, at Frankfort-on-the-Main, was promoted by the Calcium Carbide and Acetylene Gas Association, of which Herr J. Knappich, of Augsburg, is President. After Dr. H. Rössler had welcomed the visitors to the town of Frankfort, Dr. FREUND, the President of the Congress, called upon Professor Erdmann, of Halle, to make a communication on the "Chemistry of Acetylene."

Professor Erdmann said that the methods of handling calcium carbide in the laboratory had not yet been properly studied. Reactions proceeded either sluggishly or so violently that they were beyond control. For instance, concentrated sulphuric acid had no action on lumps of calcium carbide, but with the powdered substance a very violent reaction occurred. Nitric acid and powdered calcium carbide reacted with explosion. Useful products might be obtained by the action of other substances than water on calcium carbide. Thus Maquenne, by the action of iodine, had discovered periodethylene, which he proposed to employ as a substitute for iodoform. Professor Erdmann examined the new substance, and found it an unsatisfactory

substitute for that material. It had long been known that alcohol could be produced by the combination of water and acetylene; but the process did not pay when tried on a commercial scale. An intermediate product—viz., acetaldehyde—which had formerly been obtained from alcohol, could however be produced by leading a fine stream of acetylene into hot dilute mineral acids, to which some mercury had been added. Complex organic substances could also be obtained from acetylene. Pure acetylene had no action on pure copper at ordinary temperatures; but Professor Erdmann obtained a rather remarkable substance by leading acetylene over the finely-divided metal at 446° Fahr. This substance was quite distinct from copper acetylide produced in the wet way. It was non-explosive, and on heating to a high temperature it yielded a light brown oil containing benzene, naphthalene, and other aromatic hydrocarbons, and having a smell resembling that of natural naphtha. Pure carbon could be obtained by heating acetylene. Generally this carbon was in the form of graphite; but as the state in which a substance crystallized could be modified by varying the external conditions, it seemed likely that diamond might thus be obtained from acetylene.

Dr. A. Frank, of Charlottenburg, next read a paper on the "Economic Importance of Acetylene and Carbide Manufacture." He stated that the fears frequently expressed that there was no scope for a new illuminant were groundless, as the present rate of progression in the lighting industries, due to reiterated demands for more and better illumination, indicated rather that fears that the means of coping with the demand would prove inadequate would be better founded. Take, for instance, the immense increase in the consumption of petroleum. In 1879, the production of crude oil in America was 20,000,000 barrels; while in 1897 it had risen to 60,900,000 barrels. Russia in 1880 produced only 2,400,000 barrels; but in 1897 this had increased to 42,000,000 barrels. The gas industry showed a similarly enormous development. The consumption of gas in Germany now exceeded 800 million cubic metres (28,253 million cubic feet) per annum; whereas in 1868 it was only 151 million cubic metres (5333 million cubic feet). Assuming that 400 cubic feet of gas consumed in ordinary burners gave the same amount of light as a gallon of petroleum, the petroleum imported into Germany in 1897 was equivalent, as an illuminating agent, to more than three times the present gas production of the country. Therefore it was absurd to suppose, with some people, that acetylene would ever supplant petroleum. Assuming that acetylene had fifteen times the illuminating value of coal gas, the volume required to displace the petroleum imported into Germany would be about 180 million cubic metres (6357 million cubic feet); and 600,000 tons of carbide would be consumed in its production. Electrical installations of about 500,000-horse power would be needed to supply this quantity of carbide per annum. The illuminating value of coal gas had been increased five-fold at least by the introduction of the Welsbach mantle. There did not even seem to be ground for anticipating that acetylene would displace the electric light; for the latter had special applications, and a better efficiency was expected to be realized shortly. Nevertheless, there was ample scope for acetylene. The whiteness and brightness of the acetylene light were very important advantages. It was necessary, however, for the success of acetylene as an illuminant, that generators should be properly constructed and the gas adequately purified. The use of acetylene in incandescent lighting did not seem promising, as the whiteness and intensity of its flame were by this system completely sacrificed, and only the heating power of the gas was utilized. Large quantities of carbide were already used by the Russian railways for the production of acetylene for admixture with oil gas; and the annual requirements of the German railways, where the mixture of acetylene and oil gas was generally adopted, would amount to 10,000 tons of carbide. Electric lighting works could profitably employ their plant during the hours when the load was light in the production of carbide. In addition to water power, the peat deposits might also be turned to account as a source of carbide, as 16 to 20 tons of peat would yield 1 ton of carbide. In the first half of the present century, Europe looked to other lands for its sugar supply, just as it now did for petroleum. Germany now produced 1,700,000 tons of crude sugar, and exported 1,200,000 tons. Even as, by the aid of science and art, Germany had rendered herself independent of foreign sugar supplies, so might she hope in the future to provide her own illuminating agents; and to this end she should foster the carbide industry.

Dr. Frölich, of Berlin, described a new electric furnace, introduced by Messrs. Siemens and Halske for electro-chemical processes.

Dr. May, of Frankfort, next spoke on the explosion of copper acetylide. He referred to the researches by which Messrs. Pintsch had shown that acetylene did not form an acetylide when passed through copper or brass apparatus. The acetylide could be heated in the open to 140° Fahr. before it would explode. The explosion did not extend to a bulk of acetylene, but was limited to the vicinity of the acetylide.

Dr. P. Wolff, of Berlin, then gave a paper on the "Purification of Acetylene," and therein expounded the systems of purification devised by himself and by Dr. Frank. Dr. Wolff's views on the subject have been given recently in the "JOURNAL" (see *ante*, p. 1032, and p. 1102).

Herr Liebetanz, of Düsseldorf, next discussed the planning of



installations of acetylene lighting. He referred to the difficulties which young or inexperienced technicians found in determining the requisite number of burners for various rooms. Dr. Cohn, of Breslau, had stated that artificial lighting should be equal to 50 metre-candles, in order that a person might read as comfortably as by daylight; and he had given for reading purposes 10 metre-candles as the least illumination compatible with hygienic requirements, and for general lighting 4 or 5 metre-candles. But his laws assumed that the whole of the light was derived from one source, which radiated equally in all directions. In practice, many considerations influenced their application. Reflection from surrounding objects played an important rôle. Yellow walls reflected 40 per cent. of the light which fell upon them, while dark brown walls reflected only 4 per cent. In the lighting of wide streets and open spaces reflection did not come into play, because of the absence of walls. The number of candles per square yard of area which gave adequate illumination would be about as follows: In living rooms, 3 to  $3\frac{1}{2}$ ; in bedrooms,  $1\frac{1}{2}$  to  $2\frac{1}{2}$ ; in passages, 1 to 2; in offices, 3 to 4; in shop interiors, 5 to 7; in ball-rooms, &c., 10 to 13. Street lighting would be good if the lamps were 30 yards apart and afforded at least 2 candles per square yard of ground. Moreover, the effects of globes and shades had in many cases to be taken into account, as by such means the intensity of the light in particular directions might be greatly increased or decreased. With regard to the diameter of services for acetylene, Herr Liebetanz was of opinion that it was best to use the same sizes as for coal gas, though a reduction to one-third the diameter was generally recommended.

Herr Herzfeld, of Augsburg, next spoke on the "Storage and Transport of Carbide." He said that the regulations varied in different countries, but were in most cases too stringent. Carbide must usually be kept in hermetically sealed vessels, and this was commonly understood to mean soldered vessels. But if the carbide happened to be damp at the time of packing, very high pressures were produced in the soldered vessels. In some cases, safety-valves opening at a certain pressure were now required to be fixed in the lids of the vessels. It was unnecessary to prohibit the storage of carbide in cellars; and in towns it was impossible to find any other accommodation. In closed vessels, carbide was certainly no more dangerous than spirit and petroleum.

Herr J. Knappich, of Augsburg, then gave a communication on the attitude of fire insurance companies towards acetylene. He discussed the regulations imposed by some German, Swedish, and American Insurance Companies, and expressed the view that they were unnecessarily stringent. He hoped that the Companies would consult the Association as to the regulations which should be enforced with regard to the storage of carbide and the use of acetylene installations.

The railway station at Kronberg was, as an experiment, lighted by acetylene on both days of the congress, and was visited by the members of the Association.

## SOCIETY OF CHEMICAL INDUSTRY.

### Opening Meeting of the London Section.

The current session of the Society of Chemical Industry opened on Monday, the 7th inst., when Mr. BOVERTON REDWOOD took the chair at the first meeting of the London Section. He called upon Mr. Watson Smith to give two communications—(1) on a Central American lignite, soluble in benzol, and (2) an exhibit of Miike coal with shale and fossils.

The sample of Central American lignite had the appearance of a good bituminous coal, except that small particles were brown instead of black. The precise locality whence the sample came was not known. When heated in a flame, it burnt like cannel, while the warmed portions melted like sealing-wax. It differed from the bitumens properly so-called in that it conducted heat. Its softening point was found to be between  $570^{\circ}$  and  $610^{\circ}$  Fahr. Its specific gravity was 1.26. On prolonged extraction with benzene, no less than 80.1 per cent. of the substance was dissolved. The Miike coal, from Kiushiu Island, Japan, extracted with benzene in the same manner, yielded only 9.5 per cent. of soluble resinoid matter or bitumen. The bitumen obtained by the extraction of the Central American lignite began to distil between  $248^{\circ}$  and  $266^{\circ}$  Fahr.; and 20.4 per cent. passed over below  $302^{\circ}$  Fahr. A viscid mass remained at the close of the distillation. The odour of the products resembled that of petroleum. The lignite yielded only 3.76 per cent. of ash; but it contained no less than 9.1 per cent. of sulphur. The amount of iron in the ash was only 0.41 per cent. of the lignite; and the pyrites equivalent to this quantity of iron would contain sulphur equal to only 0.5 per cent. of the lignite. The balance of the sulphur—8.6 per cent. of the lignite—must therefore be in some organic combination or as free sulphur.

Destructive distillation of the lignite on a small scale showed a yield of 44.8 per cent. of coke, 12.4 per cent. of tar, and gas equivalent to 8899 cubic feet per ton. The results indicate that the lignite could be used for gas making; but the coke would be friable, and the tar would be of little value. The ash consisted chiefly of silica; hence the lignite probably occurred in the sandstones and above the true coal measures.

Mr. Boverton Redwood considered that the lignite in question bore a close resemblance to certain bitumens from Utah and Colorado, and to the well-known mineral "Albertite," which occurs in New Brunswick, and is reported to yield on destructive distillation 100 gallons of oil and 14,500 cubic feet of illuminating gas per ton.

Mr. Dann, the Chief Engineer at the Japanese mines at Miike, gave some interesting details of the mining and uses of the coal worked there, which has previously been referred to in the "JOURNAL," Vol. LXI., p. 454. About 4000 acres had already been mined. There was no bed of stone above the coal-seams, and hence water soaked through from the surface to the working levels. In some places lava had flowed over the coal-seams, and had converted the coal into a natural coke. The mining was done almost entirely by means of convict labour, which proved very efficient. A considerable amount of coke was made from the Miike coal in beehive ovens. The yield of coke was only 51 per cent. of the coal; but close ovens were now being constructed, and with them a yield of 60 per cent. was anticipated. The coal was used very generally as gas coal in the Japanese and Chinese markets. It was found that 1 lb. of the coal would evaporate  $8\frac{1}{2}$  lbs. of water from the boiling-point. Certain fossils found with the Miike coal had been examined at the Jermyn Street Museum; and though the majority of them were too ill-preserved to be of much service, the evidence they afforded tended to support Mr. Watson Smith's contention that the Miike coal was really a lignite and not a true coal.

## THE PRESENT POSITION OF ACETYLENE LIGHTING.

Dr. Paul Wolff's Berlin Lecture.

(Continued from p. 1033)

The after-development constitutes a second difficulty in the generation of acetylene. The evolution of gas does not cease when the water supply is interrupted, because a quantity of moisture remains in the carbide receptacle, and is converted into acetylene. The heat of the reaction vaporizes water, which subsequently condenses and reacts with the carbide; while water combines with lime at about  $140^{\circ}$  Fahr., and is removed from it when cold by the carbide. A carbide receiver, if opened immediately after the generation of gas has been interrupted, will be filled with a damp mixture of unconsumed carbide and lime sludge; but if it be left for twelve hours before opening, the contents will be dry and the moisture will have gone to form acetylene. Carbide is a most hygroscopic material, and it eagerly seizes every trace of moisture.

Various means have been tried to regulate the development of the gas. In order to moderate the violence of the reaction, substances which have no action on carbide—such as alcohol, acetone, or glycerine—have been added to the water, or the carbide has been protected by oil, petroleum, or other water-resisting material. Substances such as sugar have been employed to dissolve the lime liberated, and thus prevent the accumulation of a coating of lime on the carbide. Against all these means may be urged their cost, which would quite preclude their employment on a large scale. They are also inefficient. Numerous experiments with the majority of the proposed means under varying conditions invariably had unsatisfactory results. Oil or petroleum, if in small quantity, scarcely retards the reaction; and if in large quantity, it completely stops it. The attenuation of the water retards the development of the gas; but the effect is not satisfactory. Alcohol, acetone, and other readily volatile liquids are volatilized by the heat of the reaction, and affect the intensity and colour of the acetylene flame. Concentrated aqueous solutions of salts liberate the gas almost as rapidly as does water. The use of sugar has not the desired effect, as the quantity which can be used is too small to form a soluble compound with the whole of the lime. Even if substances—such as hydrochloric acid—which dissolve lime much more freely are used, the results are not satisfactory. Some of the substances mentioned may prove useful in experimental work; but they cannot be of service on a practical scale.

A third source of danger in the generation of the gas is the development of heat which occurs. The temperature of decomposition of pure acetylene is about  $1436^{\circ}$  Fahr.; that of its mixture with air, about  $896^{\circ}$  Fahr. It therefore becomes very necessary to ascertain if these temperatures can be attained in the generator. The temperature which can by theory be reached will be found by calculation to be about  $2012^{\circ}$  Fahr.; but in reality so high a temperature is never attained, because the heat is dissipated, especially by conduction through the outer walls of the generator, and by absorption by the water. The actual temperature reached varies very greatly according to the design of the generator.

All the difficulties which have now been referred to must be taken into consideration in the construction of apparatus. Three factors are of importance in every acetylene installation designed to work properly—viz., the generation, the purification, and the combustion of the gas.

Generators are of three classes—namely, (1) those of the "dip" system, which resemble in principle Kipp's apparatus; (2) those of the "drip" system, in which water drops on to carbide; and (3) those in which carbide is plunged into a large



excess of water. Generators of the first class were the early favourites, because of their simplicity. The general plan was to place the carbide in a basket within a bell, which floated in a tank of water. The lower portions of the carbide came in contact with the water; gas was generated and raised the bell, and thus removed the carbide from contact with the water and interrupted the generation, until, owing to consumption of the gas, the bell sank and brought the carbide again into contact with the water. There are serious faults in this plan of generation. The after-development is very great, as more water is always taken up by the carbide when it dips into the water than corresponds to the consumption; and the surplus causes a continuous generation of gas. This surplus water, however, is exhausted after awhile; and the amount of gas which would be developed by it can be determined and allowed for. But the aqueous vapour arising from the water in the tank continues to act on fresh carbide, and causes an after-development of gas which continues so long as any carbide remains. Experiments have shown that the total after-development from 1 kilo. of carbide (2'2046 lbs.) amounts to 7'5 litres (0'265 cubic foot) in the first half hour; to 25 litres (0'883 cubic foot) in the first 24 hours; and to 50 litres (1'766 cubic feet) in three days. It then becomes regular, and amounts to 5 to 6 litres (0'177 to 0'212 cubic foot) for every 24 hours, so long as any carbide remains. The complete avoidance of this after-development is practically impossible; but it may be reduced by diminishing the surface of the water as much as possible.

An even more serious disadvantage of generators of this class is the great development of heat which occurs. Whenever the carbide is brought in contact with the water, aqueous vapour is formed and takes up a considerable part of the heat of the reaction; but the aqueous vapour rises through the mass of unattacked carbide, and causes evolution of gas and a fresh development of heat. The process repeats itself continually, and there results eventually a rise of temperature not far below that which is theoretically possible. The author has observed that when the diameter of the carbide holder exceeds a particular size, so that a certain minimum amount of carbide is brought into contact with the water each time the holder dips into it, the temperature becomes so high that the whole, or at least a part, of the carbide is incandescent. Enveloping the generator with a water-cooler has often been recommended, and has been stated to prevent over-heating. Such a recommendation displays gross ignorance of the actual conditions. The generation of acetylene takes place with violence and suddenness, and can give rise to a temperature of nearly 1832° Fahr.; and a superficial and incomplete method of cooling such as that referred to, can have no considerable effect—especially as both carbide and lime are very bad conductors of heat. Thus it happens, as the author has repeatedly observed, that a portion of the carbide in the generator is incandescent, while the surrounding cooling-water is not above 120° or 140° Fahr. All tests of the temperature of the cooling-water while the generator is at work are quite valueless, as they afford no indication of the actual temperature within the generator. Heating to or above the temperature of decomposition of acetylene does not, however, necessarily cause an explosion; for, as has been already stated, the decomposition has not an explosive character under ordinary pressures. But if the generator contains air, as it usually does when first put in action, an explosion may result. In all cases, however, where a decomposition of the acetylene takes place, products of its polymerization are found; and these not only adversely affect the illuminating value of the gas, but cause stoppage of the services and burners. Styrol, naphthalene, and tar are found among the complex mixture of the products of the polymerization of the gas. The "dip" generators are therefore very unserviceable, and even dangerous unless of very small size. The charge of carbide should never exceed 1 kilo. (2'2046 lbs.) in generators of this class.

The second class of generators consists of those in which water drops on to carbide. The carbide is usually in one or more receptacles, which communicate with a cistern of water by means of a pipe. The flow of water through this pipe is controlled according to the movements of the bell of the gasholder into which the gas passes as it is generated. The patent claims refer chiefly to the devices by which the regulation of the flow of water is effected. Generators of this class have the faults of those of the first class on a moderated scale. The heat evolved when a drop of water falls on the carbide vaporizes a part of the water, and the vapour rises and escapes with the generated gas, without coming in contact with more carbide. The cumulative development of heat is not found as in generators of the first class. The temperature of decomposition of acetylene does not appear to be reached so long as the apparatus is of such a size that the water actually drips on to the carbide, and does not fall on it in a continuous stream. If it runs on to the carbide in a stream, an excess of water is certainly present; but it is insufficient to decompose the whole of the carbide and to absorb the heat which is evolved, yet enough to cause a continuous after-development and rise of temperature. Very high temperatures can thus be attained. A limit must therefore be set to the size of drip generators. The author's researches lead him to recommend that the charge of carbide in generators of this class should never exceed 3 kilos. (6'614 lbs.).

For all larger installations, apparatus in which the carbide is discharged into a large excess of water should alone be used.

Each piece of carbide is thus completely decomposed, so that there can be no after-development; while the heat of the reaction is absorbed by the water, and a considerable rise of temperature is avoided. Repeated trials showed that even when such apparatus was worked to its utmost capacity, the temperature did not exceed 122° Fahr. Endeavours to secure automatic regulation of the generation of gas with this class of apparatus have not been attended with success owing to the nature of carbide, which is a hard material in lumps of irregular shape and size. Automatic feeding appliances only act satisfactorily with a material consisting of uniform granules or of powder. It is difficult to bring carbide into this condition, and loss occurs during pulverization owing to the action of atmospheric moisture on it. Hence it appears to be the best plan to dispense with automatic regulation in all large generators, and to supply the carbide by hand. It is essential, however, that gas should not escape when the carbide is introduced, and that air should not be carried into the apparatus with the charge of carbide. These conditions may be secured by providing the generator with a hydraulic seal.

Purification plays an important rôle, because commercial carbide invariably contains a number of impurities which are decomposed by water and yield gaseous products which contaminate the acetylene. The nature and amount of the impurities vary very much, according to the degree of purity of the raw materials used in the production of the carbide. Analyses of the acetylene formed from three comparatively good varieties of commercial carbide showed the following mean results in volumes per cent. :—

|                                  | Sample A.<br>(American.) | Sample B.<br>(German.) | Sample C.<br>(Swiss.) |
|----------------------------------|--------------------------|------------------------|-----------------------|
| Acetylene . . . . .              | 98'41                    | 99'01                  | 98'63                 |
| Oxygen . . . . .                 | 0'87                     | 0'55                   | 0'63                  |
| Nitrogen . . . . .               | 0'42                     | 0'20                   | 0'34                  |
| Hydrogen . . . . .               | 0'09                     | 0'07                   | 0'16                  |
| Sulphuretted hydrogen . . . . .  | 0'08                     | 0'07                   | 0'10                  |
| Phosphuretted hydrogen . . . . . | 0'05                     | 0'03                   | 0'03                  |
| Ammonia . . . . .                | 0'08                     | 0'07                   | 0'11                  |
|                                  | 100'00                   | 100'00                 | 100'00                |

There are also sometimes found, siliciuretted hydrogen, arseniuretted hydrogen, and organic sulphur compounds.

The small quantities of oxygen, nitrogen, and hydrogen are of no moment, and may be ignored; but the ammonia, sulphuretted hydrogen, and phosphuretted hydrogen may cause a great deal of trouble, and so their removal is absolutely essential. Ammonia conduces to the formation of the explosive copper acetylides; and sulphuretted hydrogen is poisonous. Phosphuretted hydrogen, however, is the most noxious impurity, because in the first place it corrodes the metal parts of services, cocks, burners, &c. (especially when the metal is copper or one of its alloys), and renders them useless. The impurities, moreover, give rise to noxious products and injure the illuminating power when the gas is burnt. Especially is this true of the phosphuretted hydrogen, which fills the air with a cloud of phosphoric acid distressing to the respiratory organs. The greatest risk arises, however, from the spontaneous inflammability of phosphuretted hydrogen, and more particularly of siliciuretted hydrogen. The presence of air consequently can cause disastrous explosions; and many apparently inexplicable mishaps can be ascribed to the presence of these spontaneously inflammable impurities.

The formation of the various impurities is not very readily explained. Ammonia arises from nitrogen compounds of calcium and magnesium, which are decomposed by water. Sulphuretted hydrogen occurs if the raw materials contain sulphur, though it is uncertain in what combination the sulphur exists in the carbide. The formation of calcium sulphide seems probable; but this substance is not decomposed by water, and therefore it could not yield sulphuretted hydrogen. It has been assumed that at the temperature of the electric furnace an aluminium sulphide ( $Al_2S_3$ ) is formed; and this substance decomposes on contact with water. But whether this sulphide is formed seems uncertain; and the author has undoubtedly often detected sulphuretted hydrogen from samples of carbide which were quite free from aluminium. It seems probable that there are in carbide certain complex organic sulphur compounds, which are decomposed by water at a certain temperature, and form sulphuretted hydrogen. Lunge and Cedercreutz have shown that such organic sulphur compounds probably occur in acetylene. The formation of phosphuretted hydrogen is more easily explained; for if phosphorus occurs either in the coke or the lime as phosphate, it will be reduced in the electric furnace to calcium phosphide, which liberates phosphuretted hydrogen as soon as it is brought in contact with water. It is more difficult to find an explanation of the occurrence of siliciuretted hydrogen. If the raw materials contain silica, there may be formed silicon carbide, ferro-silicon, magnesium silicide, or calcium silicide. Silicon carbide (or carborundum) and ferrosilicon are insoluble in all solvents; while the silicides only give rise to siliciuretted hydrogen when they are treated with acids. We must therefore assume that complex silicon compounds of uncertain composition, which yield siliciuretted hydrogen when treated with water, are found in the carbide. The reactions which really take



place in the present electric furnace have not been sufficiently studied; and there is no doubt that unrecognized minor reactions, which produce novel compounds, occur simultaneously with the well-known main reactions.

The safest means of avoiding impurities lies in the careful selection of the raw materials. Lime which is as nearly pure as is possible, and contains no phosphate, sulphate, or silica, and coal which is free from sulphur, yield a carbide which produces almost pure acetylene. But as the prevailing materials have to be used, and as coal (being a product of organic substances) is never free from phosphorus, purification of the acetylene must be considered as indispensable. Ammonia and sulphuretted hydrogen are likewise impurities of coal gas; and the gas industry has long since found the best means of separating them from gas. Ferric oxide, or other ordinary purifying materials, do not, however, remove phosphuretted hydrogen. Numerous agents which have been proposed have nearly all proved useless, either because, like ferric oxide, they do not attack the phosphuretted hydrogen, or because, like bromine, permanganate, &c., they act so energetically that they partially decompose the acetylene.

Two methods of purification which have given satisfactory results may be described. The first, which has been invented and patented by Herr A. Frank, consists in washing the gas with acid solutions of metallic salts, of which a concentrated solution of copper chloride in hydrochloric acid answers best. The ammonia is absorbed by the acid; and the sulphuretted hydrogen and phosphuretted hydrogen are precipitated as copper sulphide and copper phosphide. All the impurities are thus removed at one operation; and the method is therefore very suitable for use with a small plant. Its application on a large scale demands careful consideration, because the acid nature of the reagent precludes the use of metal vessels; while the removal of the precipitate is not easy, and the acidity of the agent must be maintained in order to prevent the formation of copper acetylides. The acetylene, moreover is attacked and absorbed to some extent, and is partially oxidized to aldehydic compounds. Nevertheless, with care, this method gives good results.

The second plan is one elaborated by the author. Lunge and Cedercreutz recommended chloride of lime for the technical purification of acetylene, but their system needed amplification in order to make it serviceable. The author found that the passage of crude acetylene through purifiers charged with chloride of lime caused explosions, which proved to arise, not from the acetylene, but from the ammonia in the gas, which formed chloride of nitrogen with the chlorine of the chloride of lime. The sulphuretted hydrogen is only partially retained by this material. It was therefore necessary to remove the ammonia and a portion of the sulphuretted hydrogen before the gas entered the vessel containing chloride of lime. The removal of these impurities can be effected by merely washing the gas in an efficient washer; but it is preferable to intensify the action of the water by adding to it calcium chloride or a similar substance. The phosphuretted hydrogen is subsequently oxidized by chloride of lime (bleaching powder), or some other oxidant which is without action on the acetylene. This scheme of purification is adopted in the Pictet generating apparatus as made in Germany. (The apparatus was briefly described in the "JOURNAL" for Oct. 4, p. 744.)

(To be continued.)

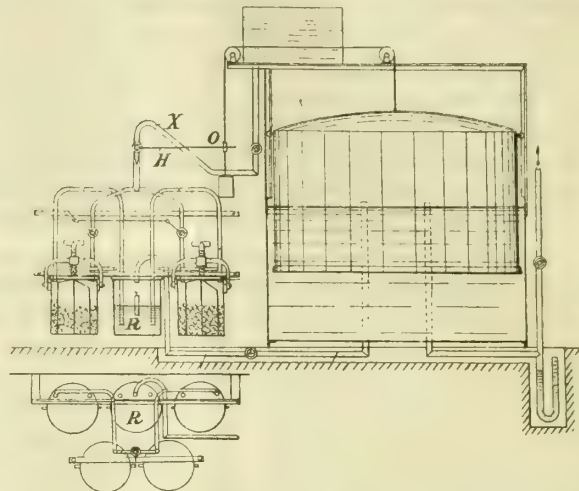
**The Extension of the East London Water Company's Mains.**—At a recent meeting of the St. Pancras Vestry, sanction was given to an application from Mr. W. B. Bryan, the Engineer to the East London Water Company, for permission to lay, before next summer, a new 36-inch main, commencing in the Camden Road and passing to the York Road. The application was made because the Company have no statutory powers outside the line of their existing 36-inch main running from west to east through St. Pancras, though they have such power throughout Islington. Mr. Bryan stated that the Company intend to introduce a Bill next session, in which, if necessary, the length of main in question would be included. It was, however, highly desirable that the pipe should be laid before next June; and if the Company had to wait for statutory powers, the work would be delayed for at least nine months. The Highways Committee of the Vestry expressed the opinion that it would be advisable to render the Company every facility for developing the capacity of their works, so as to afford a more adequate supply of water in the district; and it was upon their recommendation that the request was granted.

**Accidental Poisoning by Water Gas at Manchester.**—Last Tuesday, an inquest was held at Manchester on the body of John Clelland, age 21, lately foreman of the water-gas plant at the Bradford Road gas-works of the Manchester Corporation, who was suffocated while following his employment on the previous Sunday. The deceased, who was formerly employed at the Belfast Gas-Works, went to Manchester about two years ago. It was part of his duty to attend to the working of a gas-cooling chamber. In spite of a warning by Mr. Rodgers, the Station Manager, never to go down the manhole, Clelland descended on Friday, and again on Sunday. His last venture proved fatal. He was overpowered by the fumes; and on an alarm being raised, the yard foreman—a man named John Mason—bravely attempted to rescue him. Feeling that the fumes were also overcoming him, Mason was obliged to ascend and get assistance. Eventually the unconscious man was got out by means of a rope. Oxygen was at once administered to him; but he never recovered consciousness, and died at the Ancoats Hospital the same day. In recording the jury's verdict of "Accidental poisoning by water gas," the Coroner said Mason's attempted rescue was a noble act, and the Gas Committee should be proud of such a workman.

## REGISTER OF PATENTS.

**Producing Acetylene.**—Wartenweiler, A., of Engwang, and Spengler, R., of Hasli, Switzerland. No. 23,547; Oct. 13, 1897.

The inventors employ a series of generators and a water-reservoir situated over them, and connected therewith by a pipe X. The generators are in communication with a condenser or washer R, by means of pipes which reach nearly to the bottom. It is connected by a pipe with the holder, into which the gas is forced. The bell of the holder is provided with a counterpoise, so that the pressure is to a suitable extent decreased within it, so as to prevent the back-pressure forcing the water out of the condenser. The generators are connected so that only two of them may be worked together, while the remaining generators are shut off. In order to prevent a too sudden generation of the gas, the generators are provided with radial partitions (preferably of unequal



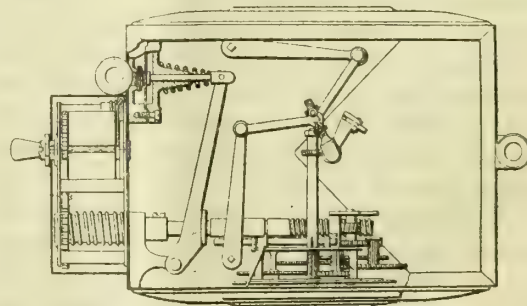
height), so that the chambers within the vessels are successively brought into action by the water. The gasholder inlet-pipe is preferably provided with a three-way cock, to enable any excess water to be drawn off; and the discharge or escape pipe is provided with a syphon through which excess water from the holder flows. The gasholder has its bell running between guides; and the cord which carries the counterpoise has a stop O, with which a lever H, connected to the water-cock, engages; the arrangement being such that, as the bell is raised, the lever is depressed, and the supply of water cut off or regulated, so that less gas is generated.

**Preserving Carbide, and Its Subsequent Treatment for Producing Gas.**—Lundstrom, C. J., of Stockholm. No. 23,793; Oct. 15, 1897.

The patentee claims that experiments he has made prove that, if carbide of calcium be covered or impregnated with a matter indissoluble, or hardly dissolvable in water—for instance, oil or turpentine, or similar matters or mixtures of them—the carbide can afterwards be placed in water for a long time without decomposition taking place. The carbide can again be made sensitive to the influence of water, either by heating it or by treating it with such matters as partly at least have a solvent influence on the matter used for the impregnating of the carbide—such as sodium lye, a solution of boric acid, or the like, or by mixing the water to be used for developing the gas with matters like these. For instance, carbide saturated with oil and insensitive to water is decomposed by a solution of boric acid or sodium lye, or by a solution of soda or similar material.

**Coin-Freed Meters.**—Simpson, S., of Exeter. No. 24,829; Oct. 26, 1897.

This invention relates to coin-freed mechanism of the type in which a measuring wheel, disc, or shaft is rotated in one direction by an operating handle, so as to turn on the supply and set the meter in operation, and in the opposite direction by the ordinary registering mechanism of the meter, so as to cut off the supply when the quantity of gas prepaid has been consumed—the operating handle being normally locked, so as to prevent it from turning until released by the insertion of a coin, or by the action of a coin in a coin-holder. It comprises improvements whereby the operating handle



is positively and securely locked until the insertion of a coin, the fraudulent operation of the mechanism effectually prevented, and the quantity of gas supplied in exchange for the coin accurately adjusted.

The improvements are particularly applicable to coin-freed mechanism such as that described last week (p. 1035) in patent No. 22,830, in which a coin-holder is employed having the coin-slot parallel to its axis, and in which the usual measuring disc or wheel is replaced by a longitudinally moveable measuring shaft, as shown in the plan given of a dry gas-meter (with the top cover removed).



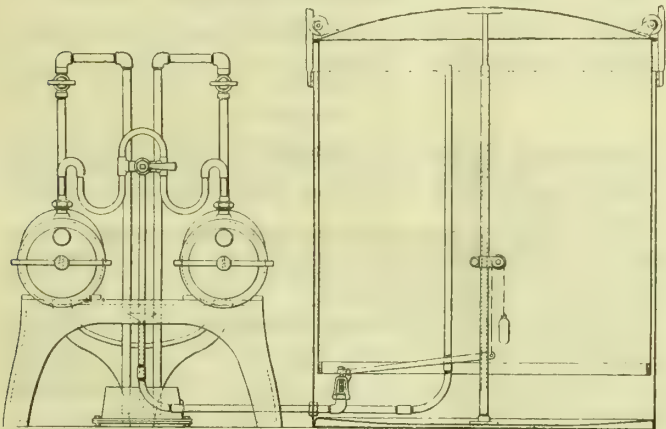
### Coin-Prepayment Apparatus for Supplying Water.—Barr, J., of Kilmarnock. No. 25,064; Oct. 29, 1897.

This apparatus comprises (according to one modification) a tap or supply valve which, when opened, closes automatically whenever the quantity has passed for which the parts are proportioned and adjusted. The valve-piece which closes with the pressure up against a seat is loose on a spindle which is depressed to open the valve; and it is formed with a piston working in a cylindrical chamber in the valve box. Below the valve-piston is a separate piston, also loose on the spindle; and between the two pistons there is a helical spring tending to keep them apart. On the lower end of the spindle is fixed a small valve arranged to close up against the opening in the lower piston through which the spindle passes, and which opening, as well as that in the upper or valve spindle, is slightly larger than the spindle. A helical spring placed between the bottom valve and the bottom of the valve-box raises the spindle after having been depressed. When the valve-spindle is depressed, water from under the bottom piston passes up round the spindle to the outlet; whereupon the pressure depresses the valve piston and opens the outlet-port. But the valve-piston immediately begins to rise again through the action of the spring between the two pistons and of the pressure water getting between them past the piston, which does not fit tightly.

The valve-spindle is acted on by a lever, the handle end of which projects through an opening in the external casing of the apparatus. This lever is made with a crank arm, which acts on a small bar fitted to slide in a guide, along which it is moved on the lever being depressed to open the valve. This motion is, however, prevented unless a coin has been placed in a slot provided for it; the movement of the lever being obstructed by a stop formed on a sliding-piece, which is made with a holding part to temporarily retain a coin, and with an opening smaller than the coin. When no coin is in the holding part, the bar passes through without action; but when a coin is there, the bar acting on it moves the sliding-piece, and so removes the stop and allows the lever to be fully depressed. The sliding-piece, in moving as described, carries the coin over a slot, through which it drops into a receptacle. Counting mechanism is arranged to be acted on by the sliding-piece, so as to record the number of times supplies of water have been taken.

### Manufacturing Acetylene.—The Acetylene Light Syndicate, Limited, and Gore, J., of Trowbridge. No. 25,952; Nov. 8, 1897.

This apparatus for the manufacture of acetylene is of the class in which two generators, designed to be successively brought into operation, are provided with means whereby after the contents of one generator have been exhausted, the water will be caused to automatically enter the other generator. In apparatus of this kind, as heretofore constructed, a series of cocks has been provided for shutting off the water and gas from the exhausted generator, so as to permit of emptying and re-charging them; and the object of the present invention is to dispense with the use of cocks and to provide "improved means for controlling the supply of water to the generator in operation."



As shown in the engraving, the patentees arrange in the water-supply pipe a single cock, which serves to direct the water into one generator or the other as desired. This distributing-cock has preferably a hollow plug, through which the water enters, and a single opening at the side, through which the water leaves. The pipe between the distributing-cock and each generator is formed with a dip or bend for containing water, which prevents gas from the generator entering the water-supply pipe, or passing from one generator to the other. A bye-pass around the distributing-cock connects the water-supply pipe of the two generators, so that when one generator is full water can flow into the other generator.

In order that the supply of water to the generator and the consequent generation of gas may approximately correspond with the demand, a sliding holder is arranged in conjunction with the generator; and a valve which controls the water supply is operated by the holder when it falls to a certain level. In practice, it is found advantageous to operate the valve through the medium of a rod which extends up to the centre of the crown of the holder; the lever and other parts of the valve being counterbalanced, so that the amount of work which the holder has to perform in operating the water-supply valve is reduced to a minimum.

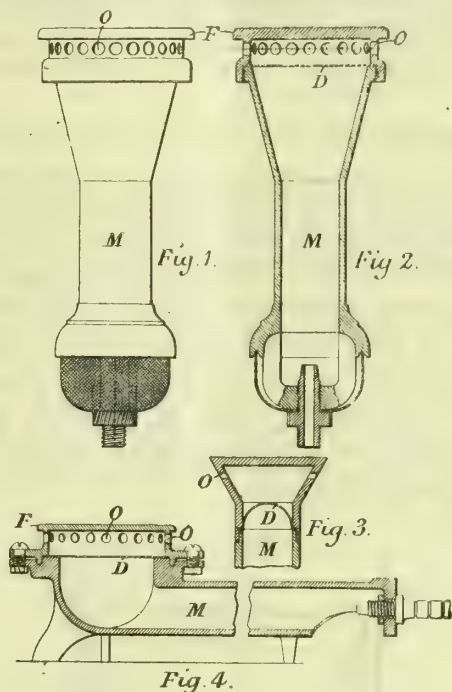
The pipes through which the gas from the generator flows to the holder are not continuous—a water-trap being arranged into which dip the gas-discharge pipes upon the generators.

### Atmospheric Gas-Burners.—Fletcher, T., and Fletcher, Russell, and Co., Limited, of Warrington. No. 26,834; Nov. 17, 1897.

The claim made for this arrangement of burner is that it will, "when in use, be incapable of lighting-back, shall give complete combustion of the gas, and at the same time be incapable of becoming choked."

The burner-outlets, at which the mixed gas and air are ignited, are of

equal size, and formed in a vertical inclined or protected face or surface; and each outlet, if not protected by the form of the burner from matters falling vertically upon it, is provided with such protection in cases where the outlets are likely to become obstructed by such matters. Between the outlets and the pipe leading the mixture to the burner (the mixing-tube) is a diaphragm or partition of metallic gauze, with perforations in it not exceeding about one-sixteenth of an inch across. "The size of the holes in the burner is such that the sum of the areas of the outlets is equal to the sum of the areas of the perforations or passages in the diaphragm or partition, and each sum should separately equal the cross sectional area of the mixing-tube." A burner constructed according to these improvements is said to produce "a brisk, vigorous flame with the maximum power, whereas hitherto when a perforated or metallic gauze diaphragm or partition has been employed in the body of the burner, the flame has been generally dull and sluggish, and there has been a loss of efficiency and a liability to burn on the surface of the gauze, when the flame is turned low."



Different forms of the burner are shown. O indicates the burner-outlets; D, the perforated or metallic gauze partition; and M, the mixing-tube of the burner. In figs. 1, 2, and 4 there is a flange F above the outlets, to protect them from dripping matter. In the form shown in fig. 3, the projecting upper part substitutes the flange F. In fig. 3 (where the partition D has to be fixed in a position where the openings through it, if flat, could not possibly have a total area equal to that of the mixing-tube M on the one hand, and to the total areas of the outlets on the other hand), it is more or less dome-shaped, or arranged in a sloping position, so as to obtain the necessary area. In fig. 4, the diaphragm, being much larger than the mixing-tube, may be advantageously constructed of perforated sheet metal, having holes to the required number and size formed in it.

### Igniting Gas by Its Own Action.—Thompson, W. P.; a communication from H. Schimmel, of Charlottenberg, near Berlin. No. 28,110; Nov. 29, 1897.

This invention has reference to self-igniters for gas which, by their own action, grow hot when a stream of gas passes over them, and which render a fine platinum wire incandescent so that it lights the gas. In employing this kind of self-igniter, it sometimes occurs that the igniting wire is not heated enough by the self-heating body, so that it might light the gas. The invention takes advantage of the well-known fact that platinum and other substances used for preparing self-igniters grow hot by their own action, even in a stream of gas of a very low temperature, when they are in a very finely-divided form—named platinum black or "platinum mohr;" while platinum of a less finely-divided form (platinum sponge) heats itself only in a stream of warmed gas, or when the platinum sponge is itself warmed. The patentee points out that platinum black must be produced in the pores of a porous material (as shown by Duke in his patent No. 969 of 1895), in order to prevent it coalescing to platinum sponge, and thus becoming unfit for lighting gas. This, he says, is the reason why it is impossible to connect the igniting body with the igniting wire so intimately that the heat of the igniting body is transmitted in every case in such a degree that the gas is ignited. On the other hand, there is no difficulty in producing platinum sponge on the igniting wires so that an intimate connection with them exists.

The object of the present invention is to provide the igniting wires near the igniting body with a small knob, or several small knobs, or a thin layer of platinum sponge—called "an igniting body of the second order." When employing igniting wires of this kind, the process of ignition will proceed in the following manner:—

First, the igniting body containing platinum black will grow hot when a stream of gas passes over it. The heat of the igniting body of the first order will then be partially transmitted to the igniting wire; and though perhaps sometimes not sufficient to render it incandescent, it will in every case warm the wire to such a degree that the small knobs of platinum sponge grow hot by their own action in the stream of gas. The warming of the "igniting bodies of the second order," which are directly fixed to the igniting wires, will not fail to warm the igniting wires to such a degree that they become incandescent and light the gas. The lighting of the gas would also take place if the igniting wires did not



become incandescent; for platinum sponge "possesses by itself the property to light a stream of gas when it is somewhat warmed, and thus rendered capable to grow hot by its own action."

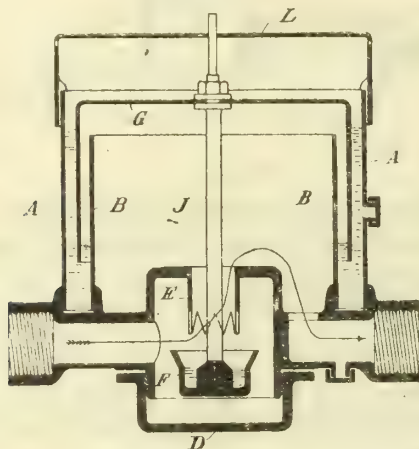
This method of preparing the igniting wires of self-igniters renders it possible to make them out of any other refractory material, instead of out of platinum—for example, out of asbestos. In this case, the wires or refractory threads connected with the igniting bodies of the first order are not igniting wires, but only serve for holding the igniting bodies of the second order, which in this case have their heat transmitted to them by radiation from the igniting body of the first order.

In practice, the Duke igniter above referred to (consisting of an igniting body containing platinum black connected by a simple wire of platinum) would be treated with a solution of a salt of platinum, or of another metal of the platinum group—say, chloride of platinum—in such a manner that a drop or two adheres to the wire near the igniting body. This being done, the solution adhering to the igniting wire would be evaporated, and the remaining salt of platinum reduced to platinum. When employing chloride of platinum, it is sufficient to heat the igniting wire. For this purpose, it is advantageous to bring the igniter in a stream of gas so that it heats itself by its own action. Then the fluid evaporates; and the chloride of platinum is reduced to platinum only by the action of the heat.

**Gas-Regulating Device.**—Sondermann, E., of Dresden. No. 13,984; June 23, 1898.

The centre part of the gas-conduit shown in the engraving is enlarged; and the bottom of this part is normally closed by a gas-tight cap D. In its upper portion is sunk a short pipe E, having its under end serrated. Affixed to the conduit are two shells, A B, in such way that a water-tight vessel is formed by the space between, which is filled with a fluid, such as glycerine. G is a bell which is telescoped into the space between the shells, and to which is attached a rod J having its under end threaded. This under end passes through the centre of the short pipe E, and has attached to it a dish F (containing mercury), which is lifted by each upward movement of the bell G and rod J, and in the same ratio.

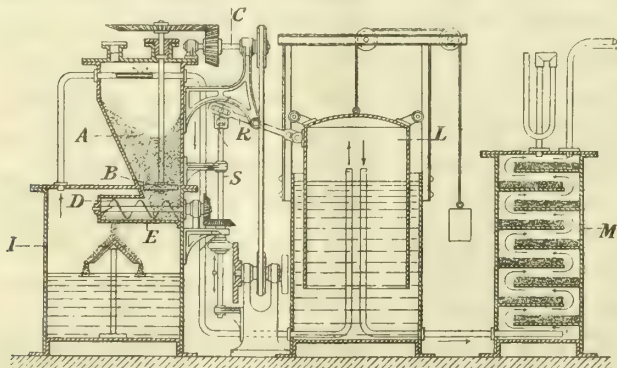
Assuming the bell G, the cap D, and the dish F, not to have been yet fitted, the first thing is to put the bell into position by telescoping it between the shells A B. The end of the rod J will then project beyond the under serrated end of the short pipe E, so that the dish F can be screwed on. The cap D is then attached, and the apparatus is ready for work when covered by a hood L.



In previous devices of this description, says the patentee, the valve is formed by the contact of mechanical parts, while in his invention the agent for regulating the current or pressure is a fluid. "With a fluid there is no friction; and the serrated end of the short tube E enables the regulation to be effected to the finest possible degree."

**Generating Acetylene.**—Bollé, C.; a communication from P. Dreske, of Berlin. No. 11,964; May 26, 1898.

This is an apparatus for generating acetylene by dropping calcic carbide into water; the arrangement for doing this being driven from an independent continually rotating motor in combination with mechanism operated by the rise and fall of a gasholder, and so arranged that the rotation of the carbide-delivering mechanism is stopped and started, or its speed reduced or increased, by the rise and fall of the holder, without stopping the motor or altering its speed.



The carbide (suitably crushed or granulated) is filled into a conical hopper A, the bottom of which is closed by a perforated disc B, which supports most of the weight of the carbide, and is fixed to a vertical shaft passing through the cover of the hopper, and rotated from a laterally arranged shaft C through bevel wheels. As the disc is revolved, the

carbide resting on it drops through the perforations on to a worm-conveyor D (enclosed in a trough E), the shaft of which is rotated from a shaft driven by a motor not represented on the drawing. The shaft C is rotated by belt pulleys and a belt, or in any other convenient manner.

As the conveyor is rotated, the carbide falls on a "roof-shaped" distributor, off which it slides into the water contained in the generating vessel I, and is decomposed. The acetylene produced flows into the gas-holder L, which is balanced in the usual way so that the gas is pressed into the purifier M, and passes from this into the distributing-pipes under any pressure required.

In the position of the holder shown on the drawing, the maximum production of acetylene is supposed to be lit; the worm D being rotated at such a speed that it delivers the quantity of carbide required for generating the volume of gas consumed. When more gas is produced than is required, the bell L and the end of the lever R connected to it rise; and in consequence the other limb of the lever connected to the shaft S pushes the latter downwards. As the shaft slides in a bevel-wheel, the driving of the latter by the shaft is not interrupted thereby; but a friction pulley is brought nearer to the centre of a face-plate, so that the speed of the shaft, bevel-wheels, and worm D is reduced. The quantity of carbide delivered into the water in the unit of time is thereby reduced; and in consequence the holder will remain in the position in which the rotary speed of the conveyor D and the quantity of carbide delivered into the water exactly corresponds to the consumption of the gas required. If the quantity of carbide supplied is too great and the gas-bell L rises again, the friction pulley is further shifted towards the centre of the face-plate, and the speed of the conveyor further reduced.

#### APPLICATIONS FOR LETTERS PATENT.

- 22,818.—HOOKER, G. S., "Gas-engines." Oct. 31.
- 22,826.—BAILEY, J. W., and CLAPHAM, J., "Generating acetylene." Oct. 31.
- 22,839.—BRÜNLER, O., "Improvements in burners." Oct. 31.
- 22,890.—HENRY, F. M., "Gas-lamps for incandescent lighting, and burners therefor." Oct. 31.
- 22,901.—MARTINI, A., "Automatic gas-igniting apparatus." Oct. 31.
- 22,920.—HINDLE, N., "Gas-burners." Nov. 1.
- 22,922.—SMITH, J. E., "Generation and storage of acetylene gas." Nov. 1.
- 22,945.—EAMES, F. W., and SPEIGHT, W. T., "Oil or gas engine." Nov. 1.
- 22,982.—ACRES, B., "Apparatus for temporarily increasing the pressure of illuminating gas." Nov. 1.
- 23,001.—GOODSON, J., "Draught screen for gas-burners." Nov. 1.
- 23,003.—BAURWERAERTS, E., "Incandescent gas-burners." Nov. 1.
- 23,008.—MORRIS, L., "Generators and lamps for acetylene." Nov. 2.
- 23,037.—PRESTON, C. W., "Gas economizer." Nov. 2.
- 23,169.—MOSS, R. J., and TIMMINS, S. A., "Acetylene gas-lamps." Nov. 4.
- 23,230.—GILMER, G. A., "Generating acetylene gas." Nov. 4.
- 23,255.—BORMANN, J. G. L., "Gas-producers." Nov. 4.
- 23,287.—PATTERSON, W. E., "Generators for acetylene gas." Nov. 5.
- 23,308.—LEVETUS, E. L., "Acetylene generators." Nov. 5.
- 23,316.—GAEBERT, C. F., "Adjusting-taps for gas-burners." Nov. 5.

**Water Supply Damaged by a Landslip.**—At the mountain village of Hartley, near Kirkby Stephen, a serious landslip occurred last Thursday, choking up the stream from which the water supply for the village was drawn.

**The Gainsborough District Council and the Gas-Works.**—At the meeting of the Gainsborough District Council on Monday last week, they went into Committee to consider whether the time had not arrived for taking steps to purchase the gas-works.

**Additional Capital for the York Gas Company.**—At an extraordinary meeting of the York Gas Company held last Thursday, authority was given for the raising of £20,000, in £10 shares, carrying a maximum dividend of 4 per cent. per annum; being part of the £80,000 additional share capital sanctioned by the Act of last session.

**The Public Lighting of Halesowen.**—The Gas Committee of the Halesowen District Council yesterday week passed a resolution agreeing to accept the offer of the Gas Company to light the ordinary gas-lamps during the present season for £3 each, and next season for £2 15s., and £8 for each double incandescent lamp. This definitely settles the long-pending dispute.

**The Gas, Electric Lighting, and Water Undertakings of the Wallasey District Council.**—A statement of the receipts and expenditure of the Wallasey Urban District Council for the year ended the 31st of March last has just been issued by Mr. J. J. Burnley, the Accountant to the Council. On the gas lighting account, the income was £41,855, with an expenditure of £36,852; there being thus a credit balance of £5003. The income on the electric lighting account was £2141, and the expenditure £1402; leaving a credit balance of £739. The water-works accounts showed an income of £17,275, and an expenditure of £14,003; so that there was a credit balance of £3272.

**The Derwent Water Schemes.**—At the meeting of the Chapel-en-le-Frith District Council yesterday week, some further light was thrown upon the proceedings of the Provisional Committee of the Derbyshire District Councils on the proposed Derwent water schemes. The Clerk (Mr. Boycott) reported that the Committee had interviewed the Clerk to the Derbyshire County Council, and also the Town Clerk of Leicester; and after fully discussing the various schemes for utilizing the water from the Rivers Derwent and Ashop, the Committee unanimously came to the conclusion that, owing to the enormous cost involved, and for other reasons, a comprehensive scheme promoted jointly by the Corporations of Derby and Leicester would be far preferable to a separate scheme for one of the Authorities concerned. According to Mr. Boycott, the Town Clerk of Leicester had, in the course of conversation, stated that his Corporation were quite willing to co-operate with Derby in promoting a joint scheme, and for the various District Councils to be provided for in that scheme.



## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

## The Benevolent Fund of The Gas Institute.

SIR,—The value of this fund has become very apparent during the past two or three weeks. I desire to urge that it be utilized by giving such relief as the circumstances call for.

The policy of the Committee of the fund is, in my opinion, open to much objection. Their aim seems to be to accumulate money, and invest it, until the interest arising therefrom amounts to such a sum as will meet all claims for assistance. A year or two ago the Committee were appealing for more subscriptions, "to enable them to deal adequately with the cases brought under their notice;" while at the same time they were seeking an investment for £230 they had by them. We may imagine them listening to the tales of woe with their eyes full of sympathetic tears, but keeping their hands tightly closed on the two hundred sovereigns they had for investment. Why should such a fund be accumulated? The Committee have no legal liabilities to meet. It is not like a life assurance society; there are no policies to fall in. If there is a surplus one year, it should be carried to the next, and work in the same way as a gasholder does, taking up the surplus at one period to give it out when larger demands arise. The investments in the eyes of the Committee are sacred, and must not be touched. True charity would not, however, hesitate to use any of the funds, whether invested or not, should pressing circumstances call for it. The money is subscribed to be distributed at once to any in need of relief. There is no necessity to provide for posterity; that would be to deprive our successors of their privileges. Those who follow us will be quite as able, and quite as willing, to help the unfortunate as we are now.

The formation of a large fund is calculated to give growth to evils. The fact of there being such a fund will be regarded by some thriftless ones as doing away with any necessity on their part to make provision for those dependent upon them. Also the knowledge of its existence will be apt to beget attempts on the part of the designing and crafty to obtain some of it for their own use. It is an inducement to imposition.

The love of money is said to be the root of all evil. Stagnant money has a corrupting influence. As much as will meet the necessities of the time, is all that is desirable with this fund. Many donors in times past have left money for the good of mankind, which has in the course of years festered, and bred evil.

I may point to the fact that, though The Gas Institute numbers some 700 members, there are less than 90 subscribers to the Benevolent Fund—plainly showing that the policy of the Committee does not meet with the approval of the general body.

Nov. 12, 1898.

"TOBIAS CANTS."

## Developments in the Commercial Uses of Gas as a Fuel.

SIR,—My attention was attracted by a paragraph under the above heading in your issue for the 1st inst., having special reference to the use of gas in cloth-singeing machines. I do not know whether my experience in this matter is similar to that of others, but I must confess it has been rather disappointing. One of our consumers had one of these machines fitted up about a year ago. It has a full width of 8 feet, with six rows of bunsen burners controlled by separate stopcocks, so that it can be adjusted to any width of cloth. It required a supply to give not less than 1800 cubic feet per hour during the day; and I was told it would be worth half-a-dozen gas-engines. Of course, those visions suggested in your paragraph—1800 cubic feet per hour, 10 hours per day, and 313 days per annum—loomed up before me, and made me set about the work of laying a 3-inch main and fixing a 300-light meter with all enthusiasm. But alas for my bright hopes! This machine singes all the finer cloths—about half the total production of two factories employing 800 looms; but the speed referred to in the paragraph is so much greater than that of manufacture, that a few hours now and again suffice for the whole work. The consumption for the first ten months' working has only been 100,000, not 4,000,000 cubic feet.

Of course, an extra 120,000 cubic feet per annum is not to be despised in a small town; and gas managers should try, by all means, to get their staple product into every available field. But if anyone should indulge very sanguine hopes from the introduction of such machines as those in question, I fear he will be doomed to disappointment.

J. WHIMSTER.

Armagh, Nov. 8, 1898.

## Tramway Traction.

SIR,—As a member of the Birmingham deputation who visited the Continent on the subject of tramways, and also a member of the Sub-Committee of inquiry appointed by the Public Works Committee of this city, I have read your special article and Mr. Hersey's letter, with a great deal of interest. I have also read Mr. J. Allen Baker's report to the London County Council.

I think there has been a misconception of the views of my colleagues and myself in relation to the adaptability of gas for tramway traction. Although we looked upon the Blackpool installation, in its then form, as scarcely suitable for such a city as Birmingham, we felt that the principle was capable of very great improvement and development. We shall continue to watch the progress of the system with considerable interest; for if a self-contained motor tramcar is ultimately forthcoming, which will be efficient, economical, and unobjectionable in its working, there are most important reasons why the question of its adoption should receive favourable consideration from all municipal authorities.

HOWARD LANE.

Birmingham, Nov. 7, 1898.

SIR,—I have much pleasure in supporting the opinions of the authors of the letters in your last two issues with regard to the adaptability and efficiency of gas-motors for tramway purposes.

The Neath Corporation lately purchased the horse tramways from a Company who had been in existence for many years, but had allowed everything to go to rack and ruin. The question then arose as to which was the best system to adopt. Of course, the universal shout was elec-

tricity, but the Borough Engineer and myself were instructed to furnish a joint report. After making an exhaustive inquiry, we came to the conclusion that gas-motor cars (though the Borough Engineer was very much in love with electricity) were the most suitable for us, both as regards efficiency and cheapness, over all other systems—taking the cost of gas at 3s. 2d. per 1000 cubic feet, which is our charge to consumers.

In company with our Committee, we visited Blackpool, and inspected the system there; and after due consideration, they unanimously went in for gas, especially taking into consideration the fact that the Corporation own the gas undertaking. The cost of the installation was in our case much lower and simpler than in others. Gas-motors will improve the same as other motors. Our cars are fitted with double cylinders, which will reduce the vibration to a minimum.

In conclusion, I can only add that I have every confidence in the gas-motor system; and my only object in troubling you with this letter is to "back up" the gas profession, and show the electricians that we can tackle them in all quarters. The cars will be running in this town in February, when I shall be pleased to give anyone practical details.

Neath, Nov. 11, 1898.

ROBERT ALEX. BROWNING.

## The Coal and Coke Problem.

SIR,—The dealing with, or handling of, material in gas-works, more especially in the form of coal and coke, I need hardly state to readers of the "JOURNAL" is one of the most important problems of the day, as affecting the economical production of coal gas. This arises from the well-known fact that the material, from the time of the delivery of the coal on the works, is handled three, four, or even six times—according to the description of plant used and the size of the works—before the coke leaves in buyers' carts; and the handling of 200 tons of coal is, in effect, the dealing with 800 or 1000 tons.

The inclined system of retorts, with coal-elevating machinery, appears to have solved the question, where it is in successful operation, up to a certain point. For once elevated, the coal gravitates into the retort (with occasional eccentric variations, no doubt duly appreciated by those in charge), and falls, as coke, from the retort. But so far I am not aware of the coke gravitating into carts, railway trucks, and barges, without a second handling by coke-elevators and conveyors. This second handling of coke is, to my mind, most undesirable, especially when the coke is of a soft description—a condition much appreciated for domestic use—and so does not require more breaking. For myself, I have no desire to see coke submitted to a process of clawing and hauling by machinery. There is enough breeze, without further scrunching up.

What is the remedy then? Simply this: Go up higher with the retort-house, elevate the coal an additional 10 or 12 feet, and abolish coke elevators, cellars, and subways below the yard level. It is, of course, a matter of opinion. It is far from my wish to dictate to others who know their conditions of working better than I do. The conditions at Barry are, however, most favourable to the scheme; one of the most important being that of a ready sale of coke for domestic use. Suitable hoppers for containing measured quantities of coke would be carried by girders, and would form the coke-floor. The matter is principally one of details; but the suggestion may prove of interest to others.

Barry, Glam., Nov. 11, 1898.

F. M. HARRIS.

## LEGAL INTELLIGENCE.

## HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, Nov. 9.

(Before Mr. Justice ROMER.)

## Hayes v. The New Incandescent Gas Company.

This was an action brought to enforce specific performance of an agreement by the defendant Company to sell to the plaintiff the De Mare English patents for gas-burners.

Mr. FLETCHER MOULTON, Q.C., Mr. LEVETT, Q.C., and Mr. WALTER appeared for the plaintiff; Mr. NEVILLE, Q.C., Mr. RUFUS ISAACS, Q.C., and Mr. G. F. HART represented the defendants.

Mr. MOULTON, in opening the case, stated that the plaintiff, Mr. Hayes, acting on behalf of Messrs. Kern and Robinson—two American gentlemen who had patents for gas-burners in connection with incandescent lighting—negotiated with defendants, to whom the De Mare patents for England had been assigned by the Liquidator of the De Mare Company in France, for the purchase of those patents. The reason for so doing was that when application was made in Germany for a patent for the Kern burner, the De Mare English patents were set up in opposition to it; and it was thought advisable therefore to purchase these patents, simply as a protection to their own. A Mr. Tiano was employed to negotiate the purchase, and several interviews took place between him and Mr. Duncan, the Manager of the defendant Company; and various letters passed, leading up to the two constituting the agreement—an offer on Nov. 29, 1897, and its acceptance, subject to certain points, which were agreed to on Dec. 3. In the course of the negotiations, defendants, by their Managing Director, insisted that they would not put themselves in the power of any rival Company, and that they must therefore have a licence to work the patents if they desired; and it was agreed that they should have an exclusive licence to work one claim, which was termed the "collodion process," and a free licence to use the other patent.

The learned Counsel was about to read the letters, when

Mr. NEVILLE said they were not admitted at present. They probably would be, later on; but he objected to their being read unless his friend said he would call Mr. Tiano.

Mr. MOULTON said the two letters on which the agreement was founded were admitted on the pleadings; but he would call Mr. Tiano. The letter of Nov. 29 was from Mr. Tiano to Mr. Duncan, and said that he was desired by his principal, Mr. Hayes, to accept defendants' offer and purchase from them the De Mare patents Nos. 10,497 and 10,606 of 1894, on the terms mentioned—viz., to purchase outright all rights in the above



named patents; and granting to the Sunlight Company a licence to use the above if they desired to do so for their own use. And it was agreed that the Sunlight Company should have exclusive use of the third claim in the patent No. 10,606 of 1894. Then it set out the wording of the claim, which related to the making of collodion threads; the purchase price to be £750 and £100 commission. He enclosed £100 as deposit, and undertook to prepare an assignment to be accepted on or before Dec. 21, at which date he undertook to pay the balance of the purchase-money. In answer, Mr. Duncan, writing from Paris, said he had forwarded it to London with a recommendation that it be accepted formally by the Secretary. The formal answer came on the 3rd of December. It enclosed a letter from Messrs. Michael Abrahams and Sons, relating to the title to the patent, which it was suggested introduced a new term, but which, he submitted, involved no new term at all; and even if it did, the parties showed by their action that they accepted it. Plaintiffs' Solicitors then prepared a draft assignment, which was sent to the defendants; who made some amendments and returned it. The draft, as amended, was engrossed in duplicate, and executed by the plaintiff, and he believed was sealed by the defendant Company; but they refused to carry it out, and hence the present action. The defence was that there had been misrepresentation; but this he must leave his friend to make out. Messrs. Kern and Robinson had now sold the Kern patent to the Welsbach Company, who naturally did not want any patent which might interfere with it to be in the hands of a rival Company. It was not that the Welsbach Company wished to work the De Mare patents, or that there was any obligation on Kern and Robinson to enable them to do so.

Mr. W. M. Robinson, of Paris, said he was associated with Mr. Ottmar Kern in the Kern burner patents. In the year 1897, he was negotiating the sale of the patents to Mr. Julius Moeller, whom he at first supposed to be a private gentleman in London, but afterwards ascertained that he was the General Manager of the Welsbach Incandescent Company. He gave him an option on the patents. At the beginning of the negotiation, he knew nothing of the De Mare patents; but finding they were set up in opposition to the granting of the German patent, Mr. Kern suggested that the patents should be purchased, and he applied to Mr. Moeller for advice on the matter. Mr. Moeller suggested employing Colonel Hayes; and he told him to let Hayes go ahead and secure the patents. He was supposed to own all the Continental De Mare patents, and had a transfer of the French patent. Mr. Kern and he still held the Kern patents for other countries except England.

In cross-examination, witness said he gave Mr. Moeller the option on the Kern patents in May, 1897. His option was exercised in March, 1898. He arranged to buy the De Mare patents for the protection of the Kern patents. He left the matter entirely in Mr. Moeller's hands; and he did not know how Mr. Tiano came into it. He did not find the £100 which was sent to Mr. Duncan as deposit, but had paid it since. An account was sent by Mr. Moeller to Mr. Kern, who told witness to pay it. This account included the £100. That occurred after the issue of the writ in this action. He first heard about the action last spring, and was finding the money for it; but he had not paid anything yet. It was understood that he would find the money.

Mr. John Bransbury, Managing Clerk to Messrs. Saxelby, plaintiffs' Solicitors, said they were instructed in the matter on Dec. 4 last. He prepared the assignment, which was sent to the defendants for approval, returned with alterations, and engrossed in duplicate as amended. It was executed by the plaintiff; and he left it with defendants' Solicitors for execution on Dec. 16. He subsequently tendered £750, the balance of the purchase-money, which was refused.

Cross-examined: He saw Colonel Hayes several times. He did not know he was acting for Mr. Moeller, or that there was anyone behind him. He was a retired Surgeon-Colonel in the English Army.

Mr. LEVETT said this was the plaintiff's case.

Mr. NEVILLE claimed to have Mr. Tiano put in the box.

After some discussion, this was done; but no question was asked by plaintiff's Counsel.

In cross-examination by Mr. NEVILLE, witness said he was originally interested in the Company who fought the De Mare patent action, when it was held to be an infringement of the Welsbach patents. Mr. Frederick Williams, a Director of the Welsbach Company, came to him and asked him to secure the English De Mare patents. He considered that he was acting for Colonel Hayes and two Americans. Their names were not mentioned in the first instance. He ascertained them about November, 1897, after he had been in communication with Mr. Duncan. Mr. Williams told him that they wanted to buy a lot of gas patents to launch a company in the United States. Witness drew this conclusion from what Mr. Williams said. He never stated that the De Mare patents were wanted to protect the Kern patents. Witness did not hear anything of these patents until long afterwards. He first saw Mr. Duncan on Nov. 10, 1897; and on the next day he said his Board would no doubt be inclined to sell the De Mare patents, subject to retaining the collodion process, if they were satisfied they were not going to be used by a rival Company. He did not think the De Mare patents were worth anything, because they lost the case in England, and soon after went into liquidation in France. He said the purchaser would be willing to leave the vendors the collodion process; that was in accordance with his instructions. Mr. Duncan said they could not run the risk of having a competitor outbidding them with their own tools. Witness's answer was that the patents were worth nothing, and that he was buying for an American gentleman who was getting together all the patents he could, and he thought it was for the purpose of launching a company. The representations he made were quite sincere, as he did not believe anyone could work the De Mare patents in England. He did not remember saying on Nov. 22 that he knew for certain that an American company was being formed. He said he thought the purchaser would lose his money, the same as he had, both in England and France. He did not remember Mr. Duncan asking him if he was sure there was nothing behind. He paid the £100 deposit on instructions of Mr. Williams, acting for Colonel Hayes. He drew his own cheque for the £100; but he received a cheque on the same day from Mr. Williams for £250. He thought, but was not sure, that it was a cheque drawn by Colonel Hayes.

Mr. NEVILLE then addressed the Court on behalf of the defendants, and submitted, on the authority of several cases, that specific performance ought not to be decreed where the vendor had been deceived as to the identity of the purchaser, and when his interests would be adversely

affected by the property passing into the hands of the concealed principal. It was evident these patents were being acquired in the interests of the Welsbach Company; and if Mr. Duncan and his Company had known that, they would not have entertained the proposition for a moment.

Mr. J. H. H. Duncan, Chairman of the defendant Company, said he first met Mr. Tiano in connection with the litigation between the Welsbach and the De Mare Companies; his own Company having also been in litigation with the Welsbach Company at the same time. On Nov. 10, 1897, Mr. Tiano came to him and said he had sold the Continental De Mare patents, and he thought he could find him a purchaser for the English patents. He asked what interest anyone could have in buying them. His Company had bought them for a special purpose—to be enabled to use one particular claim. Tiano said this right would be reserved to them. He told him repeatedly, at that and other interviews, that he could on no account enter into negotiations which would mean these patents being used in competition with them. He had no idea they were being bought on behalf of the Welsbach Company. Tiano gave him the most distinct assurances that the patents would not be used in opposition to his Company, and that they were being bought by an American who was getting together a lot of patents, and going to form a big company.

The case was then adjourned; and the Court has not since sat, on account of the indisposition of Mr. Justice Romer.

## HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Monday, Nov. 7.

(Before Justices RIDLEY and PHILLIMORE.)

Mayor and Corporation of Liverpool v. Assessment Committee of the Llanfyllin Union and Overseers of the Parish of Llanwddyn.

This was a case stated by the Court of Quarter Sessions of the County of Montgomery in relation to the rating of the water undertaking of the Liverpool Corporation. The Court had delivered judgment on July 8 (*ante*, p. 160) in favour of the appellants, but had not entered into the figures. It was expected that the parties would be able to agree on the figures; but this had not been done, and it was necessary to apply to the Court.

Mr. HONORATUS LLOYD (Mr. BALFOUR BROWNE, Q.C., with him) represented the appellants; Mr. F. MARSHALL, Q.C., and Mr. ELLIS J. GRIFFITH, M.P., appeared for the respondents.

Mr. LLOYD said the respondents, the rating authority, desired now to put the rateable value of Lake Vyrnwy lower because part of it was not situate within the parish of Llanwddyn. This was an entirely new point; and in his view the Justices at Quarter Session had treated the whole lake as being in the parish, because the dam was wholly within it. The real object of the respondents in their contention apparently was that they might win on the appeal in the other parish, where the rest of the lake was situate.

Mr. MARSHALL contested this, and urged that a proportion of the whole value of the property should be allotted to each parish according to the acreage within such parish.

The Court expressed the opinion that the point was necessarily implied in the decision of the Court, and that it was not, therefore, a new question raised at the last moment. It was clearly right that the rate should be levied in respect of the property really situated in the parish. The result would be that there would be a deduction in value for the part of the lake situate outside the parish of Llanwddyn. The gross value was therefore £12,037, and the rateable value £9630.

## The Winding Up of the Ystrad Gas and Water Company.

It may be remembered that, under the terms of the award of the Umpire (Sir F. Bramwell) in the Ystrad arbitration, the sum of £231,364 was to be paid by the Ystradfyodwg District Council for the Gas and Water Company's undertaking. The Act giving the Council the necessary power to purchase contained directions as to the application of the purchase-money. In the first place, all mortgages were to be paid off with interest; then the debts and liabilities of the Company were to be discharged; and the residue was to be divided rateably among the stock and shareholders in proportion to their interests in the profits. A question arose on the last point as to whether the shareholders should first receive their capital in full, and then divide the remainder, or whether they should divide the whole surplus. The matter recently came before Mr. Justice North in the Chancery Division of the High Court of Justice; and his Lordship decided that the entire surplus should be divided.

## A Question of Liability.

In the Queen's Bench Division of the High Court of Justice last Tuesday, the case of *Knight v. Perry and Co.* came before the Lord Chief Justice and Mr. Justice Wills, sitting as a Divisional Court, by way of appeal from the decision of the County Court Judge at Bow. The plaintiff was in the employ of Messrs. Christie and Co., gas-fitters, and was sent by them to do some fitting in Farringdon Market. While working in the shop of a tenant named Hampton, his attention was called to an escape of gas, which was put right by another workman. Hampton then suggested that the cock should be turned off at the meter; and this the plaintiff did. He then held a candle above his head to see if it was turned off, and an explosion occurred, which resulted in injury. The plaintiff alleged negligence in respect that the defendants had left in the roof an unplugged pipe which caused an escape of gas into the chamber. The County Court Judge nonsuited the plaintiff; holding that there was no evidence of negligence to go to the Jury. The Court dismissed the appeal, with costs; the Lord Chief Justice saying that the plaintiff was not in the employment of Messrs. Perry and Co., and therefore did not come within the first section of the Employers' Liability Act, which provided for a right of action by an employee against his master, and that, in his opinion, there was no evidence of contributory negligence.



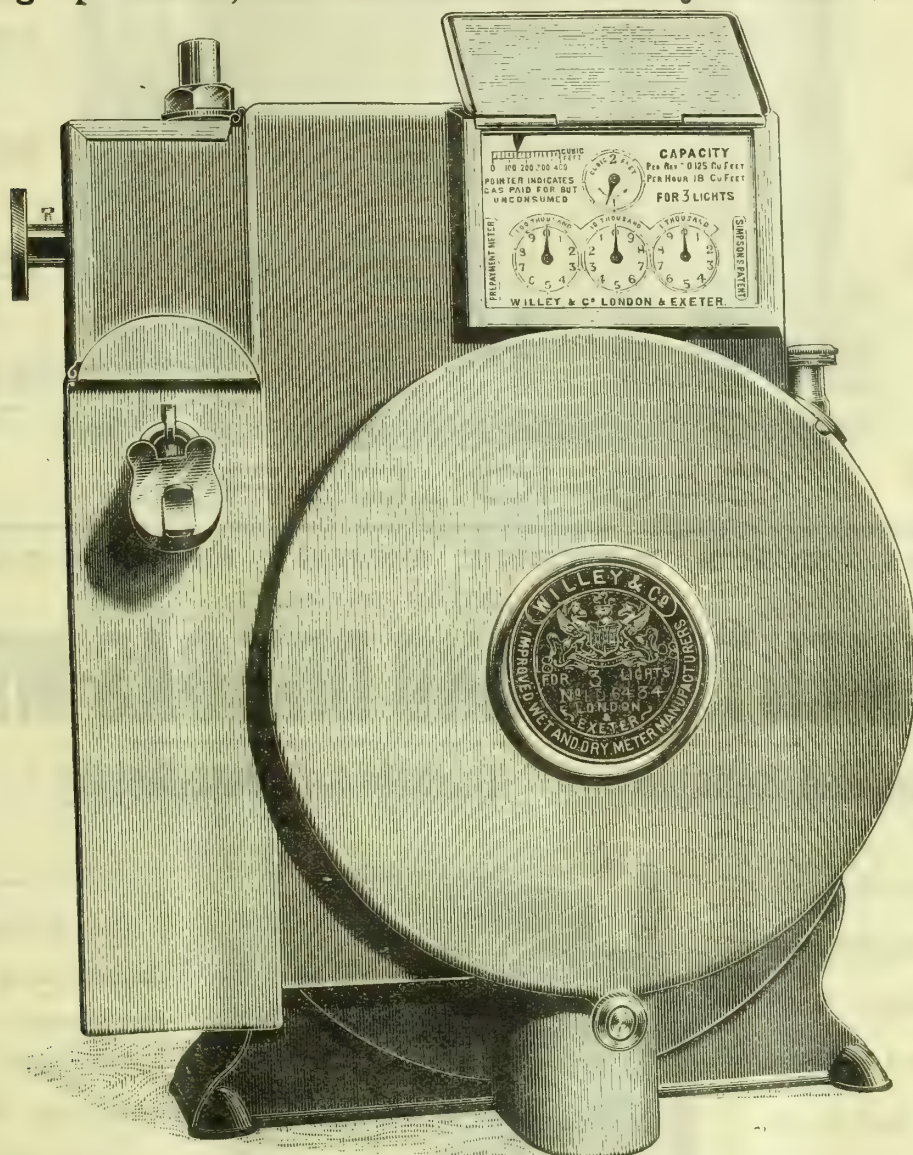
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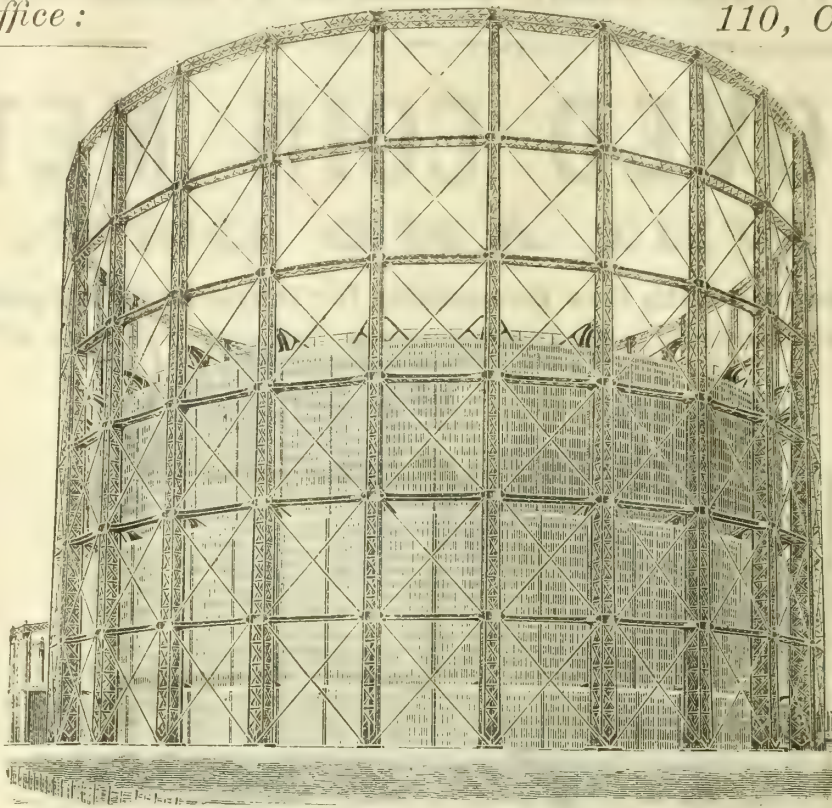
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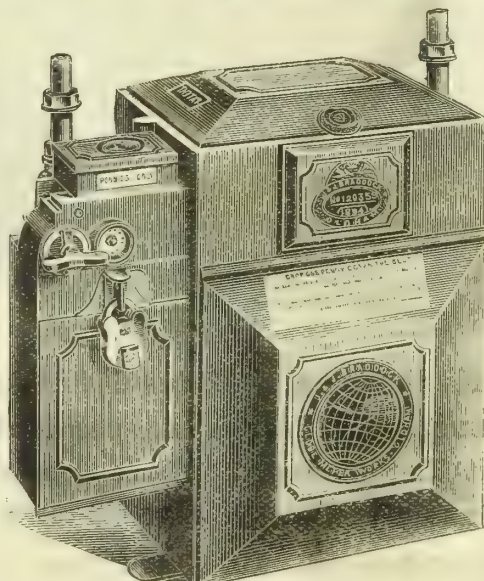
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## MISCELLANEOUS NEWS.

### FATAL GAS POISONING CASE AT PLYMOUTH.

An accident of a somewhat singular character occurred last Tuesday night at the Duke of Cornwall Hotel, Plymouth, and resulted in the death of a youth named George Lee, who was employed as a page boy, and the narrow escape of another employee, named John Brittain, from the same fate. About midnight, a kitchen porter named May was going to bed, when he found that gas was escaping from a bracket on the top landing of the hotel. He called the attention of George Finch, the night porter, to it. Finch struck a match and applied the light to the base of the bracket, with the result that a jet 4 or 5 inches long was lighted. This he put out, and plugged the hole with soap, tying a handkerchief round it, and then testing it again with a match. Everything was apparently safe; and Finch returned to his ordinary duties. At six o'clock in the morning, he went to call Lee and Brittain, who slept together in a room divided by a lath-and-plaster wall from the passage in which the bracket is situated; the bracket being secured to this wall. As there was no answer to his knocking, he burst open the door, and found both lying unconscious—Lee across the foot of the bed, and Brittain on the floor under the window. Medical assistance was called, and Brittain, after twenty minutes' unremitting attention, regained consciousness; but Lee was dead. Examination of the room showed that a considerable quantity of plaster had fallen from the wall immediately behind the place where the escape was discovered; and it was evident that there was an explosion—probably at the moment when the porter applied the match to the escaping gas. Another circumstance noticed was that the gas in the room was lit when Finch entered it at six o'clock in the morning.

The inquest on the body of Lee was held on Thursday by Mr. J. GRAVES, the Deputy-Coroner. The Gas Company were represented by Mr. ERIC WARD, Solicitor, Mr. J. THOMAS, the Secretary, and Mr. A. WHARTON, the Manager.

Finch and May were the principal witnesses as to the circumstances attending the escape, and the efforts to stop it, and both agreed that there was no report as of an explosion, and no noise of falling plaster, when the escaping gas was lighted. There was nothing to indicate that gas was escaping otherwise than into the passage. Finch added that he did not notice a smell of gas when he entered the bedroom at six o'clock. It was a large and lofty room, but there was no fireplace in it.

Mr. H. H. Parsloe, a surgeon, said the death of Lee was due to asphyxia the result of coal gas poisoning.

Brittain, who had regained consciousness, knew practically nothing about it, but thought he got up and lit the gas at five in the morning.

A JURYMEN remarked that it did not seem probable that the gas could have been burning without causing an explosion.

Mr. WHARTON said that would depend upon the extent of the leakage. There apparently was an explosion which blew the plaster off the wall; but it must have been very slight, as it did not blow out the window.

In answer to Mr. WARD, Mr. Parsloe said it was possible for there to be a sufficient quantity of gas in a room to asphyxiate a man without causing an explosion. A man might recover even after inhaling gas for forty hours.

A JURYMEN asked if there was anything in the character of the gas now supplied in Plymouth—a mixture of water gas and coal gas—which would be more fatal than ordinary gas.

Mr. Wharton was called to give evidence on this point. He said that the day supply of gas in Plymouth was a mixture of coal gas and water gas; the latter being present in the proportion of 30 per cent. Water gas was not manufactured or turned into the mains between 10 p.m. and 6 a.m. As the winter advanced, it would be supplied day and night; but at present the demand did not necessitate it, and as a matter of economical working they did not run the plant at night. Water gas contained 30 per cent. of carbon monoxide, a poisonous gas which entered into the composition of coal gas, but was present in larger quantity in water gas. He knew that there was an agitation against the use of water gas in the North of England; but he did not think it would come to anything.

The CORONER: But should it come to anything, is there any great danger to the public?

Witness: No.

By the JURY: An admixture of water gas and coal gas was more likely to prove fatal in case of an escape than coal gas alone; but there was no greater risk of explosion.

The CORONER: Is the danger of gas poisoning increased in proportion to the quantity of water gas—in this case 30 per cent.?

Witness: No; but I really have not studied the question. It would need to be gone into very carefully, and you would have to take into consideration the proportion of the mixture in the atmosphere.

A JURYMEN remarked that, as water gas was not being supplied at the time the deceased met with his death, these questions did not affect the present case.

The verdict was one of "Accidental death;" and the Jury, in a rider, acknowledged the efforts of the doctor to save the life of the deceased.

### THE FINANCIAL POSITION OF THE HINCKLEY GAS UNDERTAKING.

At a recent meeting of the Hinckley Urban District Council, a long discussion took place upon the position of the gas undertaking. The matter had been investigated by the Gas Committee; and a statement was submitted showing the financial condition of the Gas Department during the five years ending March 31 last. It was stated, however, that the accounts had been kept in such a way that it was impossible to get a correct presentment of capital and revenue, as no separate account had been kept of various items of expenditure. There appears to have been a loss of £278 in 1894, and of £1244 in 1895; but in 1896-7-8 the profit was put down at £416, £621, and £11. The total loss being £1522, deduction of the profit (£1048) made the loss £474 on the five years. At

the close of the year 1893 the balance of profit and loss account was £2337; at the present time it is £1863—showing £474 less than five years ago. The above figures were all taken from the ledger; but in 1894 the gas-rental account was shown £99 too much, and in 1895 £427 too much. This was corrected in the accounts for the year ending March 31 last. In conjunction with the foregoing statement, the Gas Committee issued another giving the sums placed to the sinking fund in the five years. They were: In 1894, £474; in 1895, £992; in 1896, £545; in 1897, £543; and in 1898, £559. The Committee said: "In the year ending March, 1895, the sum of £425 was written off as bad debts or allowance; and in the same year the gas-rents for the March quarter were entered at the gross amount, and no allowance was made for discounts. Had this item been correct in the years 1894 and 1895, the loss in these two years would have been shown £526 more, and the profit for the year 1898 would have been shown at £550. Since the works were purchased by the Council in 1881, the total profits are shown as £5742, and deducting losses amounting to £2079, leaves a balance of £3663 on profit and loss account, out of which £1800 was transferred to the district rate in 1884 and 1888."

The Chairman of the Committee (Mr. Abbott) said there was nothing left for him to explain. As most of the Council were aware, the sum of £1800 had been taken from the Gas Department by the old Local Board. Mr. Smith said they knew all about £1000; but where did the £800 go? Mr. Abbott did not reply; but on being pressed, he said he was not prepared to answer the question. Continuing, he said that, after deducting the £1800, there was a clear profit left amounting to £1863. This ought to have been a valuable help for them; but from the statement got out by Mr. Lee (the Manager) it would seem that while they were making a profit year by year, they appeared to get into a worse position at the bank. It seemed beyond his comprehension—he did not profess to have the cleverest head—but he thought that, with a clear profit of £1863, they ought to have been able to pay all accounts up to date. But this was not so. If they had been able to pay them as they fell due, they would have saved interest. Mr. Bott inquired whether the Manager was satisfied with the balance-sheet. The Chairman (Mr. G. Kinton) said he was, with the exception of one or two of the items. Mr. Bott asked what was the profit on last year's working. The Chairman replied that he believed it was approximately £700; but Mr. Lee had put it down at £11. He (the Chairman) understood Mr. Lee considered the profit to have been about £550. Mr. Bott remarked that there was a great difference between £550 and £11; and so there must be something wrong somewhere. He wished to know if the Council would appoint a small Committee, composed of members of the Gas Committee and the Council, to examine the books, so that they could understand their position more clearly. This course would be fair both to the late and the present Manager; but it would not be fair to either to go on discussing the matter unless some further light could be thrown upon it. Mr. Aucott said, in reference to the £1800, there was no question that £1000 was "stolen" from the gas-works. With regard to the £11 profit put down for last year, no doubt £400 or £500 had been spent on different things which ought to have been paid for out of revenue. When they had a nice balance, £1600 was taken and another £800 four years afterwards. If the money had been left, the Council would have been able to pay 10 per cent. profit. This was what started the dilemma; and until they could do something by means of a loan, they would get into a terrible mess. Mr. Wells said it was useless to cry over spilt milk; the only thing left for them to do was to be more careful in the future. Mr. Smith said that when the Local Board purchased the gas-works in 1881, they cost £32,000. To-day their capital was £33,198. Let them look at their turnover for last year—£9000—out of which they had to pay interest and provide for the sinking fund. He did not care who the man was, after these two items had been met he could not make any profit if he had to pay for coal, labour, and so on. And they were now going to spend £12,000 more. The Manager said no doubt at £45,000 the works were heavily capitalized; but the moment they got their new gas-works, they would be able to reduce the cost per 1000 cubic feet. If they could increase their customers by 500, to use 40 or 60 million cubic feet of gas a year, the works would not be so burdened with capital. It was his firm conviction that when the new works were finished they would pay their way. He attributed the loss in a measure to no sinking fund payment being made for one year. Mr. Bott's proposal for a Committee was negatived by 11 votes to 3; and the subject then dropped.

Since the above was in type, a long explanatory letter by the former Manager (Mr. G. Helps) has appeared in a local paper. Dealing first with the statement as to the way in which the accounts had been kept, he characterizes it as incorrect. He says the "Cheques Authorized" book at the gas-works, signed by the Chairman of the Gas Committee when the accounts were presented, showed in detail the proportion of each account to be charged to revenue or to capital. Coming to the question of the loss on the undertaking, Mr. Helps says: "In 1894 and 1895, losses were shown in the accounts presented to the Gas Committee by me (although no loss was actually incurred in these particular years), which were the accumulations of unpaid accounts anterior to the commencement of my management. In my report to the Gas Committee dated March, 1894, I refer to the loss; and in 1895 I prepared myself a statement of revenue which was supplied to each member of the Gas Committee, and therein is set out exactly how the loss of £1244 was accounted for—viz., £1837 6s. 4d. charged to this year belonged to previous years; so that there was a profit made on the year's working of £593 6s. 4d. (£1837 6s. 4d., less £1244), though a loss was shown. The profits shown for 1896 and 1897 are correct; but that for 1898—£11—is most decidedly wrong. There was a profit made in 1898 amounting to about £600. This was after paying £500 for house extensions and alterations; and it would be interesting to know how this amount has been reduced to £11." As to the statements that at the close of the year 1893 the balance of profit and loss account was put at £2337, whereas at the present time it is £1863—showing £474 less than five years ago, and that in 1894 the gas-rental account was shown £99 too much, and in 1895 £427 too much, Mr. Helps says they are most misleading; for though the figures may have been "taken from the ledger," they could not have been found there until the ledger had been made up in accordance with "new ideas," and its arrangement so altered that a sum of something over £500 had been set against his last year (March 31, 1898), lowering his profit, which, under the system adopted by the



Clerk and Auditor for the past eighteen years, should have gone to reduce the profit of the current year. He characterizes all the statements made by the Committee as "grossly misleading and inaccurate." He charges the Committee with endeavouring to "deal with detail questions of accounts without knowing or caring to know the details." His reply to the statement that £474 was lost in the five years from 1894 to 1898 is that, far from such loss having been incurred, a profit of £1952 was made, after paying interest, sinking funds, &c., and, in addition, spending considerable sums out of revenue in improvements at the works—a result which, he says, "has not been equalled in any ten years of previous management." With regard to capital, in March, 1893, it was £35,720, or it would have stood at this figure if the sinking fund had been regularly paid; being equal to £1047 per million cubic feet of gas made. The capital of the undertaking in March, 1898, was approximately £35,000 (including £1000 for new land, from which no benefit had accrued to the undertaking), or equal to £700 per million cubic feet. The capital per million cubic feet of gas made was therefore reduced in Mr. Helps's time by no less than £347. The gas sold in 1893 was 28,941,600 cubic feet; in 1898 it was 42,000,000 cubic feet—an increase of 45 per cent. With regard to charging repairs to capital instead of to revenue, Mr. Helps shows that in the five years from 1889 to 1893 only £1853 was spent on repairs and maintenance, as compared with £5582 laid out in the succeeding five years under his management; and he says, with respect to the works, that such was their state that the Gas Committee by special resolution relieved him of the responsibility for a regular supply of gas until they were put into proper condition, to do which he had to spend considerable sums—the revenue bearing its full share of the responsibilities. Summing up, Mr. Helps says that during the five years he had the honour of serving the Council, the Gas Department flourished more than it had ever done before.

### ACETYLENE GAS LIGHTING AT COWDENBEATH.

#### Consumers Dissatisfied.

In our "Notes from Scotland" last week, reference was made to the dissatisfaction manifested by the consumers of acetylene gas at Cowdenbeath, as shown by an article in the "Dunfermline Journal." It may be of interest to reproduce the article in question, though, as already pointed out by our Scottish Correspondent, discontent does not necessarily mean failure of the system:—

So far, the installation of acetylene gas has not proved the success it was expected to be. Apart from the high price of carbide of calcium, from which the illuminant is generated, the regular supply of the article cannot be relied upon; and the storage-tanks have occasionally been run empty at rather awkward hours. The matter has been receiving the serious attention of the Directors of the Cowdenbeath Gas Company, Limited, and arrangements have been made by which a fortnight's trial is to be given of an experiment of mixing the acetylene gas with oil gas, which was until recently the illuminant. Meantime, the accounts have been sent out to consumers, who are indignant at the large sums which are being charged them as compared with what they had to pay under the old order of things. It is principally shopkeepers who have got beyond the stage of burning paraffin oil; and a number of them are in open revolt against the high rate, which is a serious charge upon their business. The price per 1000 cubic feet of oil gas was 12s. 6d., while for the acetylene gas—of which, of course, there is much less consumption—it is £5, or, as those concerned in the Gas Company put it, 10s. per 100 cubic feet. So serious do some of the shopkeepers regard the situation, that a public meeting was held in one of the committee-rooms of the Co-operative Hall on Tuesday, the 1st inst., for the purpose of considering if any action should be taken to remedy matters. Mr. Smith, draper, was called to the chair. In the course of his remarks, the Chairman spoke of the supply being irregular and of poor quality lately, and also giving off a large quantity of sooty matter, which destroyed goods such as millinery. The price, too, he said, was a serious consideration—from 12s. 6d. to 15s. 6d. a week for gas being rather a heavy item of expense in a business. They were too near Dunfermline, he thought, to be handicapped in this way much longer. Mr. Dundas pointed out that no one was bound to use the gas though he had a supply at hand; but he observed that the Directors had told them that the acetylene gas would be no dearer than the oil gas, and that probably it would be cheaper. From communications he had had, he was led to understand that the charge should not be more than 4s. per 100 cubic feet, and that in some cases it could be supplied at from 3s. 4d. to 3s. 10d. The charge of 10s. was out of the question; and he thought they ought to appeal against it. There was no purifier, and the gas was not good. At Kirkliston, to which he had paid a visit, a draper was manufacturing the gas for his own private use at a cost of 3d. per burner per hour, while in Cowdenbeath they were paying about 1d. He understood that the Cowdenbeath Burgh Commissioners had a contract with the Gas Company to supply gas for the lighting of the streets at so much per lamp; and, as far as he could learn, no more was being paid for the new gas than for the oil gas. The other consumers must therefore be paying for the deficiency in the revenue thus caused. Mr. Strachan said that, so far as he was concerned, the new gas had involved a considerable loss not only by the increased cost, but by the damage which had been caused. He was not prepared to suggest a remedy; but if it came to a question of testing the legality of the payment, he would be prepared to bear his share of the expense. Mr. Dundas stated that two other consumers, who could not be present, were also willing to contribute their share, as they thought the matter should be placed in the hands of an agent. The Chairman remarked that the price was quite prohibitive. Mr. Miller endorsed what the previous speakers had said; and he thought that an appeal should be made against the charge, which was exorbitant in view of the quality of the gas. He had goods wasted, besides being put to trouble by the light going out. Mr. Strachan said he understood the Gas Company were losing, even at the rate they were charging. A general discussion followed, in which it was pointed out that the Directors had held out that the acetylene gas would be cheaper and better than the oil gas, and that one burner would be as good as two. One gentleman remarked that the gas was being

mixed now, and this evoked the retort that matters were being made worse. Some shopkeepers, it seems, have gone to the expense of putting up new fittings, which will practically only be of use for acetylene gas. The oil gas, with which the pipes had apparently been charged, had been driven before the acetylene gas. It was alleged that the pipes were underneath the pavement, and that a great leakage was taking place. A suggestion was made to the effect that legal advice should be sought; but ultimately it was unanimously agreed to appoint a Committee to wait upon the Directors of the Gas Company, and state the grievances of the consumers. In conversation with a gentleman interested in the Gas Company, one of our representatives was told that a number of consumers could very much reduce their gas bills, as their premises are over-lighted. The new gas, he alleges, has a high penetrating power, and very few jets of gas are required to light a building. There is a feeling, which was voiced at the meeting, that the Burgh Commissioners should undertake the whole lighting of the burgh; and this question may be discussed at a future meeting.

The Cowdenbeath Police Commissioners, on Thursday night, received a report from their Roads, Streets, and Drainage Committee regarding the price which the Gas Company are charging for the supply of acetylene gas to the public lamps—10s. per 100 cubic feet. Provost Mungall stated that if this figure were to be continued, the Commissioners would require to find some other method of lighting the town. The supply, too, was uncertain, because of the difficulty the Gas Company had in procuring calcium carbide; the result being that the streets had been in darkness for two or three nights. The Committee were of opinion that, provided the Gas Company did not move in the matter, the Commissioners should consider the three schemes of (1) acquiring the present gas-works, and supplying coal and oil gas; (2) erecting new coal-gas works; or (3) introducing an electric light installation. The subject has been left in the hands of the Committee, for negotiation with the Gas Company and the procuring of further information. A *plebiscite* on the question of whether the Commissioners should or should not take over the lighting of the burgh, was spoken of.

### SALES OF STOCKS AND SHARES.

Last Tuesday, Mr. Alfred Richards sold at the Mart, Tokenhouse Yard, stocks and shares in several Gas and Water Companies. The first parcels offered consisted of consolidated "A" and "B" stocks of the Croydon Gas Company, which were sold at the rates of £300, £277 10s., and £270 per £100 of stock; the first-named price yielding the purchaser £4 13s. 4d. per cent., and the average of the two last (£273 5s. 2d.) returning £4 0s. 6d. per cent. Some ordinary £10 shares (£6 paid), bearing a dividend of 9 per cent. per annum, were purchased for £15 apiece; returning £3 12s. per cent. A number of £10 shares in the Lowestoft Water and Gas Company, on which 5½ per cent. per annum is being paid, were disposed of at prices ranging from £14 15s. down to £14 each. Some consolidated stock of the Brentford Gas Company, the last dividend on which was at the rate of 12 per cent. per annum, was sold at £277 per £100 of stock; yielding £4 6s. 8d. per cent. on the investment. A parcel of £10 ordinary "E" shares in the Aldershot Gas and Water Company was sold at an average price of £16 7s. 8d. per share; yielding £4 5s. 5d. per cent. Some £10 fully paid original shares in the Grays Gas Company, Limited (last dividend 8 per cent. per annum), fetched £18s. 10s. apiece; bringing the purchaser £4 6s. 6d. per cent. on his investment. A few "B" shares, of similar nominal value, were purchased at £13 10s. each; yielding £4 2s. 11d. per cent.

Among other sales last week, the following may be noted: Some original £10 shares in the Altrincham Gas Company fetched an average of £23 8s. 9d. each. A few £5 original shares in the Princes Risborough Gas Company realized from £3 14s. to £3 16s. each. Some new ordinary £10 shares in the Yarmouth Water Company, bearing 7 per cent. interest, fetched from £12 10s. to £13 per share; the aggregate amount realized being £1986 5s. Last Thursday, Messrs. Alexander, Daniel, and Co. sold by auction £15,000 of Bristol Water-Works 7 per cent. maximum consolidated ordinary stock. The reserve price was £154 per £100 stock. The highest price realized was £155½, and the lowest £154½; the average being slightly over £154½. The sale realized £23,199 12s. 6d.

Announcements which appear in another part of the "JOURNAL" indicate that opportunities will shortly be afforded to investors to obtain, or increase existing, holdings in well-established gas undertakings. On the 6th prox., Mr. Alfred Richards will offer, at the Mart, Tokenhouse Yard, E.C., by order of the Directors of The Gaslight and Coke Company, £187,500 of the Company's ordinary stock, issued under the provisions of the Act obtained last session. It ranks for a standard dividend of 4 per cent., subject to the sliding-scale; and, in view of the last distribution on the "A" ordinary stock already issued, it would be entitled to receive a dividend at the rate of £4 18s. per cent. To-morrow week, Mr. Richards will offer £15,000 of new stock, 1881, of the Brentford Gas Company (similar stock now earning 9 per cent.); and on the 29th inst., he will put up for competition a new issue of £13,500 of 5 per cent. stock of the Southend Gas Company. An important sale will take place on the 13th prox., when Messrs. Branch and Leete will offer £40,000 of new 7 per cent. stock of the Liverpool United Gas Company, created under the powers of their Act of 1886. On the 5th prox., Mr. M. Stainton will sell by auction £8000 of new stock of the South Shields Gas Company.

### ELECTRIC LIGHTING NOTES.

Regarding the electric lighting scheme for Bury St. Edmunds, the Town Council (like many others before them) have failed to turn the will of the Local Government Board. The original project has had to be dropped; and last Tuesday a modified one was adopted, which it is estimated will cost £16,000.

For about three hours on Thursday evening the greater portion of Tunbridge Wells was plunged in darkness, owing to the failure of the electric light. Business was greatly impeded; and as many of the tradespeople resorted to candles for illuminating purposes, the chief shops presented a



quaint appearance. It is reported that the failure was due to the fact that number of consumers' wires were defective, and this threw an extra load on the transformers.

The Leeds Corporation, at their meeting last week, approved of the proposed agreement for the purchase of the Yorkshire House-to-House Electricity Company's undertaking. It was stated that by it the Corporation would take over the concern as from Sept. 1, so far as capital expenditure was concerned, and as from Oct. 1 in respect of revenue. Stores, &c., would be taken at a valuation. The purchase-money would be paid in stock, bearing interest at 5 per cent.; and the Corporation would take the whole staff and their agreements.

The Lighting Committee of the Wolverhampton Town Council appear to be very satisfied with the progress their electric lighting undertaking is making. Speaking at the meeting of the Council last Wednesday, Alderman Mander stated that in 1895, they had 7236 lamps; while now the number was 16,718. In addition, there were 1409 lamps on order; so that by Christmas they would have more than 18,000 lamps. Before the report of the Committee was adopted, it was suggested by Alderman Marston that it would be sound policy for the Council to buy the gas-works.

We agree with the "Yorkshire Post"—and many of our readers will probably hold the same opinion—that "electricity cannot yet be trusted for public lighting." In Manchester on Wednesday evening there were two breakdowns of the electric system affecting 27 miles of cable, and the first could not be remedied for an hour. This, occurring on the edge of dusk, affected the shops and a meeting of the City Council; the other, at ten o'clock, caused a good deal of inconvenience in places of entertainment. The town of Woking was in almost complete darkness for two nights last week, owing to the failure of the electric light.

The Rathmines and Rathgar Town Commissioners have applied for a loan of £50,000 for lighting the district by electricity; and Mr. C. P. Cotton, the Chief Engineer and Inspector of the Local Government Board for Ireland, held the usual inquiry on Monday last week. The Commissioners have had the question under consideration for a long period; having consulted Mr. Robert Hammond as far back as 1895. They obtained a Provisional Order in 1896; but until now they have done little in the matter. In describing the scheme to the Inspector, Mr. Hammond is reported to have said that the total estimate was £25,000; and he calculated that "the other small general expenses" would make the total of £50,000.

An interesting experiment is being made at St. Helens. It takes the form of an effort to place the working of the tramway system under the joint proprietorship of the Corporation and private enterprise. The Corporation will generate and supply the electric power; while the Company (to whom the Corporation have granted a lease of 21 years) will provide the vehicles and working staff. On their side, the Corporation undertake to lay down rails of the most improved type, to equip the lines on the trolley system, and to supply electric energy at 2d. per unit for the first 400,000 units—reducible to 1d. per unit when the full quantity of power is consumed. The Corporation also provide capital for the permanent works at a moderate rate of interest; while the Company work the traffic, and have a free hand in developing their business.

A singular occurrence was recently experienced at High Wycombe, in connection with the electric lighting of the town. At midnight a kind of explosion occurred in the mains. Simultaneously the glass globes of several of the street-lamps, and in many of the private houses where the light was turned on, were shattered; while others fell off in consequence of the fusing of the juncture with the wires. At the same time the alarm bells in some of the firemen's houses and at the police station were set ringing, and firemen, policemen, and civilians were soon running about to see where the supposed fire was. Fear was allayed by the discovery that the central fire-call had not been interfered with. It is supposed that the cause of the occurrence was that the mains were overcharged, and the escaping current affected the wires leading to the fire-call. The supply was very much interfered with.

The provision of an electric lighting installation has been agreed upon by the Durham City Council; and they will at once take steps to obtain a Provisional Order for the purpose. The Council have been advised in the matter by Mr. W. A. Hawtayne. His report shows that he is of opinion that the wisest course would be to erect plant of a total capacity of 350 kilowatts in the first instance; and he recommends the low-tension short-wire system as the most likely to suit. The total cost of plant of a capacity of 200 kilowatts he estimates at £17,350; and for 350 kilowatts, £2000 additional. He calculates that the gross revenue will be £2956, at a charge of 5½d. per Board of Trade unit, which is "equivalent to gas at 2s. 9d. per 1000 feet." Taking the working cost at £1767, leaves a gross profit of £1189. If the larger plant is installed he working expenses will be £1820; and the net profit, £112.

On Saturday, the 5th inst., the streets, shops, and sea-front promenade at Llandudno were illuminated for the first time by the electric light; the current being switched on by the Chairman of the District Council (Mr. T. T. Marks). The event is specially interesting from the fact that Mr. Marks is a member of The Gas Institute, and is upon the Benevolent Fund Committee. He was for some time Manager of the gas-works, and is now Chairman of the Gas and Water Committees of the Council. The works, which he opened on the above-named day, have been designed by Mr. A. H. Preece, and are situated just outside the railway station. The plant consists of three Babcock and Wilcox boilers, two of which will be fired from destructors, while the third will be hand-fed with coal or coke. The engine-room is equipped with two 100-kilowatt steam dynamos and one of 50-kilowatt power, together with a motor generator for regulation and for charging the batteries. The two principal generating sets are each capable of giving an output of 100 kilowatts at 440 to 500 volts. For the street lighting there are altogether 48 arc lamps, erected on cast-iron pillars. The lamps along the promenade, 30 in number, as well as those at important crossings, are fixed in carriers protected from the weather by a canopy—an ornamental as well as useful appendage. The remaining 18 lamps are all fixed along the kerb at the side of the road, suspended from overhanging brackets. The lamps on the sea-front are fixed about 50 yards apart; those in the town at a slightly greater distance.

There seems to be strong reason for the complaints that are being made, both inside and outside the Leamington Town Council, as to the illuminating power of the electric light furnished by the Midland Electric

Light Company. Things have come to such a pass that the Corporation Watch Committee have instructed the Town Clerk to write to the Company on the matter. This was reported at last Wednesday's meeting of the Council, when various members related their experiences. Mr. Fell stated that, on the previous Sunday, with two lights on in a room 16 ft. by 12 ft., he had to have a lamp to see to read. He pointed out that the Corporation had put stringent conditions on the Gas Company with regard to the candle power of the gas they supplied; and he thought they should impose the same conditions on the Electric Light Company. He did not want to return to gas; but he certainly would go back to candles if the electric light was to continue as it had been during the past few months. Alderman Bright declared that not only was the light bad at times; but it occasionally went out altogether. During the previous month, the Committees had more than once or twice been entirely deprived of light. It was intolerable that the present state of things could be allowed to go on any longer. Mr. Molesworth, on behalf of some of the outside users of electricity, joined in the protest against the way the current was being supplied. Mr. Purser gave instances in which the electric light had collapsed within the past month; and Alderman Wackrill asserted that they never knew when they could depend upon the current at all. To his own knowledge quite recently one of the principal shops in the town was obliged to close its doors because there was no light; and, being in the jewellery trade it was considered much better and safer that the shop should be closed than left at the mercy of anybody. It was stated that a letter had already been addressed to the Company by the Town Clerk; and it is hoped that this and the protests of the councillors will bring forth an explanation and an improved illuminating power.

## METROPOLITAN WATER SUPPLY COMMISSION.

### Thirty-second Day—Monday, Nov. 7.

(Viscount LLANDAFF, Chairman, Sir JOHN E. DORINGTON, Bart., M.P., Sir G. B. BRUCE, M.Inst.C.E., Major-General A. DE COURCY SCOTT, R.E. Right Hon. J. W. MELLOR, Q.C., M.P., Mr. A. DE BOCK PORTER, C.B. and Mr. R. LEWIS.)

This was the first sitting since the Commission adjourned on July 25; and it was held at the Guildhall, Westminster.

The following are the Counsel engaged: Mr. POPE, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., for the New River Company; Mr. LITTLER, Q.C., and Mr. LEWIS COWARD for the Kent Water Company; Mr. PEMBER, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. RICKARDS for the Chelsea Water Company; Lord R. CECIL for the Hertfordshire County Council; Sir JOSEPH LEESE, Q.C., M.P., for the Kent County Council and Kent Local Authorities; Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN, Q.C., for the London County Council; Sir R. NICHOLSON for the Middlesex County Council; and Mr. GABRIEL P. GOLDNEY (Remembrancer) for the Corporation of the City of London. The Southwark and Vauxhall Water Company are represented by MESSRS. BIRCHAM AND CO.

The CHAIRMAN said he presumed Counsel were aware that the Commission proposed to deal first with a separate and small subject—namely, that of inter-communication between the different Companies. The President of the Local Government Board had written asking them to take such evidence, and report upon it as soon as possible.

Mr. POPE said since the communication from the Commission to the Companies that this would probably be the course taken that morning, the Companies had met and carefully considered what their position should be with regard to it. They were prepared to offer general evidence as to the practicability of such a matter; but it involved so many small considerations of detail, and the general legal bearings of the question, that it appeared to them desirable to save the time of the Commission by directing their evidence, if called on, rather to the general question than to going into a long inquiry in detail as to any particular scheme of connection. The Companies had further concluded that it would be a convenience, and therefore (as a convenience) they would undertake the duty of promoting in the next session of Parliament a Bill obviating this question of detail. For instance, without legislation the Companies could not be relieved of their statutory obligation to supply except for the purposes of their own district, and especially of those particular obligations which bound individual Companies not to supply water to adjoining Companies. These things would have to be dealt with by legislation. He was instructed, on the part of the associated Companies, to call attention to a series of resolutions which they came to, and which in general terms expressed their views in regard to such legislation. Their view briefly was that, while a scheme of inter-communication was perfectly practicable, it would be desirable that some authority should be armed with power to say how and in what way the connection should be made—not merely when the emergency arose, but in anticipation of a necessity. They would suggest that the matter might be left in detail to the Local Government Board—putting upon the Companies an obligation to carry out whatever decision the Local Government Board might come to.

The CHAIRMAN stated that the Commission were asked to advise by whom, and in what proportion, the cost of making the connections should be borne, and what were the legal powers necessary to give effect to any such arrangement. He did not see therefore that the Commission could avoid making suggestions to the Local Government Board.

Mr. POPE said all these questions had been considered by the Companies' representatives. He proceeded to read the following memorandum which was handed in:—

The Companies propose to introduce a Bill in the next session of Parliament, for the purpose of providing for, and facilitating, inter-communication between the mains and works of the respective Companies, and the supply when needed of available or surplus water, so as to avoid the risk of deficiency in times of unusual drought or accident. The Bill to contain *inter alia* provisions to the following effect: (1) The Companies forthwith to consider what works are required for the above objects, and to submit proposals to the Local Government Board for approval. The Local Government Board to be empowered to approve and authorize such works with or without modifications, or to authorize and order other works for the like objects. (2) Further works for the above objects may in like manner be



from time to time authorized and ordered if, and when, required. (3) The respective Companies to carry out in their respective districts all works so authorized. (4) The Local Government Board to be empowered to authorize the supply of surplus water from the works of any Company to the works of any other Company for the time being requiring the same; and the Local Government Board to have power, in case of emergency, to authorize any of the Companies to take more water from the Thames than they are now authorized to take. (5) All expenditure of the respective Companies in relation to any such works to be deemed capital expenditure; and for the purpose of meeting such expenditure the Local Government Board to be empowered from time to time to authorize the respective Companies to issue an additional amount of debenture stock. (6) No contribution to any sinking fund to be made in respect of capital issued for the foregoing objects. (7) Subject to reasonable contribution by any Company taking and utilizing by means of the proposed works and powers water which they would not otherwise have been enabled to take and utilize, the interest on debenture stock applied by the respective Companies for the foregoing works to be borne by the eight Companies, in proportion to their respective water-rentals. (8) Any Company taking water from another Company to pay for such water to the Company supplying it, at a rate to be agreed upon or fixed by arbitration. (9) A standing Arbitrator to be appointed by the eight Companies, or failing such appointment by the Local Government Board; and in case the respective Companies do not agree among themselves such Arbitrator at the end of each year to decide as to the contribution of either Company taking and utilizing the water rendered available by the proposed works, and also to decide any matters in difference between the Companies.

The CHAIRMAN: I think the President of the Local Government Board would expect some criticism of these proposals.

Mr. POPE: No doubt. We were anxious to assist the Commission in this part of the inquiry; and therefore we have put our collective views before the Commission to assist them.

The CHAIRMAN: I understand the eight Companies concur.

Mr. POPE: Yes.

Mr. LITTLER said the position of the Kent Company was somewhat different from that of the other Companies; but, in general outline, they were at one. There might be matters of detail to which he would have to call attention.

Mr. BALFOUR BROWNE understood the Commission would at some time return to the question of purchase.

The CHAIRMAN: Oh, yes.

Mr. BALFOUR BROWNE said the County Council thought the scheme might become absolutely unnecessary if the Commission should take the view that purchase by a public authority was the right course to take.

The CHAIRMAN thought the Local Government Board were of opinion that immediate legislation was expedient, whether purchase were resolved on or not. He believed the Local Government Board intended next session to introduce legislation. Possibly they might adopt the proposal of the Bill to be introduced by the Companies.

Mr. Ernest Collins, Distributing Engineer to the New River Company, was then called and examined by the CHAIRMAN. He considered it quite practicable, from an engineering point of view, to connect all the systems of supply of the different Companies. The connections must be limited to a certain extent in accordance with the quantity of water there was to pass from one Company to another. He thought there were no reasons of convenience or expense, or engineering considerations, which would make it more desirable to limit the connections to some of the Companies only. The supplies of all the Companies could be made interchangeable.

Mr. DE BOCK PORTER: Would you say some of them have no available surplus to dispose of?

Witness: Oh, yes. At the time of the greatest supply, hardly any of the Companies have any to spare.

The CHAIRMAN: Then what is the use of inter-communication, if none of them could supply any water to their neighbours?

Witness replied that this was the difficulty the Engineers of the Companies had to consider when drawing up the scheme contained in their report dated Oct. 18, 1897, on the proposals to make interchangeable connections between the mains of the several Companies.

This report, which gave details of twenty connections between the various Companies, was handed in. The Engineers found that the only Company who had practically any surplus at times of great pressure was the Chelsea, who had powers to draw from 8 to 10 million gallons daily from the Thames more than they were utilizing in their district. The connections in this scheme were laid out with a view to transferring from one point to another a quantity of water not exceeding 10 million gallons a day.

The CHAIRMAN: Do you mean that all the Companies between them, at a time of pressure, would be short of water for their own purposes?

Witness: Not for their own purposes, but to spare.

That seems to strike at the desirability of inter-communication?—It does.

There is no use for inter-communication if there is nothing to communicate?—Precisely.

Mr. POPE said that had reference to October, 1897. Since then the Southwark and Vauxhall Company had obtained further powers, which allowed them to assist the East London Company.

Witness (continuing) said the Southwark Company had a surplus now of about 10 million gallons a day, which was not available when the report containing the scheme was drawn up. This made a surplus of about 20 million gallons. The scheme was devised to meet a temporary breakdown—the fracture of a main or failure of a pumping-engine—rather than failure in the source. The Southwark and Vauxhall Company's surplus was not likely to be absorbed by increase of consumption in their area. The Southwark Company were in a peculiar position. They had been erecting new works at Hampton, with a view to dismantling their works at Battersea; and this had enabled them to give a good deal of assistance in the present year to the East London Company, which, if the works were dismantled, would not be available.

The CHAIRMAN: I understood Mr. Pope to suggest that they had power to draw extra water?

Witness: They have power of drawing an extra quantity of water, but not power, I believe, of inter-sale among the other Companies.

Mr. POPE: No; it is absolutely prohibited.

Witness went on to say that the West Middlesex, Grand Junction, and New River Companies had, during the temporary difficulties of the East London Company, supplied them with between 8 and 9 million gallons

daily, of which the New River Company provided 6 millions. From the Kent Company, they had about  $\frac{1}{2}$  million gallons daily; and from the Southwark and Vauxhall Company he understood they were receiving about 6 million gallons more daily—about  $14\frac{1}{2}$  million gallons in all. He did not agree that the scheme suggested was the best mode of dealing with the question. The experience of the past year modified the proposal, and pointed to the efficiency of the seven Companies in carrying out their duties to the public. Assistance was only required by one Company. It was questionable—not only in his mind but in the minds also of the other Engineers—whether the scheme was absolutely necessary as regarded the seven Companies. Even if the connections were made, he did not believe—ignoring the East London Company—they would be required. Certainly they would not be by the New River Company, whose engines, mains, &c., were duplicated and triplicated in some places. Each Company was quite capable of taking care of itself. The outlay for this scheme would be £307,867. There was a second scheme, and one which was better than that contained in the report; but he was not authorized to put it forward as having the approval of the Boards of Directors in any way. The first plan was the best for temporary purposes; but it was practically only wanted for one Company; and the needs of that Company could only be supplied by two—the Southwark and Vauxhall Company and the Chelsea Company—unless the other Companies extended their works. The Chelsea Company had command of 8 or 10 million gallons, but not the means of bringing it. The £307,000 included pumping-engines, filters, and new mains which the Chelsea Company would have to lay to transfer the 10 million gallons to another Company. The suggestion was that the water should be passed from Molesey to Putney Heath, and that a main should be laid thence across the Thames to Campden Hill. This temporary scheme would not be sufficient for a case like that of last autumn; but it would meet a breakdown of machinery or mains.

The CHAIRMAN: What is the use of a scheme of inter-communication that will not meet such an emergency as that of last autumn?

Witness: I think in case of duplication for a breakdown it is useful; but each Company must look after itself to a certain extent. No doubt the East London Company are going to erect more works for their own purposes; then this, as a stand-by in case of sudden emergency, would no doubt be useful.

Mr. DE BOCK PORTER: Do you advocate this expenditure as being desirable for a mutual insurance between the Companies?

Witness: It might be a sort of insurance for them. I do not think it is necessary, leaving the East London Company out of the question.

By Sir JOHN DORINGTON: The New River Company gave assistance to the East London Company without help from the West Middlesex and the Grand Junction Companies, at the worst time. It was not till October that the latter Companies came in. The connections now made between these three Companies might be further extended; but in order to make them effectual, the Grand Junction and West Middlesex Companies must provide more filter-beds and mains, so as to be able to give their water. When the mains were all interchangeable, some Companies would have to increase their works, so as to be able to put more water into their own mains. But he thought this might be carried too far; it might make the Companies less self-reliant. If they could rely on their neighbours, they might not be too anxious to spend money on their own account. Still, he did not believe any of them would look at it in that light.

Further examined by the CHAIRMAN: Upon existing powers, the Chelsea, Southwark and Vauxhall, New River, and Kent Companies had surpluses they could give their neighbours. The West Middlesex and the Grand Junction Companies would be in the same position if they had more filter-beds and further power to draw water; but this was not included in the estimate. Witness proceeded to detail another scheme of interchange. The Southwark and Vauxhall Company were constructing fresh works at Hampton which would be substituted for the present ones at Battersea, which it was intended to dismantle. At Battersea, there was a filtering plant sufficient to deal with 15 million gallons daily, and pumping power for 25 million gallons. The Company also had a main from Hampton to Battersea conveying unfiltered water. Under ordinary arrangements, these works would be dismantled; but it appeared to the Engineers, in discussing this matter, that as a temporary measure it might be possible to devise means of utilizing these Battersea works, at least until other arrangements were made. Supposing 10 million gallons were available there, the position would be very central for distribution, and mains could be laid in every direction for the assistance of all the Companies. The first main would be to Campden Hill of the Grand Junction Company, and be capable of delivering 10 million gallons per day. No. 2 main would be a junction between Campden Hill and the New River head at Islington, with a capacity of 6 to 7 million gallons daily; No. 3 would connect Battersea with the New River head, and have a capacity for 10 million gallons; No. 4 would run from Battersea to the Lambeth reservoirs at Brixton; and No. 5 would be from the Southwark and Vauxhall system at Nunhead to the East London Company, through the Tower Subway, with a capacity of 10 million gallons daily. Thus, providing the Southwark and Vauxhall Works at Battersea could be utilized, all the Companies could be coupled up. Assistance could thus be rendered not only to the East London Company, but all round. This scheme supposed the legalization of inter-sale. The total cost would be approximately £255,346 for mains and connections, beyond which the Battersea works would have to be purchased or rented. The scheme, which had received the approval of the other Engineers, would be the means of rendering available 10 million gallons of water a day from the Southwark and Vauxhall Company, 6 millions from the New River Company, and 3 millions each from the Grand Junction and West Middlesex Companies—a total of 22 million gallons.

The CHAIRMAN: It is a great pity you did not lay this scheme before us instead of the first one.

Mr. POPE: I am afraid that is because of the delicacy of the position. It has not been officially sanctioned by a meeting of the Engineers, nor by a meeting of the Chairmen of the respective Companies.

By Mr. MELLOR: The Battersea works were on land worth about £10,000 an acre, and there were 30 acres. Then the main from Hampton to Battersea would be worth about £150,000—together (say) £450,000. Three per cent. on this would give, perhaps, the rentable value. Rent might also have to be paid on the fixed machinery, and the machinery would have to be kept up.



Major-General SCOTT: You bring this forward as a temporary measure, do you not?

Witness: It would be so far permanent that the mains laid under the scheme would under any circumstances—if you did away with the Battersea works—be available to carry water from a central station.

You do not contemplate that the filter-beds at Battersea should remain permanently in use, do you?—I should not think so. Why we suggest this Battersea scheme is that it is immediately available.

Mr. MELLOR: As I understand, supposing the Companies were purchased by any authority, these works would probably be kept up by the purchasers for the purposes of inter-communication between different parts of their system?

Witness: They would be very useful for the purpose—as a reserve. There should be a central reserve to take you all round London.

Mr. POPE: Battersea might be a central station for the distributing works; but these would be available whatever the distributing centre might be. That is what I understand.

The CHAIRMAN: Hardly so. How can the mains from Battersea help distribution from other centres?

Witness: In this way. If Battersea, with its filtration plant, were dispensed with, it would naturally be necessary to bring water from some other part of London to Battersea. Other works would have to be constructed, and Battersea would simply be a distributing centre. You might run a main from Battersea to Hampton. You might have your filtering plant at Hampton, and pump the filtered water direct into the Battersea centre, and so distribute it again among the various Companies. I cannot give any idea as to how the cost should be distributed among the Companies.

It would seem that the Companies who find the surplus water ought not in fairness to contribute as much, if at all, to the cost?—Of course, they would be paid for the water they sell. At present there were only certain of the Companies possessed of surplus water, and they did not want a scheme of inter-communication. Naturally these Companies felt it rather hard that they should be saddled with part of the expense, for the benefit of those who did require it. The only Company who wanted assistance at present was the East London. Even they, he thought, would probably get over their difficulties, and not want aid again.

Mr. PEMBER: The position of the East London Company to-day is not what it will be in a couple of years' time; and as these works are permanent, it would be rather hard that all the expense of them should be put upon the East London Company.

The CHAIRMAN: The result is that nobody wants these works, and that nobody should bear the cost of them.

Witness (continuing) said it would require eight months to carry out scheme No. 2—to lay the mains so as to make it workable. As the scheme would involve an Act of Parliament, it would be about eight months from the passing of the Act authorizing the scheme.

The CHAIRMAN: I am afraid that would carry you over the next dry season.

Mr. MELLOR: I suppose we may take it that the Southwark and Vauxhall Company have assisted the East London without parliamentary powers?

Witness: Clearly, yes.

The CHAIRMAN: But that assistance has been much short of what you propose they should be able to give?

Witness: Yes.

How have they been able to do that? There are Acts forbidding them to sell their water.

Mr. POPE replied that they had disregarded their Act of Parliament. Necessity had compelled them to do so.

Sir H. E. Knight, Chairman of the Southwark and Vauxhall Company, said he did not agree that in assisting the East London Company his Company had done anything illegal or beyond their powers. The Company had sources of supply other than the Thames. The Thames water they could supply only to their own district; water from other sources they could treat as they liked. The advantage of No. 2 scheme was that it enabled the works of all the Companies to be joined up without in any way interfering with the ordinary distribution in their districts.

Cross-examined by Mr. BALFOUR BROWNE: He did not know the total quantity the Southwark and Vauxhall Company drew from the wells was 1½ million gallons only. Ignoring the East London Company, his opinion was that both schemes were superfluous; and as neither would assist his Company, he did not see the justice of being brought into the scheme and bearing part of the cost. He did not know that the Local Government Board had reported that the Battersea site was unsatisfactory. It might be advisable, if the scheme were adopted, for the Companies to have power to draw a little extra quantity from the Thames in case of emergency, subject to the approval of the Local Government Board; and they intended, he believed, to ask for this power. If the prohibition or limitation of sale of the Company's water were abolished, they would have sufficient water for a surplus of 22 million gallons daily to be distributed under scheme No. 2.

Cross-examined by Lord R. CECIL: The 6 million gallons which the New River Company had been supplying to the East London Company came partly from wells and partly from the Lea.

Lord R. CECIL asked the Chairman to direct the production of the gaugings of the Lea, which were exceedingly important from the Herts point of view, in order to show what water was left in the Lea—whether it was true, as the county alleged, that the pumping from the wells acted on the Lea and Chadwell springs.

The CHAIRMAN ruled, however, that this was not within the scope of the inquiry.

Mr. J. W. Restler, Engineer to the Southwark and Vauxhall Company, examined by the CHAIRMAN, said he considered the second scheme infinitely better than the first. The two were conceived with totally different objects. The first was mainly to provide a supply in case of temporary breakdown of mains or machinery. After the experience of this year, the Engineers thought it necessary to deal with the possibility of the recurrence of such circumstances; and with this object witness suggested the use of the Battersea works. The Company had power to retain these works if they thought fit. The financial basis of the arrange-

ment was that the associated Companies should pay (say) 3 per cent. interest on £300,000—30 acres at £10,000 per acre—which would cover the use of the whole of the plant. The 15 million gallons which the Company proposed to set aside as the emergency supply would have to be filtered at Battersea. There was, however, a clause in the Company's Act of last year which would prevent them giving the whole of this quantity. If the quantity were wanted for any considerable time, the 30-inch main bringing unfiltered water from Hampton to Battersea would have to be duplicated, so that this might be left for the unfiltered supply to Battersea, while the Company could get the substituted portion of the 15 million gallons for the supply of their own district. This quantity would be available to meet unforeseen contingencies—say, the failure of wells in Kent or of the Lea. The supply would not absolve the East London Company from finding a way out of their difficulties for themselves. Such a price, he imagined, would be fixed on the Company requiring the supply as would practically amount to a penalty—thus making it bad policy for a Company to rely on such works as these. Among unforeseen contingencies, he should include such a drought as was experienced this autumn; but the drought having occurred, the Company suffering by it should provide for its recurrence. The cost of the scheme would be considerably more than that of the first. Arrangements were being made to join the mains of the Southwark and Vauxhall Company with those of the Chelsea Company, where they crossed in the Upper Richmond Road. As a matter of fact, nearly all the Companies had connections between their systems now.

Mr. DE BOCK PORTER: Would it materially affect the financial arrangements of the Southwark and Vauxhall Company if the Battersea works, instead of being dismantled, were used in the way suggested?

Witness: No. In the Act of 1894, permitting the construction of the alternative works at Hampton, a clause was inserted that the capital authorized should be reduced by the amount realized from the sale of the Battersea works; so that if they were not sold, the whole of the capital authorized by that Act would be called up, with no set-off against it.

By Major-General SCOTT: The existing connections between the Companies would almost suffice to meet next year a drought such as occurred this autumn, if the East London Company commenced taking from that supply immediately they had to fall back on their reservoirs. This was assuming they could receive 6 million gallons from the New River Company, 3 to 5 millions from the West Middlesex and Grand Junction Companies, and 6 millions from the Southwark and Vauxhall Company.

Cross-examined by Mr. BALFOUR BROWNE: If his Company's district grew as it was growing, their surplus water would be required for their own use.

Mr. W. B. Bryan, Engineer to the East London Water Company, examined by the CHAIRMAN, said he agreed with the second scheme, the connections under which could be made by next summer if there were no legal difficulties. This, however, would be impossible if an Act were required. At present his Company were receiving from the Southwark and Vauxhall, Kent, New River, Grand Junction, and West Middlesex Companies about 13,200,000 gallons of water a day. The price paid the Southwark and Vauxhall Company was £15 per million gallons, and to the Kent Company, 6d. per 1000 gallons. The amount to be paid the other Companies was not yet settled. He could not answer questions as to what connections his Company would rely on next year, having only received notice that morning that this evidence would be required. He would, however, prepare it.

Mr. John Hollams said he represented the New River, the Chelsea, and the Kent Companies; but when the associated Companies acted together, he represented them all. Questioned as to the resolutions Mr. Pope had read, he said the view of the Companies was that, as legislation would be necessary, it was impossible to foreshadow any definite scheme of inter-communication. It must vary as population and consumption increased and as circumstances changed. The Companies therefore thought it better that any such scheme should be regulated from time to time to meet requirements, under the control of the Local Government Board.

The CHAIRMAN: Do I understand you that the Companies suggest an Act which should not authorize any particular set of works, but such works as the Companies hereafter may propose and the Local Government Board approve of?

Witness: Yes; or such as the Local Government Board may impose on the Companies.

That would be a novel form, would it not? It strikes me as an extraordinary novelty that works not described, not enumerated, not specified, but left to the discretion of the Companies and the Local Government Board between them, are to be authorized?—Yes; the circumstances do not admit of prescribing them.

Examination continued: All the extra power required was that the supply need not necessarily be restricted to their own districts. If the Companies were amalgamated, and given the same powers for the whole London area, they would have all the powers required. The power sought was really to remove the technical application of the Water-Works Clauses Act to a particular district, and make it available for other districts. Witness was taken at length through the resolutions. Under No. 4, the statutory prohibitions as to sale would remain, but the Local Government Board would have power in case of emergency to say they might be disregarded temporarily, and also to sanction more water in the same event being taken from the Thames. Two things must be considered in relation to the subject. They must have the water, and they must have the means of conveying it; neither without the other was of use in the present difficulty.

The CHAIRMAN: You know Parliament has watched rather jealously this right to take water from the Thames. It has limited the amount each Company may take. A Royal Commission has recommended an enormous increase in the storage of the different Companies, to enable them to get on without increasing the draft on the Thames. We have been told that there are but two Thames Companies who have a surplus. Yet here you make a proposal that the Local Government Board shall have power to authorize any Company to draw more water from the Thames, even in times of greatest drought—and the greatest want, therefore, of water in the river—in spite of all these precautions that Parliament and the Royal Commission have taken?



*Witness*: Only in an emergency which calls for some such thing. It is merely temporary. It is a case which no one anticipates, and which one hopes and expects will not occur. It is merely to meet the recent scare, and the repetition of any such disaster. As to the water taken from the Thames, if there were adequate storage the draft would be immaterial, because at times there is a superabundance of water, so that the depletion of the river is entirely dependent on the storage. The Companies have been asked to deal with this question; and they feel that if necessity arose they should have this power.

In reply to a suggestion from the Chairman, that this seeking of power to draw further water from the Thames indicated that the Companies did not think their present supplies sufficient, witness said that was not so. But if some of the Companies were to be overtaxed for the benefit of others, they did say it might be advisable to increase their possible draft on the Thames. The power was only to enable one Company to benefit its neighbour—not itself. With regard to the proposal that there was to be no contribution to the sinking fund in connection with this matter, witness said the only excuse for a sinking fund was that the money expended was assumed to yield revenue and profit. Here it was obvious there could be no profit, and therefore there could be no pretence for putting the sinking fund on such expenditure.

### Thirty-third Day.—Tuesday, Nov. 8.

Mr. Hollams, in further examination by the Chairman, said the payment made by a Company receiving benefit under the resolutions would be in the nature of a way-leave, and would have relation to the quantity of water taken, the time during which it was taken, the distance conveyed, &c. Probably the contribution would not be very heavy, because the essence of the scheme was mutual protection of all the Companies. It must be borne in mind, also, that this insurance was against risk which did not concern the Companies, because they were protected from accident or drought. Witness was questioned closely as to what was to guide the arbitrator in fixing the contribution of a Company; but he declined to go beyond saying the "general circumstances." The fact that one Company alone had made use of the system would certainly not justify the Arbitrator in charging the whole interest on the outlay on one Company. If the inter-communication system was not used, each Company would contribute to its cost in proportion to their water-rental. If a Company required water, they would pay the Company supplying it; and he anticipated no practical difficulty in fixing the price. The charge would probably be lower than the ordinary price. This was the case at present with the East London Company who were paying a sum which yielded no profit to the supplying Company. The receiving Company supplied the water to their own consumers; but they could hardly be said to sell water to them, because they charged a rate, undertaking to supply water save only in case of drought, accident, or frost. It was a fallacy to say a Company sold water. The rate was levied on a house whether occupied for only one or twelve months in the year, and irrespective of the quantity consumed. In East London, he believed many houses were supplied at a substantial loss. The rich paid for the poor, no doubt. The objection to supplying by meter was on sanitary grounds. Replying to the suggestion that this difficulty could be met by starting the initial price at an amount amply sufficient for sanitary purposes, he said he could not argue the question; but he knew there were sanitary objections to that. He proceeded to refer to a circular issued by the Local Government Board in October, 1897, under which it appeared that they thought they had some of the powers which it was now proposed to give them. According to this, schemes were to be put forward for approval by the Local Government Board or the Railway Commissioners; and under the Public Health Act of 1875 power was given to the Local Government Board to sanction a local authority supplying water in an adjoining district.

Cross-examined by Mr. H. L. CRIPPS (in the absence of Counsel for the London County Council), witness said the present scheme would tend to lessen the value of the Companies' concerns, because it would involve an annual burden on themselves. If the only opposition to the Bill that would have to be promoted had for its object the insertion of a clause like clause 84 of the Staines Act of 1896 (which provided that the privileges granted by the Act would not, in case of purchase by a public authority, have to be brought back), he should advise that it should be accepted. The receiving of water under the inter-communication scheme would not benefit either the seller or the purchaser.

By the CHAIRMAN: The East London Company, being prevented by drought from giving a full and constant supply, were not violating their statutory obligations. The scheme suggested, if adopted, would merely enable the Companies to do something which they were not bound to do by statute. Therefore there was no occasion for such a clause as that suggested. The Companies were simply voluntarily taking on themselves a serious annual burden for the protection of the public against a risk which would not fall on the Companies. The short supply being excused by drought, the income of the Company would not be diminished at all; nor would a full supply aided by the inter-communication scheme increase their income.

Sir H. E. Knight, re-called and examined by the CHAIRMAN, said he considered the schemes of inter-communication practicable and desirable, though he was quite certain they would never be wanted or brought into use. The present condition of affairs was sufficient to meet another drought like the one just experienced. They had been altered since the drought by more connections having been made. It was true these connections had not yet enabled the East London Company to resume the constant supply; but this was because the assistance was not rendered as early this year as it would be next. Thus the Company would not have to draw on their reserves so early. The New River Company had been supplying 6 million gallons daily for weeks past, and had now made connections with the West Middlesex and Grand Junction Companies which enabled them to supply 3 millions more. Then there were connections with the Southwark and Vauxhall Company whereby they got another 6 million gallons. This made 15 million gallons daily available now or next year—ignoring the small quantity procurable from the Kent Company. This quantity could be augmented by a few works which could be carried out this autumn. If the connection between the East

London and the Southwark and Vauxhall Companies was enlarged, the latter Company could give 10 instead of 6 million gallons. Other engineering works, however, would be necessary to enable this to be done. Then the Kent Company would be able to afford 2 million gallons more, which could be conveyed through the Southwark Company's main when a projected connection was completed. By a communication with the Chelsea Company, a further 3 million gallons would be available *via* the Southwark and Vauxhall Company's main. This gave 24 million gallons daily which the Companies, with their present powers, and without any trouble, could place at the disposal of the East London Company.

In reply to Major-General SCOTT, witness said he could guarantee the supply from his own Company for several years, because he had always endeavoured to keep his works in excess of requirements. The whole of the water from his Company could be treated at Hampton. The Battersea works would not be needed at all by them.

The CHAIRMAN: Your evidence suggests that the Battersea scheme is an unnecessary expense?

*Witness*: The Battersea scheme as laid before you is a necessary and admirable one, if we are to satisfy the public mind. As I said from the first, although it may be a very good insurance, it will seldom or never be wanted. The need is only with the East London Company at present; and their case could be met with an expenditure of no very serious importance—£25,000 or £30,000. To do this, no Act of Parliament will be necessary.

In reply to further questions, witness said the Companies had taken every precaution. This, he thought, was shown by what happened this year. The Companies had power to make agreements for the sale of water to anybody. He would not suggest that No. 1 scheme should be set aside. It was very admirable so far as it went, though No. 2 was better. It was a question whether the first would not suffice for all emergencies when the Companies were in the condition they ought to be in. With an expenditure of £25,000 or £30,000, they could meet another drought like the last. The failure was called a drought; but this was a wrong term, because when 25 gallons of water per head per day were supplied, they could not call it a famine. The difficulty was caused by the ridiculous system of building houses without cisterns; but for this, they would not have heard a word as to failure of supply in East London. If they had cisterns with shelving bottoms, like the side of an inverted champagne bottle, whatever sediment there was would flow out with the water. With the lids riveted tightly on, there would be practically no sediment. He held that each Company should be compelled to have sufficient appliances, not only to meet the actual maximum demands of their district, but to supply at least 3 million gallons more. Then the eight Companies would have 24 million gallons, which, if they were all coupled up, would be available for the use of anyone. Assuming his Company abandoned the Battersea works, their total filtering area would be 22 acres, to deal with 46 million gallons daily—when supplying the East London Company with 10 million gallons. But this would only be in time of emergency, and at a season when water was much more easily filtered than in the winter time. If the system of inter-communication were to be made efficient, they must get rid of the clauses prohibiting inter-sale of water from the Thames. All the water supplied to the East London Company by his Company had been from sources other than the Thames. The Southwark and Vauxhall Company were sinking wells now, and had more in prospective. Whichever scheme of inter-communication Parliament thought best, the Company were prepared to carry out. Either Parliament should give the Companies power to take more water in case of emergency, or the Local Government Board should be the authority to give permission under certain conditions. He thought it would be a proper measure for control of the Companies to require them to have works 3 million gallons daily in excess of their requirements. In the interests of all the Companies, they did not want a recurrence of the recent failure.

By Sir G. BRUCE: By power to draw more water from the Thames, he meant even below the 200 million gallons flowing over Teddington Weir. If the drought had proved anything, it was that the reserve of this quantity over Teddington Weir was utterly useless and unnecessary. Less than this had flowed over the Weir, and no calamity had happened, beyond perhaps a barge or steamer going ashore. But what was this compared with the wants of London? As long as the Thames would supply water and London wanted it, the Companies should be able to take it. There should perhaps be a limit; but to make this limit 200 million gallons at Teddington, was to put it much too high. All the Companies were striving to place themselves in as secure a position as his Company occupied.

The CHAIRMAN: I see you have a suggestion for a kind of Central Committee, which should supervise the action of the Water Companies?

*Witness*: I am of opinion that a Committee formed of the representatives of the Water Companies would not be at all a bad thing. It might be formed of the Chairmen of the Companies, with the power which it was proposed to place in the hands of the Local Government Board. If the Committee thought one Company was not doing its duty, they should have power to order that Company to execute works to bring it level with the others. If it was necessary to go to Wales for a further supply, the Committee should be able to direct the Companies to go to Parliament for the purpose. The case of a recalcitrant Company would have to be met by giving the Committee power to take steps which would make their decisions respected.

Cross-examined by Mr. FREEMAN: The wording of the resolution would not necessarily mean that the amount paid by one Company for water should be simply the cost price. The figure was to be agreed or settled by arbitration. The price at present paid by the East London Company to his Company was the cost. Questioned as to whether the power to sell water in this way would not increase the price to be paid for the Company in case of purchase, he said the selling of water at cost would not increase the Company's profit. If the Lambeth Company were drawing 32 million gallons, whereas they had power to take only 24 million gallons from the Thames, they were drawing beyond their powers or must apply to another Company. It might occur that witness's Company might be supplying this excess to the Lambeth Company, who would be distributing it in a part of their district which was part also of the Southwark and Vauxhall Company's district; so that the latter Company would be taking water from the Thames and handing it to the Lambeth Company who would supply it at higher rates than the Southwark and Vauxhall Company



could supply it in the same district. This might be the case during short periods of emergency. He did not think his idea of a Supervising Committee would be practical amalgamation. It would be confederation; amalgamation he regarded as almost impossible. It would not be confederation without restriction, to avoid amalgamation with reduction of rates.

In reply to the CHAIRMAN: Besides the rates, there were other difficulties in amalgamation—such as parliamentary powers and obligations, &c. If confederation were adopted, leaving each Company to work out its own ends, they would avoid all these difficulties.

Mr. Walter Hunter, Engineering Director to the Grand Junction Water-Works Company, and Joint Engineer to the Staines Reservoirs Committee, examined by the CHAIRMAN, said No. 2 scheme of connection appeared to him to be better than No. 1. It was not really much more expensive; and it had the advantage of joining the works of the Companies without in any way interfering with internal distribution. He confirmed the preceding witness by saying he thought it probable that the existing communications of the East London Company, somewhat enlarged and improved, would amply suffice to meet the possible breakdown of that Company. This would be much cheaper than one of the larger schemes; but the Companies had felt they were open to a good deal of criticism from the public in regard to the fact that they had not been able yet to render that assistance one to the other which the public thought they had a right to expect. They were very anxious to do anything necessary to ensure the supply of any district of the Metropolis. If the whole question were looked into before the Commission, and if the Commissioners could come to a certain resolution, this might satisfy the public mind as any statement given by the Companies alone could not possibly do. No doubt an enlargement and improvement of the existing mains and communications of the East London Company, as proposed by Sir Henry Knight, would make that Company safe for next year, because they were only under a temporary disability due to a failure of the Lea in consequence of an unprecedented drought. With the works they now proposed, no doubt they would soon be in as good a position as any Company in London—but not within the next year. This was the difficulty they were endeavouring to meet. Both Sir Henry Knight's improvement of existing connections and scheme No. 2 could be completed by next summer, if the Companies had such an assurance given them as would justify them in putting the works in hand at once. If the Commission were satisfied as to the necessity of the works, and would report in that sense to the Local Government Board, the Government might introduce a Bill giving the necessary powers. The No. 2 scheme would enable filtered water, ready for delivery, to be handed from almost any one Company to any other Company. This would be useful and desirable whether purchase took place or not. The same mains would be useful for the same purpose. It would therefore not be a waste of money, in the event of purchase taking place in a reasonable time, because it would guard against any possible breakdown. As to the cost, he agreed about the sufficiency of the £255,000 for the mains and connections. He understood the Southwark and Vauxhall Company were willing to allow the associated Companies the use of their Battersea works, and of part of the 36-inch main from Hampton, at a rent. If the rent of the works were taken at £9000 a year, this would be £45,000 for five years. The third of the Campden Hill works of the Grand Junction Company would cost £1200 a year, or £6000 for five years. The rent of the main would be roughly £1800 a year, or £9000 for five years. These items made a total of £315,000, which would be the cost of No. 2 scheme for five years. This would include nothing for standing charges. From Battersea, it was proposed to pump into reservoirs at Campden Hill, Claremont Square, the New River Head, and Brixton. The great advantage of the scheme was that the water would be delivered into the various reservoirs whence the distribution would go on in the ordinary way without any interference. There would be no difficulty with regard to pressures or levels or similar things either way.

By Major-General SCOTT: The Southwark and Vauxhall Water Company would ultimately want a portion of the 15 million gallons, so that it would only be available for this purpose for a limited time. Part only of the 36-inch main would be available for the scheme, because the Southwark and Vauxhall Company would want part sufficient for 5 million gallons. The communications between the East London and Southwark and Vauxhall Companies worked very well as from the former to the latter, because the high reservoir at Nunhead was supplying. He could not say how the arrangement would work if reversed. In scheme 2, the Grand Junction and West Middlesex Companies were supposed to pass 3 million gallons daily to the New River Company. With existing plant and powers, the Grand Junction Company would only be able to deliver to this scheme  $1\frac{1}{2}$  million gallons daily. To enable the Company to deliver more, they would require a main from Kew Bridge to Campden Hill, and another separate main from Campden Hill, adjoining the New River Company's, which had just been coupled to one of the Grand Junction Company's service mains. The expense was included in the £255,000. They would also want more water; but this they could get by inter-sale with the Chelsea Company (the Thames-taking Companies having powers of inter-sale among themselves), or by increased power to pump from the Thames. This would not diminish the contribution of the Chelsea Company, because this Company made no contribution under the scheme. When the Staines reservoirs were completed, the Grand Junction Company would have power to take 12 million gallons more from the Thames. The absurdity was that Parliament put upon the Companies restrictions which prevented them from helping one another whenever they wanted to. The prohibition on the sale of water among the Companies should be abolished; and he expressed the opinion that the sinking fund should not be allowed to apply to any money raised for the present object, because these works must necessarily mean a diminution of the profits of the Company.

The CHAIRMAN: The whole quantity of water will be sold to some consumer or other?

Witness: It is expenditure of, I was going to say, unnecessary capital.

The water will ultimately be supplied on the ordinary terms, the same as any other water?—Yes. But we have to expend a large amount of additional capital to do it; and I say that this capital ought not to be subject to the sinking fund clauses.

Mr. PEMBER: It may be fifty years, and never used.

Witness: There is no extra water-rent coming in for it. There might be a recoupment in one year to one Company; but on the whole it will be absolutely out of pocket.

Mr. MELLOR: The question is what risk you ought to run?

Witness: Quite so; but I think it is a question on which Parliament should meet us in a fair and equitable spirit.

Sir G. BRUCE: Do you agree that this may be a desirable thing as a matter of insurance, but practically you do not expect it to be of use?

Witness: Practically I do not expect it to be of use after next year.

Mr. DE BOCK PORTER: You think the emergency provisions made this year will be sufficient to carry over another year to two?

Witness: Probably, with a little addition.

Mr. Restler, re-called and examined by the CHAIRMAN, said that the increase in the quantity of water supplied by his Company to the East London Company from 5 or 6 to 10 million gallons daily was limited to connecting the systems at the nearest possible point—viz., Southwark, where the Southwark and Vauxhall Company had a 20-inch main. There was a certain demand on this main in the Southwark and Vauxhall Company's own district; and to increase the supply through it, it was connected with a reservoir 200 feet, instead of to one only 150 feet above Ordnance datum. This worked fairly well. If it were sought to increase the quantity, there ought to be an additional main from Nunhead to the Tower Subway. Witness preferred No. 2 scheme, and believed that it would solve the whole difficulty. His Company were getting no water now from the Chelsea Company, the connection not yet having been made. But such a connection was practically arranged between the two Boards. If the connection were utilized, he supposed they would have to risk the legality of the use of the supplied water. The pipe across the Thames from his Company's district to that of the East London Company was carried through the Tower Subway under a seven years' agreement with the Hydraulic Power Company, to whom way-leave was paid. He did not think the size of the main could be increased; but by increasing the velocity of the water, they could add to the amount passing.

Some discussion then took place between Counsel as to the restrictions on inter-sale imposed by the various Acts of the Companies and as to the freedom which was given under the Thames Conservancy Act of 1894. But no general agreement was come to as to what were the powers and restrictions.

Mr. T. F. Parkes, Engineer to the Lambeth Company, said that, with their present plant and appliances, the Company could spare no water at all during their time of maximum supply—viz., July and August. Storage works at Molesey and new mains were about to be laid, which would enable the Company to contribute to an inter-communication scheme. A pumping-main from Ditton to Brixton, and an unfiltered water main from Molesey, would be proceeded with almost immediately. With these works, further powers to take more water from the Thames, and some new filter-beds, they might give, even during July and August, 5 or 6 million gallons. Then there was a well being sunk at Selhurst, which would give 2 million gallons daily; but this would not be completed for two or three years.

Cross-examined by Mr. FREEMAN: Their actual power of abstraction from the Thames was 24 million gallons daily; and during September their consumption was 31 million gallons. The balance was made up, not from the Thames, but from water pumped from the gravel beds near the Thames at West Molesey. He did not think this was Thames water. It stood in the gravel at a level below that of the river.

The Commission then adjourned.

The thirty-fourth sitting of the Commission was held yesterday—Lord Llandaff presiding. Mr. W. B. Bryan, the Chief Engineer to the East London Water Company, was called and examined regarding the Company's supply during the last few months. The population supplied was 1,800,000. In June last the average daily supply was 42,563,000 gallons; in July, 44,959,000 gallons; in September, 33,149,000 gallons; and in October, 34,202,000 gallons. Up to the 22nd of August, when the intermittent supply commenced, the figure was 43,107,000 gallons, and for the whole of the month it was 40,656,000 gallons.

**Gift of Water-Works.**—At a meeting of the ratepayers of Bulmer, one of the villages on the Earl of Carlisle's Castle Howard Estate, last Thursday, his Lordship's clerk of works (Mr. Reavell) stated that Lady Carlisle proposed to hand over the village water-works to the parish. They were constructed by the Earl a few years ago; and since they were opened, the tenantry have enjoyed a free supply of water, while freeholders using it have been charged a nominal sum. The Chairman (Mr. W. Peacock) characterized the offer as a very liberal one—a sentiment which was frequently reiterated during the meeting.

**The Brightlingsea District Council and the Water-Works.**—Last Thursday, Mr. H. P. Boulnois, one of the Local Government Board Inspectors, held an inquiry at Brightlingsea into the proposal of the District Council to borrow £9000 for the purpose of purchasing the Water Company's undertaking. Mr. W. I. Osborne, Clerk to the Council, stated that the area of the town was 2873 acres, with an estimated population of 4238 in 1897. The rateable value was £11,273, and at present there were about 1100 houses, 750 of which obtained their water supply from the Company, 380 depending upon surface wells. The Council had agreed to purchase the undertaking for £4500, and had acquired a site for the new well from which the supply was to be obtained. The Company's revenue in 1897 was £388. There were 380 houses which had no water, but which would be provided with a supply under the new scheme; and he estimated the revenue from these at £164—thus making a total of about £552. The expenditure was estimated at £168; leaving a net income of £384. If they borrowed the £9000 at 3 per cent., some £460 per annum would be necessary for repayment of loan and interest; and deducting from this amount the £384 net income, only £76 remained to come from the rates. The Council were satisfied that in three years the scheme would be a source of profit to the ratepayers. Mr. Goodyear, the Borough Surveyor and Engineer to the Council, gave details of the proposed new works, and said the tank would have a storage capacity of 71,000 gallons. Dr. Cooper, the Medical Officer of Health, supported the application.



## METROPOLIS WATER SUPPLY.

## Rainfall and Flood Water.

In their report to the Official Water Examiner for the Metropolis (Major-General A. de Courcy Scott), on the quality of the London Water Supply in the past month, Sir W. Crookes and Professor Dewar state that of the 182 samples examined by them, all were found to be clear, bright, and well filtered. The rainfall at Oxford during the month was 4.59 inches. As the average for the last thirty years is only 2.57 inches, there was an excess of 1.84 inches. This reduces the deficiency for the year to 6.38 inches, or 30.09 per cent. The report concludes with the following observations:—

The average daily flow of the Thames over Teddington Weir, for the present year to the end of the drought, is 550 million gallons, as compared with 826 million gallons, the average daily flow for the same period during the ten preceding years. Thus there has been a deficiency of one-third in the average daily flow of the river since the beginning of the year to Oct. 17, when the drought ended.

The extraordinary drought—the most severe for at least 40 years—having ended, there are several matters which deserve consideration. The average bacteriological condition of the raw unfiltered Thames and Lea waters during that period was exceptionally good, seeing that the bulk of the supply was spring water. The condition of the filtered water supplied to London was excellent; and in the case of the East London supply, the quality was substantially the same as during similar seasons when the supply of water was ample.

The large rainfall which took place in October has had the effect of suddenly washing into the rivers organic matter accumulated on the watershed during the three previous months; and as the reservoirs of the East London Company were almost empty at the end of September, the Company was forced, in October, to use the Lea, without the advantage of the purification resulting from proper storage in the reservoirs. During this critical time, we took extra pains to ascertain the character of the East-end supply, and additional samples were regularly taken from various points in the district. It is highly satisfactory to report that, in spite of the severe strain thus thrown on their filtering appliances, the clear water supplied to East London has been bacteriologically better than it was during the months of August and September.

It has been shown over and over again in these reports that, as a matter of fact, the bacteriological quality of the London Water Supply does not depend on the use or rejection of flood water, but upon the proper regulation and the efficiency of the filtration. This has long been conducted substantially under the supervision of the Official Water Examiner appointed under the provisions of the Metropolis Water Act, 1871. The direct use of water from the river during a prolonged flood, depending somewhat on the time of year, may result in the filtered supply containing in solution a little additional vegetable matter, thereby slightly adding to the brown colour; but, in our experience during the last fifteen years, we have seldom, if ever, known the colour of the London Water Supply, in its most peaty condition, to equal that of the average colour of Loch Katrine, Thirlmere, or the Welsh Lakes.

## THE PROJECTED WELSH WATER SUPPLY SCHEME FOR LONDON.

The Report of Sir B. Baker and Mr. G. F. Deacon.

(Concluded from p. 1050.)

The fourth part of the report consists of the following concluding observations:—

In accordance with the terms of the reference, we have reported on the suitability and sufficiency of the Chief Engineer's proposed Welsh supply, and on the practicability and the cost of carrying out schemes of storage for providing 200, 300, and 400 million gallons per day respectively from the Thames on the lines of the Royal Commission report. The result of our investigations has led us to increase somewhat the magnitude of the works required for the Staines project, and in the Welsh project to omit some reservoirs and include others for compensation purposes. Having done this, we think the projects and the costs per unit as fixed by the projectors are fairly comparable.

The Welsh scheme would deliver water of unexceptionable quality—as good, no doubt, as the waters of Loch Katrine, Thirlmere, or Vyrnwy. Neither Glasgow nor Manchester thinks it necessary to filter such water. But Liverpool does filter it; and the Chief Engineer—rightly, we think—proposes that London should do the same. As to which portion of the Welsh scheme should be first carried out we cannot, in the absence of the necessary details and surveys, offer a final opinion; but, on the information before us, we think it probable that the Wye sources will prove the more generally advantageous.

If enlarged in the manner we have indicated, the Staines scheme would, we think, supply the stated quantities of water; but the quality, in our opinion, would not always be that apparently intended by the Royal Commission, since water in which the impurities were as great as they are on the average during the first 15 days of a flood of 2300 million gallons per day, would frequently be taken into the reservoirs, and even to the filters direct.

That the reservoirs would have a beneficial action in assisting the proper working of the filters we have no doubt; but we do not think any system of filtration, except a double and perfectly overlapping system, will at all times secure immunity from the passage of impure water, considering that, in the words of the Royal Commissioners, with which we concur, “a new filter”—i.e., new in the sense of newly cleansed—“composed of perfectly purified sand, has little or no effect in producing either chemical or bacteriological purification.”

Having reference to the character and extent of the present London water-works, and to the length of time which must elapse before any radical alteration of the system of supply could be effected, it is clear that neither the Staines nor the Welsh scheme, in its entirety, nor the estimate for either project, applies exactly to existing circumstances; and the most important and generally useful part of the reference to us is

therefore the instruction to take into consideration the whole of the circumstances of the case, and to advise the Council whether, in our opinion, it would be more advantageous to bring into London from the proposed Welsh sources than from the Thames the additional quantity of water over and above the quantity at present supplied.

In considering the question from a practical point of view, it is necessary to remember that for the next ten or fifteen years the Thames must be the chief source of supply, and that there is little reason to suppose it will ever be entirely abandoned as an alternative or contributory source. In 1911, the quantity of water required by London will not, at the present rate of increase, exceed the existing powers of the Water Companies, which include supplies of 165 million gallons from the Thames and 120 million gallons from the Lea and elsewhere, or 285 million gallons in all; so that as regards statutory power no difficulty need arise from the delay incidental to the adoption of a Welsh project, except such as may be inseparable from the present divided administration.

We will for the purpose of comparative estimates assume that whether the Welsh supply be adopted or not, there would, before that supply could become available, be 165 million gallons per day taken from the Thames. The question, therefore, is whether twelve or fifteen years hence—say, in 1912—it would, on the whole, be more advisable to gradually increase that 165 million gallons as the growth of the population might require, or to introduce a supply of 200 millions in one or more instalments from Wales, and to correspondingly reduce the quantity pumped from the Thames and other sources.

As regards capital expenditure, no figures are required to show that it must necessarily be more costly to bring water from Wales than from Staines; and further, while the Welsh scheme must be commenced earlier than the Staines, and be completed to the extent of one or two reservoirs, and the greater part of one of the aqueducts, before it becomes available, while the latter may be completed in smaller sections, the interest during the construction must be somewhat greater proportionately than the capital expenditure in the respective cases. On the other hand, the working expenses would all be in favour of the Welsh scheme, by reason of the cessation of pumping charges, and the reduced working charges on filters and settling reservoirs.

We have considered many alternative ways of presenting our views as to the respective costs of the two systems of supply, and have thought, on the whole, that the price per 1000 gallons of water distributed would be the most generally understood unit of comparison. In relation to this comparison, it is to be observed that the Staines scheme can only be worked on the conditions laid down, if it is made to apply to the whole of the water drawn from the Thames—that is to say, not only to the increment of volume between the present and the later date, but to the original volume also. If it did not so apply, the reservoirs, in order to maintain a flow of 200 million gallons a day over Teddington Weir, would have to be very much larger and more costly.

Let us suppose that either one, two, or three instalments of one of the 200 million gallon Welsh schemes were brought to London in 1911, when the pumping from the Thames would be nearly the statutory maximum of 165 million gallons a day. A portion of the pumping expenditure on the Thames, and possibly on the Lea also, would immediately cease, and the present excess of pumping in dry weather would be relieved. The wet weather difficulty would also be removed, because turbidity would be confined to a much smaller quantity of water with which slower filtration could be practised, and if it were thought desirable that settling reservoirs should be constructed to prevent the choking of the filters during floods, their size would be insignificant by comparison with the huge storage reservoirs which the Staines scheme at present demands to prevent the fall of the river below 200 million gallons a day at Teddington.

If, on the other hand, an attempt were made to apply the Staines scheme as a general solution for the future, not only must it be applied to the various increments of supply after 1911, but to the whole quantity previously pumped also. If the necessary Act of Parliament were obtained in 1898, we think there would be no difficulty in securing Welsh water before 1911. In the alternative of the adoption of the Staines scheme, the works must be ready by the same date, and must have been constructed for the 165 million gallons a day, and for a small additional quantity to go on with, increasing to 66½ millions, plus that small additional quantity, in 1924, thirteen years later. We believe that such works would take about half as long to construct as the first instalment of the Welsh scheme, and we have apportioned interest on capital accordingly. The latter supplies from the Staines scheme (so far as it could be carried) might be extended in instalments of about 40 million gallons a day.

We will assume in the first instance that the whole of the 200 million gallons of Welsh water is brought to London in 1911, and that the pumping charges are proportionately reduced. Upon these conditions, on the views of the Royal Commission as to increase of population and of demand for water, and on the assumption that interest and sinking fund can be provided for a rate of 3 per cent., we arrive at the following conclusions regarding the relative costs per 1000 gallons of the additional supply from Wales and from the Thames: (a) That until 1911 the question of the relative cost per 1000 gallons does not arise. (b) That in 1911 the supply from the Thames would probably be 165 million gallons per day, and from other existing sources 120 million gallons; being 285 million gallons in all, which is the total quantity for which statutory powers have been at present obtained. With the additional quantity of 200 million gallons from Wales, this would suffice for London for a further period of 33 years after 1911, or until the year 1944, and additional supplies could be obtained from Wales as might be required. (c) That with the Staines reservoir project, in the same year (1944) the supply would be 365 million gallons from the Thames, and 120 million gallons from other sources. (d) Dividing the interval between 1911 and 1944 into three periods of eleven years each, we find that for the first period the extra cost of the purer and softer Welsh water would be less than 1d. per 1000 gallons; for the second period, less than ½d.; while for the third period it would be practically nil. The preceding figures would be varied if the 200 millions were brought from Wales to London in successive instalments, but not to an extent affecting the deductions to be drawn from them.

Our opinion as engineers as to what would be the “more advantageous” course to adopt, assuming the above estimates to be reasonably correct, is, of course, not worth more than that of others who are not engineers.



But we have been asked to give our "best advice to the Council;" and we therefore venture to make the following general remarks:—

The Royal Commissioners observe that they "are well aware that a certain prejudice exists against the use of drinking water derived from the Thames and the Lea, because those rivers are liable to pollution." On this we would remark that the two rivers are actually and seriously polluted; and it is impossible to foresee whether the prejudice on this account may not increase for the future. The Council have to consider, not what are the present views of the majority of the ratepayers, but what may possibly be the views of their successors, say twenty years hence; for it is the future rather than the present generation that would be most affected by any decision the Council may now make.

The whole history of the London Water Supply shows a steady and continuous demand on the part of the public for increased purity of water; and we have no reason to assume that the desire to get the purest water reasonably attainable will cease to grow. Experience elsewhere has proved that the quantity and quality of water insisted upon in any given place depend at least as much upon the "prejudices" and "sentimental objections" of the inhabitants as upon hygienic considerations.

Happily the evidence brought before successive Royal Commissions as to the general quality of water at present supplied, notwithstanding the pollution of the source of the supply, relieves the Council from the necessity of adopting any heroic measure, such as the entire abandonment of the Thames and Lea in the interests of public health; but it does not relieve them from the necessity of giving due weight, as regards any additional supply, to the "prejudice" which the Royal Commissioners refer to in their report. No one acting for himself personally with regard to a water supply to his own country house would allow a small difference in cost to determine whether he should go to a pure spring or to a stream into which some other house drained, although the latter might be so remote that he could allege no better reason for his decision than "prejudice." It appears to us that in coming to a decision upon so vital and irrevocable a question as the additional supply of water to London for a long series of years, the safer course would be to act for future generations as our instinctive and deeply-rooted feelings in favour of pure water would lead us to act for ourselves. It is true that the results of chemical and biological researches in relation to filtered Thames water are eminently reassuring; but it is necessary to remember that science has not said the last word on this or any other subject.

In following the course suggested, entire consistency, we venture to think, would be preserved with the admittedly proper action of public bodies generally in matters relating to pure air and pure water. Thus the restriction of the heights of houses in streets of certain width, and the pecuniary loss thereby imposed upon owners, is justified upon broad general principles, and not upon the number of bacteria observable in different streets. It is held reasonable also to insist upon certain minimum heights of rooms in new buildings as conducive to purity of air, although this involves increased cost; but it would be held unreasonable, except in extreme cases, to order the demolition of existing and otherwise good buildings because they did not comply with the same requirements. Similarly, it might be considered unreasonable to dispense with the existing water supply from the Thames and the Lea, and at the same time quite reasonable to insist upon an unpolluted supply for future requirements, and this notwithstanding that some increase in cost may be involved.

It is hardly necessary to observe that the Royal Commissioners, in their report, recommend on hygienic grounds that the water should be delivered for consumption in as unpolluted a condition as large subsidence reservoirs, perfect filtration, and the exercise of all possible vigilance in preventing unnecessary contamination of the Thames would admit; and *a fortiori*, apart from the question of cost, an initially unpolluted supply must have met their approval. The Commissioners also acknowledge the existence of a "not unnatural sentiment against drinking water which, though wholesome, has been polluted at an earlier stage;" and the strongest advocates of the Thames supply admit that the wholesomeness of such water depends upon efficient filtration which has not always been secured in the past.

Apart, however, from satisfying sentimental objections and hygienic doubts, the adoption of the Welsh project for additional supplies would have the further advantage of introducing a volume of soft water to London, and of leaving a corresponding body of land water in the river to dilute the sewage, and to clear the bed and banks of deposits.

As regards the first point, we adopt the conclusion of the Duke of Richmond's Commission of 1869—"That, for washing and for manufacturing purposes generally, soft water is preferable, as more efficient and economical; but there appears no means of expressing the amount of saving in a money estimate." We agree also that this advantage does not in itself render it "necessary" to go to a great distance for soft water. As regards the abstraction of water from the Thames, there is even a greater difficulty in expressing the results in a money estimate; but we do not think any hydraulic engineer would question the serious disadvantage of extending the present period of minimum flow of 28 days in any year to more than 200 days.

Summarizing our views generally "on the whole of the circumstances of the case," and therefore sometimes upon matters governed by personal feeling rather than by engineering principles, which we should not have ventured to do had the terms of the reference not imposed this duty upon us, we may state our general conclusions as follows:—

- 1.—That for the next ten or fifteen years the Thames must necessarily remain the chief source of supply for London.
- 2.—That together with the wells and probably the Lea, the Thames will always be maintained as an alternative or contributory source of supply, if for no other reason than that set forth by the Duke of Richmond's Commission—namely, the undesirability of any change by which the Metropolis would become dependent upon a single source of supply which might be liable to accidental interruption.
- 3.—That the evidence brought before the Royal Commission as to the quality of the existing supply when perfectly filtered shows that there is no reason for entirely abandoning the present sources of supply, though views differ widely as to the maximum quantity which may be taken from the Thames with impunity.
- 4.—That the practical question for decision within the next year or two

is whether twelve to fifteen years hence the additional supply shall come from the Thames or from Wales.

5.—That the personal prejudices and sentiments of the public, rather than the opinions of engineers, chemists, and accountants, are the most powerful factors in deciding such questions, and therefore it is not necessarily a wise course to accept the lowest tender and take an inferior article where water supply is concerned.

6.—Personally, we should feel no hesitation in deciding that the additional supply of water should, as far as possible, come from Wales, because we should then, in our opinion, have had all reasonable regard both to true economy and to existing and future prejudices and sentimental or real objections to an initially polluted and subsequently more or less purified supply. We should in short be doing for the population collectively what we should be doing for ourselves individually in going to a pure spring, if there were one reasonably available, for our own domestic supply, although it might involve a little more trouble and expense.

7.—The extra trouble and expense to individual households in London of getting the additional supply of water from the purest source available rather than out of the nearest stream would be insignificant compared with that willingly incurred by country residents and cottagers for the same object, since on the basis of the figures given in this report for the first 200 million gallons a day, it would involve an additional expenditure of less than a penny per week for an average household, whilst for the second instalment of 200 million gallons the Welsh water would be the cheaper of the two.

### TORQUAY CORPORATION WATER ARBITRATION.

(Before Mr. E. P. SQUAREY, Umpire.)

Arbitration proceedings were commenced at Exeter on Thursday, the 3rd inst., to determine the value of certain land which the Torquay Corporation propose to acquire in the Trenchford Valley, part of the watershed which they are authorized by their Act of last year to purchase. Mr. H. DREW was Arbitrator for the claimants; Mr. A. RENDALL for the Corporation.

The first case taken, which related to the value of land, was that of Mr. G. WILLS, the owner of the Pepperton Estate.

Mr. H. E. DUKE, opening his case, pointed out that the estate formed part of the watershed; and if they did not acquire it, the Torquay Corporation would have to become customers of Mr. Wills, which gave it an extra value. It had been estimated that on this land they could be sure of getting 120 million gallons of water, which without compulsory powers the Council would be bound to have from him. The Torquay water was sold at 1s. 4d. per 1000 gallons; and if they put on a royalty of ½d. per 1000 gallons it would produce £225 per annum.

Mr. Wills, who described himself as an Australian merchant, said he did not wish to sell the land. He was brought up on it; and it was the ambition of his life to farm it. He would be willing to pay the Corporation £5000 if they would withdraw their proposal. He paid £6850 for the Moor Barton farm, £1800 for Didworthy, and £3045 for Pepperton; and he had spent £4400 on improvements at Didworthy, and £6700 on improvements at Moor Barton. He had no vouchers for these payments. It was not a financial speculation on his part, but a hobby; and he may have spent money foolishly.

Mr. A. E. ELLIS, a land valuer and surveyor of Exeter, said that the Pepperton Estate consisted of 1173 acres, of which the Corporation proposed to take altogether 422 acres. His estimate of the value of the land was as follows: 231 acres at Moor Barton, net rental £274, which at 30 years' purchase was £8220; sporting rights value, £600; timber at a valuation, £1250; machinery, £50; compulsory purchase, 25 per cent., £2550; severance damage in respect of the 102 acres, £510. On the same lines he put the value of Didworthy at £6195, and added £1500 in respect of damage sustained as a residential property.

Cross-examined: The price for the Moor Barton property worked out at £55 or £56, and for the other land at £32 an acre. He was not aware that other property was bought by the Corporation in the same neighbourhood for £15 5s. an acre.

Similar evidence was given by Mr. A. LOVEYS, of Moreton Hampstead, and Mr. H. DREW, of Exeter.

Mr. G. D. BELLAMY, Consulting Engineer to the Plymouth Corporation, said the whole land was more or less water bearing. He had taken the mean rainfall at 35 inches, which was the lowest he could find. He estimated that 40 per cent., or 14 inches, could be collected. The area that could be underdrained was, he believed, 382 acres; and, roughly speaking, they would be capable of collecting 121 million gallons per annum. At a low charge of ½d. per 1000 gallons, this would bring in a revenue of £252 a year, which might be capitalized at 20 years' purchase. Looking at the nature of the Torquay water undertaking, he considered that this added to the value of the land.

Mr. BALFOUR BROWNE asked witness if he considered that the rainfall on this land was worth £7500 a year.

Witness said he thought it was worth ½d. per 1000 gallons. He had not calculated how much it would cost to collect the 120 million gallons. Torquay might be getting all this water now, but it could be diverted by the owner of the land.

Mr. BALFOUR BROWNE, for the Corporation, agreed that Moor Barton was a good farm, and had been much improved; but he said it was a novel expedient to take all the money spent on it, add it to the original purchase-money, and say that this represented the present value. Moreover, 30 years' purchase was too high a figure; and the most that could be expected from the Corporation was 25 years' purchase, which, at their estimate of the rental—£200 gross and £166 net—worked out at £4150. Mr. Bellamy's figures about the water had surprised him; and he submitted that no claim could be made in respect to that. Allowing for the compulsory sale, the severance, timber, and machinery, the Corporation put the value of Moor Barton at £5750, and of Didworthy at £2897, or a total of £8647. This was nearly half of the lowest of the claimant's figures, which, for a compensation case, was almost unanimity.

On the resumption of the proceedings on the following day, Mr. A. S. RENDALL, Mr. E. J. SANDY, and Mr. A. BODY gave evidence on behalf of



the Corporation as to the value of the estate; and Mr. W. Ingham, Water Engineer to the Torquay Corporation, put in returns as to the rainfall.

In the case of Mr. William Addems, the owner of the Clampitt farm, the valuations were as follows: Mr. Loveys, £5900; Mr. E. Desmond, £5761; Mr. Drew, £5940. For the Corporation, Mr. Rendall's estimate was £3025; Mr. Body and Mr. Sawdye corroborating.

The Trustees of the late Thomas Loveys claimed £5200 in respect of the Kennick farm; while the Corporation witnesses put the amount at only £3000.

In the case of the Trustees of the late William Addems, £950 was claimed for part of the Elsford farm. The valuation according to the Corporation witnesses was from £400 to £500, including compensation for severance.

The sitting was concluded on the 5th inst., when the case of the Bullator farm was taken. The owners put their claim for compensation at between £2500 and £2800, while the witnesses for the Corporation held that the value was not more than £1530. In the case of Mr. N. Addems, of the Middle Westcott farm, the claim was £860, and the Corporation value £200.

### STOCKTON AND MIDDLESBROUGH WATER SUPPLY.

#### The Grassholme Reservoir Scheme.

At the Meeting of the Middlesbrough Town Council last Wednesday, Alderman Bell moved resolutions sanctioning application to Parliament by the Joint Water Board to alter the name, if desired, to amend the Act of 1876 in connection with the Grassholme reservoir, to secure some modification of the obligation to supply water to manufacturers at 3d. per 1000 gallons, and to increase the Board's borrowing powers by £344,304. The Alderman explained that they had only powers at present to supply, out of the quantity of water at their command, 100 million gallons per week; and as they were already supplying 82 millions, it was necessary that they should exercise their further powers to construct the Grassholme reservoir, to enable them to provide 190 million gallons per week. If the growth of the district continued in the future, as they had reason to expect it would, it would mean that in ten years, which were needed to construct the reservoir, they would be requiring more water than they had. It was true that this would be a demand upon the ratepayers' money of £16,000; but £10,000 would be for redemption—thus buying a valuable property, although the balance, no doubt, was a direct loss. But their position in ten years would be that only a loss of £2600 per annum would be involved on the assumption that they then supplied 95 million gallons per week. The probability, however, was that they would supply nearer 100 million gallons; and every gallon of water they sold would be a reduction of the charge upon the rates. They would have 190 million gallons available; and they could widen their area of supply. Every million gallons sold means a relief of £15 or £16 per week to the rates. He was sanguine the deficit would soon be wiped off.

They were administering the works much cheaper than the old Company, whose cost was £3 10s. 1d. per million gallons, against £2 14s. to-day. Several members of the Council wished for an adjournment, to consider so vast a scheme. Alderman Bell explained that notices must be published by the 19th inst., and there was not time; but that the Council were only committing themselves to a general resolution, and he would guarantee ample opportunity for full discussion of details. He would undertake, moreover, that if the Council were not convinced of the necessity of the steps suggested, the Bill would not be proceeded with. The resolution was adopted by 17 votes to 16. In the Stockton Town Council this matter was discussed on the same day, and adjourned till Friday.

**Bedworth Water Supply.**—The ceremony of laying the foundation stones of the water-tower in connection with the Bedworth Water-Works was performed on the 5th inst. The stones were laid by the Chairman and Clerk of the Foleshill District Council, the local representatives of the Council, the Chairman, Vice-Chairman, and Secretary of the old Parochial Committee, and the Chairman of the Bedworth Parish Council. The works have been entrusted to Mr. Amos Jenkins, and they will cost £9700. Mr. H. B. Nicholls, of Birmingham, is the Engineer of the scheme. The yield of water has averaged 210,240 gallons in 24 hours; and as only about 80,000 gallons are required at present, the supply will be ample for the needs of the district.

**Water Divining.**—A water-finder recently met with some success on an estate near Chippenham. He located a spring at 100 feet, and sank a 6-inch artesian tube-well, with the result that water has been found at 104 feet. It was a mineral spring. A second spring was located about 400 yards from the first; the estimated depth being 150 feet. Water was found at 158 feet. This proved to be a magnesia spring. There was about 110 feet of water in the well, which was pumped four days at the rate of 17,280 gallons per day. The same diviner located excellent springs on an estate near Brighton. He sank a 6-inch artesian well, and found an abundant supply of water; and a 9-inch one, which will run double pumps, is to be sunk, as well as a 6-feet external diameter cylinder well to the depth of 200 feet.

**Otley Water Scheme.**—The Otley District Council on the 7th inst. decided to promote a Bill in Parliament to carry out the new scheme of water supply which was referred to in a paragraph last week. The resolution stated that the Bill is "to enable the Council to purchase (otherwise than by agreement) the water rights of certain owners of a stream called Bow Beck, situated at Middleton and Denton, and the right to lay water-pipes and make conduits through certain lands at Middleton, Denton, Askwith, Weston, and Newall-with-Clifton, and also to purchase (otherwise than by agreement) land in one or more of the said townships, for the purpose of constructing a reservoir or reservoirs, and to construct such other works as may be necessary for improving the supply of the said district with water from the said stream." The estimated cost is £35,000. The Ilkley District Council have appointed a Committee to see that their interests are not prejudicially affected by the scheme.

### GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1084.

| Issue.    | Share. | When ex-Dividend. | Dividend or Bonus. | NAME.                       | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue.    | Share. | When ex-Dividend. | Dividend or Bonus. | NAME.                                | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|-----------|--------|-------------------|--------------------|-----------------------------|-----------------|---------------------|------------------------|-----------|--------|-------------------|--------------------|--------------------------------------|-----------------|---------------------|------------------------|
| £         | p. c.  |                   |                    | GAS COMPANIES.              | £ s. d.         |                     |                        | £         | p. c.  |                   |                    | GAS COMPANIES.                       | £ s. d.         |                     |                        |
| 590,000   | 10     | Oct. 13           | 104                | Alliance & Dublin 10 p. c.  | 204-213         | ..                  | 4 17 8                 | 75,000    | 5      | June 29           | 6                  | Malta & Medn., Ltd.                  | 43-54           | ..                  | 5 14 3                 |
| 100,000   | 10     | July 1            | 7                  | Do. 7 p. c.                 | 16-17           | ..                  | 4 8 3                  | 541,920   | 20     | Nov. 11           | 5                  | Monte Video, Ltd.                    | 13-14           | ..                  | 7 2 10                 |
| 800,000   | 100    | Nov. 11           | 6                  | Australian 5 p. c. Db.      | 105-107         | ..                  | 4 13 6                 | 617,946   | Stk.   | Aug. 31           | 94                 | Newt'le & Gathes'd Con.              | 230-240         | ..                  | 4 1 3                  |
| 200,000   | 5      | Aug. 12           | 6                  | Bombay, Ltd.                | 62-67           | ..                  | 4 2 11                 | 252,355   | Stk.   | Jan. 3            | 34                 | Do. 5½ p. c. Db. Stk.                | 113-117         | ..                  | 2 19 10                |
| 40,000    | 5      | Aug. 12           | 6                  | Do. New, £4 paid            | 42-43           | ..                  | 5 1 1                  | 150,000   | 5      | May 26            | 8                  | Oriental, Ltd.                       | 72-73           | ..                  | 5 3 3                  |
| 880,000   | Stk.   | Aug. 12           | 12                 | Brentford Consolidated      | 275-280         | ..                  | 4 5 9                  | 135,000   | 5      | "                 | 8                  | Do. New, £4 10s. pd.                 | 64-7            | ..                  | 5 2 11                 |
| 240,000   | "      | "                 | 9                  | Do. New                     | 210-215         | ..                  | 4 3 9                  | 15,000    | 5      | "                 | 8                  | Do. do. 1879, £1 pd.                 | 12-13           | ..                  | 4 11 5                 |
| 50,000    | "      | "                 | 5                  | Do. 5 p. c. Prf.            | 140-145         | ..                  | 3 9 0                  | 60,000    | 5      | Sept. 29          | 7                  | Ottoman, Ltd.                        | 6-54            | ..                  | 6 6 2                  |
| 159,375   | "      | June 10           | 4                  | Do. 4 p. c. Db. Stk.        | 130-135         | ..                  | 2 19 3                 | 500,000   | 100    | June 1            | 6                  | People's Gas & 2nd M. of Chicago Bd. | 103-108         | ..                  | 5 11 1                 |
| 220,000   | Stk.   | Sept. 15          | 114                | Brighton & Hove, Orig.      | 263-268         | ..                  | 4 5 10                 | 848,070   | 10     | Oct. 13           | 6                  | River Plate Ord.                     | 9-94            | ..                  | 6 6 4                  |
| 226,820   | "      | "                 | 84                 | Do. A. Ord. Stk.            | 190-195         | ..                  | 4 7 2                  | 250,000   | Stk.   | June 29           | 4                  | Do. 4 p. c. Db. Stk.                 | 99-101          | ..                  | 3 19 3                 |
| 933,560   | Stk.   | Aug. 31           | 5                  | Bristol, 5 p. c. max.       | 125-130         | ..                  | 3 16 11                | 250,000   | 10     | Sept. 29          | 10                 | San Paulo, Ltd.                      | 143-154         | ..                  | 6 9 0                  |
| 420,000   | 20     | Sept. 29          | 10                 | British                     | 492-503         | ..                  | 3 19 1                 | 135,000   | Stk.   | Sept. 15          | 10                 | Sheffield A.                         | 242-245         | ..                  | 4 1 8                  |
| 50,000    | 10     | Aug. 12           | 113                | Bromley, Ord. 10 p. c.      | 25-27           | ..                  | 4 5 2                  | 209,053   | "      | "                 | 10                 | Do. B.                               | 242-245         | ..                  | 4 1 8                  |
| 75,000    | 10     | "                 | 84                 | Do. 7 p. c.                 | 20-22           | ..                  | 3 17 3                 | 447,427   | "      | "                 | 10                 | Do. C.                               | 242-245         | ..                  | 4 1 8                  |
| 500,000   | 10     | Oct. 13           | 6                  | Buenos Ayres (New) Ltd      | 92-10           | ..                  | 6 0 0                  | 5,600,000 | Stk.   | Aug. 12           | 51                 | South Metrop., 4 p. c. Ord.          | 138-142         | ..                  | 3 15 1                 |
| 98,122    | Stk.   | June 29           | 4                  | Do. 4 p. c. Db. Stk.        | 98-100          | ..                  | 4 0 0                  | 1,460,000 | "      | July 14           | 3                  | Do. 3 p. c. Db. Stk.                 | 102-105         | ..                  | 2 17 2                 |
| 150,000   | 20     | July 14           | 81                 | Cagliari, Ltd.              | 29-30           | ..                  | 5 10 0                 | 60,000    | Stk.   | Aug. 31           | 12                 | Tottenham and A.                     | 280-290         | ..                  | 4 2 9                  |
| 100,000   | 10     | Sept. 29          | 7                  | Cape Town & Dis., Ltd.      | 14-15           | ..                  | 4 13 4                 | 60,000    | "      | "                 | 9                  | Edmonton B.                          | 200-210         | ..                  | 4 5 9                  |
| 50,000    | 50     | Nov. 2            | 6                  | Do. 6 p. c. 1st Mort.       | 57-59           | ..                  | 5 1 8                  | 182,380   | 10     | June 10           | 7                  | Tuscan, Ltd.                         | 102-112         | ..                  | 6 1 9                  |
| 550,000   | Stk.   | Oct. 13           | 124                | Commercial Old Stock.       | 310-320         | ..                  | 4 4 5                  | 149,900   | 10     | July 1            | 5                  | Do. 5 p. c. Dbs. Red.                | 100-103         | ..                  | 4 17 1                 |
| 200,750   | "      | "                 | 104                | Do. New do.                 | 247-252         | ..                  | 4 3 4                  |           |        |                   |                    |                                      |                 |                     |                        |
| 200,750   | "      | June 10           | 43                 | Do. 4½ p. c. Db. do.        | 148-153         | ..                  | 2 18 10                |           |        |                   |                    |                                      |                 |                     |                        |
| 800,000   | Stk.   | June 10           | 12                 | Continental Union, Ltd.     | 207-212         | ..                  | 5 13 2                 |           |        |                   |                    |                                      |                 |                     |                        |
| 200,000   | "      | "                 | 9                  | Do. 7 p. c. Prf.            | 193-198         | ..                  | 4 10 11                |           |        |                   |                    |                                      |                 |                     |                        |
| 51,600    | Stk.   | Aug. 31           | 14                 | Croydon A 10 p. c.          | 305-310         | ..                  | 4 10 4                 | 746,164   | Stk.   | June 29           | 104                | WATER COMPANIES.                     |                 |                     |                        |
| 168,400   | "      | "                 | 11                 | Do. B 7 p. c.               | 255-265         | ..                  | 4 3 0                  | 150,000   | "      | "                 | 5                  | Chelsea, Ord.                        | 313-318         | ..                  | 3 6 0                  |
| 555,000   | Stk.   | Aug. 12           | 51                 | Crystal Palace Ord. 5 p. c. | 125-130         | ..                  | 4 0 9                  | 160,000   | "      | "                 | 44                 | Do. 5 p. c. Prf.                     | 170-175         | ..                  | 2 17 2                 |
| 60,000    | "      | "                 | 5                  | Do. 5 p. c. Prf.            | 140-145         | ..                  | 3 9 0                  | 175,785   | "      | Sept. 29          | 43                 | Do. 4½ p. c. Prf. Stk. 1875          | 148-152         | ..                  | 2 19 3                 |
| 486,090   | 10     | July 28           | 11                 | European, Ltd.              | 23-24           | ..                  | 4 11 8                 | 1,720,560 | Stk.   | Oct. 18           | 7                  | Do. 4½ p. c. Db. Stk.                | 155-160         | ..                  | 2 16 3                 |
| 354,060   | "      | "                 | 11                 | Do. £7 10s. paid            | 17-18           | ..                  | 4 11 9                 | 654,740   | "      | June 29           | 42                 | East London, Ord.                    | 212-217         | ..                  | 3 4 6                  |
| 6,922,230 | Stk.   | Aug. 12           | 124                | Gaslight & Coke, A, Ord     | 286-291         | -2                  | 4 4 0                  | 390,000   | "      | "                 | 3                  | Do. 4 p. c. Db. Stk.                 | 157-160         | ..                  | 2 16 3                 |
| 100,000   | "      | "                 | 4                  | Do. B, 4 p. c. max.         | 120-125         | ..                  | 3 4 0                  | 700,000   | 50     | June 29           | 72                 | Do. 3 p. c. Db. Stk.                 | 103-105         | ..                  | 2 17 2                 |
| 665,000   | "      | "                 | 10                 | Do. C, D, E, 10 p. c. Prf.  | 308-311         | -1                  | 3 4 4                  | 310,000   | Stk.   | Sept. 29          | 4                  | G'd Junction, 10 p. c. max.          | 115-118         | ..                  | 3 3 7                  |
| 30,000    | "      | "                 | 5                  | Do. F, 5 p. c. Prf.         | 152-157         | ..                  | 3 3 8                  | 708,000   | Stk.   | Aug. 12           | 14                 | Do. 4 p. c. Db. Stk.                 | 138-143         | ..                  | 2 15 11                |
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| 1,061,150 | "      | June 10           | 4                  | Do. 4 p. c. Db. Stk.        | 131-133         | ..                  | 3 0 2                  | 500,000   | 100    | Aug. 12           | 134                | Do. 4 p. c. Db. Stk.                 | 139-143         | ..                  | 2 15 11                |
| 294,850   | "      | "                 | 43                 | Do. 4½ p. c. do.            | 148-153         | ..                  | 2 18 10                | 1,000,000 | Stk.   | July 28           | 4                  | New River, New Shares                | 435-440         | ..                  | 3 0 2                  |
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| 70,000    | 10     | Nov. 11           | 8                  | Hongkong & China, Ltd.      | 13-14           | -2                  | 5 14 4                 | 126,500   | 100    | "                 | 6                  | Southw'k & V'xhall, Ord.             | 165-170         | ..                  | 3 10 7                 |
| 3,800,000 | Stk.   | "                 | 10                 | Imperial Continental        | 217-222         | -1                  | 4 10 1                 | 489,200   | Stk.   | "                 | 5                  | Do. do. 7½ p. c. max.                | 160-165         | ..                  | 3 12 9                 |
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† Next dividend will be at this rate.



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## EDITORIAL NOTES.

## An Involved Incandescent Gas-Burner Lawsuit.

THE result of a piece of incandescent gas-burner litigation of a very peculiar and novel character is reported in our "Legal Intelligence" to-day. This is the case of *Hayes v. The New Incandescent Gas Company*, which turned upon a question arising out of a certain "deal" in incandescent burner patents. In the course of the proceedings, a point was raised (but not gone into) as to the principle covered by a De Mare patent which was alleged to be identical with that of the Kern burner now made by the Welsbach Company. The latter Company were no party to the present suit; but there was an allegation that they had been behind the plaintiff (who was negotiating for the purchase from the defendants of the De Mare patents) in a sense that should invalidate the bargain. It was pleaded that the plaintiff's object in acquiring the De Mare patents was to protect the Kern patent; but inasmuch as the latter patent is now the property of the Welsbach Company, the defendants objected to the turn of affairs, and declined to perform their contract of sale. Matters were complicated by the fact of the present defendants having instituted proceedings against the Welsbach Company, under the same De Mare patent, for infringement by the manufacture of the Kern burner. The anomalous position was thus created that the Welsbach Company were being sued for infringing a patent which was their own property, assuming the Hayes deal to hold good. Mr. Justice Romer has now decided that the contract in question was a *bonâ fide* one, and has decreed specific performance. Stay of execution was instantly granted, so that it is not safe to treat the matter as finally settled. But the practical effect of the judgment appears to be that the action of the Sunlight Patent Company against the Welsbach Company in respect of the Kern burner patent must be stayed. It is part of the settlement, however, that the Sunlight Patent Company are to have a licence to use the De Mare patents which they have sold to the plaintiff Hayes. Thus there will be a Sunlight burner which is also a De Mare burner; but whether this is the same as the Kern burner of the Welsbach Company is quite another story. At any rate, the Sunlight Company cannot attack the Kern patent from the ground of the De Mare patents with which this lawsuit is concerned, unless and until Mr. Justice Romer's judgment is revised by a Superior Court.

## The First Appeals under the Workmen's Compensation Act.

THE first appeals from County Court judgments under the Workmen's Compensation Act were heard and disposed of on Saturday. In one case, a stevedore was employed in discharging the cargo of a vessel lying at one of the quays of the Royal Albert Docks, being moored thereto. The unloading was effected by means of a hydraulic crane, standing on the quay; and the accident upon which the claim arose was an explosion of a case of percussion caps. The question was whether the Act applied. In order to ascertain this, a long string of definitions had to be adduced from the new Act, and also from the Factory and Workshop Act, 1895. The County Court Judge had given a decision in favour of the claimants. Counsel for the appellants argued that a ship does not form part of a dock; but the Court dismissed the appeal, without, however, defining when a ship is or is not a dock. The defendants were using a quay; and the injured workman was certainly employed "about" the crane by means of which the cargo was being discharged. In the other case, the plaintiff had been injured by a brick falling from a building in course of erection. When finished, the building would be four storeys high; but when the accident in question happened no part of the walls was up more than 26 feet. The Act does not apply to buildings less than 30 feet high; and the question was whether the actual or the complete height was to be regarded. The County Court Judge had decided against the claim; and the Court of Appeal confirmed the decision without calling upon Counsel for the defendants—marking that nothing could be plainer than the words of the Act.

## Industrial Legislation Actual and Prospective.

MR. CHAMBERLAIN spoke last week in Manchester upon various topics of actual and prospective political interest; and not the least important of these were the cognate subjects of Workmen's Compensation for Accidents, and



**Old-Age Pensions.** It has not hitherto been customary to regard these ideas as having any close connection with one another; but those newspaper writers and public speakers who have failed to perceive the relationship between them will be well advised to think the matter over in the light of this suggestion. Naturally, as a member of the Administration responsible for the Workmen's Compensation Act, Mr. Chamberlain is anxious to defend the principle of the Act, which he explains as being "that when a man is injured in the ordinary course of his employment without wilful misconduct on his own part, he is entitled to charge the compensation of that injury as a liability upon the business in which it took place." As a politician, also, he is concerned to show that the parallel Bill promoted by the other Party—Mr. Asquith's Bill—was a mistake, and was a Bill that would have profited the lawyers more than anybody else. Mr. Chamberlain claims for the existing Act that it is at least definite, and avers that it does not impose an undue burden upon the national industries to which it is applied. The industry which it was expected to hit hardest was coal mining; and Mr. Chamberlain, according to his manner in controversy, called by name on Sir Joseph Pease and Mr. Bainbridge to justify or withdraw allegations they made in this regard while the Bill was passing through the House of Commons. These representative coalowners said the Bill would put a tax of 3d. per ton upon the coal raised in England. The Northumberland and Durham Miners' Relief Fund has offered to take the whole burden of the Act for 0.7d. per ton, which the coalowners refused. Hence, whatever may be the causes of the advanced quotations for gas coals in this region, the Workmen's Compensation Act is not one of them, or not to an appreciable extent.

With regard to Old-Age Pensions, Mr. Chamberlain is in the difficult position of believing in the principle of securing "the veterans of industry—the men who have fought the good fight—from the worst consequences of failing power and of undeserved misfortune," while being unable to decide upon the means of carrying it out. Yet the problem is a pressing one, and is becoming more insistent every day with the rejection from employment of elderly men. Whatever else the Workmen's Compensation Act is doing, it is rendering it imperative upon employers to weed out from dangerous employments the men who, through age or bodily infirmity, are unable to take the fullest care of themselves. The masters are not to be blamed for this proceeding. It is only the industrial counterpart of the "short service" system, whereby the army is kept pruned of those "old soldiers" who were of no use with the Colours, even to themselves. All the same, the policy points directly to fresh legislation, when the way shall have been made clear.

#### Mechanical Road Traffic—Electricity Not In It.

IN view of the actual position of the problem of mechanical road traffic, and the series of articles now running through our columns, which aim at setting out the prospects of gas and electric tramway traction, it is worth recording that two years have elapsed since the relaxation of the laws relating to locomotion on British highways permitted self-propelled road carriages to show their paces. The anniversary was celebrated in London, in true British fashion, by a dinner organized by the "Automobile Club of Great Britain and Ireland." This cumbrously-named association has recently absorbed another society of similar aims; and the blended forces of the two organizations succeeded in getting together a respectable company to commemorate the coming into operation of the Locomotives on Highways Act. Mr. Shaw Lefevre, the Minister who, as President of the Local Government Board, was instrumental in procuring the statutory removal of the man with the red flag who was supposed to stand in the way of the improvement of mechanical road carriages, was present, and he made a not uninteresting speech. He confessed, however, that the removal of the statutory hindrance to the application of mechanical power to road carriages has not had the effect he anticipated from it. This is an old story. People clamour for the removal of what they fancy to be an artificial obstacle to their legitimate advances in a particular direction; and then, after the obstacle has been removed, they discover that they do not want to go that way. Mr. Shaw Lefevre was convinced, when in office, that Great Britain was behind other countries in the development of

the road motor; and he accordingly drew up a Bill "to remove the disabilities of antiquated legislation." Let us pause here just to remark how interesting it would be if these words formed part of the preamble of other Improvement Bills. At any rate, Mr. Shaw Lefevre had his desire. He "looked to the disappearance of horses from the streets within three or four years." Alas! the hope was vain.

On the morning of the same day, the third annual meet of the Motor Car Club in Whitehall was held, and was well attended. It is significant that, whereas the object of the first rendezvous of the kind was a drive down to Brighton, this year the bold motorists were content to get as far as Richmond Park, and (some of them) back again. We mention the meet here, because we have always taken a sympathetic interest in the subject since our esteemed contemporary the "Engineer" vainly offered a prize of a thousand guineas for a satisfactory road motor. Also, the progress of the road motor, such as it is, is a decided setback to the overweening pretensions of the electricians to have "the future" in their keeping. Mr. Shaw Lefevre twaddled very amiably in the evening about the ultimate solution of the problem of mechanical road traction being reserved for electric power. "Electricity" means as much in the mouths of such speakers as did "Mesopotamia" to the old lady of blessed memory. The fact remains that petroleum was far and away the most common source of power represented at last week's meet. A few of the now familiar yellow electric cabs that buzz along the streets of London with their carefully-limited loads were present; but otherwise electricity was not in evidence. This is a poor showing for the "motive power of the future;" for that which has no beginning rarely comes to any good.

#### Sir John Wolfe Barry on London Streets.

AN extremely interesting Inaugural Address was read at the opening meeting of the Society of Arts last week, by the Chairman of the Council, Sir John Wolfe Barry. It is a long time since we had the pleasure of following an engineering essay so well composed, and dealing with so happily-selected a subject. The Chairman's topic was the requirements of Modern London in the matter of street and thoroughfare accommodation—a tremendous subject indeed. Sir J. W. Barry's handling of it will greatly enhance his reputation. A Presidential Address, especially when intended for a Metropolitan audience, is a great difficulty; but, to paraphrase the adage, it is an even greater opportunity. On the occasion under notice, Sir John had the felicity of feeling that both his subject and the treatment he was able to give to it were exactly to the taste of his distinguished audience. The streets and thoroughfares of London, having regard to the needs of the foot and wheel traffic circulation—how manifold and diverse are the pictures which the words conjure up before the mind's eye of the man who "knows his London," though never so slightly! When the gas engineer thinks of the streets of London, his mental vision pierces through the surface of the roadway and footpaths, and he sees the cast-iron mains and services lying alongside and crossing the multifarious other pipes, conduits, and cables crowding the subsoil. The vision of a railway engineer goes deeper still, to the tunnels that convey their tens of thousands of passengers and hundreds of tons of goods into and across the great human hive. When Sir J. W. Barry spoke of the streets and thoroughfares of London, however, he chiefly meant to discuss them in their superficial aspect, as means of communication for the inhabitants. He first defined London as an occupied area nearly oval in shape, having a major axis, east and west, of 12 miles, and a minor axis, north and south, of 11 miles. This area is consequently about 122 square miles in extent, and has a population of nearly five millions. The Greater London under the protection of the Metropolitan and City Police extends over an area of 688 square miles, and has a population of nearly six millions. The denser populated region, designated by Sir J. W. Barry as Urban London, occupies a central area of about 95 square miles, and has a population of something like four millions.

This enormous population is very much alive, and pretty constantly on the move. Familiar as the phenomena of London street life are to us to-day, it is certain nobody living sixty years ago could have foreseen them. As a matter of fact, London has had its street and railway facilities provided piecemeal, and has also gone on from hand



to mouth in a number of other respects. The gas-works were banished out of town, along with the slaughterers and numerous other purveyors whose room was preferred to their company; but every such move threw more traffic upon the streets. Sir J. W. Barry showed that there had never been an adequate grappling with the problem of thoroughfare provision. Over and over again have street improvements been carried out, and then discovered to be nugatory owing to the re-appearance of the "neck of the bottle" a little farther on. We must look abroad—to Paris, Vienna, and the United States—to see thoroughness and adequacy in the laying out of city streets. Sir J. W. Barry declares that new and additional lines of arterial streets are urgently required to provide for the internal traffic of London. He will not recommend more railways, which only bring people into town without enabling them to move about freely when they leave the stations. This means subways for the gas and water mains. But the question of subways in general is a very large one, and should be thoroughly considered before any such great schemes of arterial communication are entered upon.

#### Sir W. B. Richmond on the Smoke Nuisance.

THE perennial "smoke nuisance" forms the subject of a letter to "The Times" by Sir W. B. Richmond, written during the fog of Thursday last, which was the first of its kind for the season. Those who live in London all the year round expect their little fog at the usual time, about the middle of November, although the finest specimens do not usually appear until a month later. Last Thursday's fog, Sir W. B. Richmond complains, was really no fog at all, but only smoke. Usually, when a thing is said to be "only smoke," the meaning intended to be conveyed is that it is nothing at all. The case is different when a London fog, or what passes for it, is concerned. Sir W. B. Richmond protests that such an atmospheric infliction as that of Thursday is more or less preventable. He is persuaded that "the nuisance can be greatly modified, "if it cannot be wholly got rid of." Unhappily, this is a question of the enforcement of the law, which is not easy to procure when an apathetic public or local authority are entrusted with the initiative. It is quite refreshing to find this impartial observer witnessing that, "owing to the almost weekly additions which are made of electric light stations in the Metropolis, and are apparently under no control whatever, the smoke, and consequently the darkness and dirt, of London rapidly increase." Well, well! And this is the deliberate judgment of a leading artist on the arrangements by which the cleanest, most sanitary artificial light known to science are rendered available in London! Sir W. B. Richmond thinks that the suffering public ought to combine with the object of compelling the reluctant Local Authorities to set the Smoke Prevention law in motion against all the offenders. So far as London is concerned, remissness on the part of the Vestries in this regard is amenable to correction by the London County Council. It is suspected, however, that this body has its attention too much engrossed by "big" schemes to have any aptitude or time left for attending to the duties already confided to it by statute. Sir W. B. Richmond's complaint has been sympathetically received by "The Times," which ingeniously suggests that the electric lighting companies may not be wholly averse to creating, by their smoky chimneys, a degree of artificial gloom for which it is their business to provide a remedy. This arrangement, however, is characterized as being both cumbrous and wasteful. The London County Council should see to the complaint. It will be in vain that the calling of the common domestic chimney-sweep is rendered unremunerative by the growing popularity of the gas-fire and gas-kitchen, if the electric lighting station is permitted to poison the air for acres round. Now that "Richmond's in the field" (Sir W. B. of that ilk), perhaps the London County Council may rally to him. They would do it quickly enough if he would only engage to paint (gratis) a series of tableaux representing the Progressive County Councillors sitting in judgment on a bevy of Moderates charged with permitting smoke.

**Athermanous Glass.**—A glass which is specially obstructive to the passage of radiant heat can be made from a mixture of 70 parts of sand, 24 parts of Kaolin, and 35 parts of soda. According to "Glasindustrie," only 11 to 12 per cent. of the heat radiated from a gas-flame passes through glass 0.3 inch thickness made from the above composition.

## WATER AND SANITARY AFFAIRS.

THE sittings of the Royal Commission on the London Water Supply occupied two days last week. Yesterday there was a private sitting for the purpose of preparing a report relative to the question of establishing an inter-communication system between the works of the several Companies; and to-day further evidence will be taken on the general question of the supply. It is reasonable to expect that the policy of the Government with regard to the Metropolitan Water Question will be largely influenced by the purport of this intermediate report. If it is shown that by connecting the works of the several Companies a sufficient water supply for the present, and for some time to come, will be furnished to the East London district in particular, and to any other that may be in need of help, the more pressing part of the problem will be thereby solved. Then will follow the larger question, on which the Commission will resume their inquiry to-day, as to whether other sources than those now employed should be forthwith resorted to in order to secure an adequate supply for the growing population of London in a not distant future. There is evidence now before the Royal Commission, from Mr. Bryan and other engineers, which to an outside observer has every appearance of proving it is only necessary for the Companies to aid each other in order that London may have all the water it wants. How it may fare with some future London, of almost incalculable size, is a speculative question involving a variety of considerations, mainly of a hydro-geological character, which a Royal Commission may be quite able to grasp, and on which it may be desirable for the Government to be enlightened. It will be highly unsatisfactory if one Royal Commission should contradict another—Lord Llandaff and his colleagues arriving at conclusions differing essentially from those propounded by the Commission of which Lord Balfour of Burleigh was Chairman. If we look to the origin of the present complication, we may easily trace it to the action of the County Council. All the trouble and apprehension now prevailing with regard to the Metropolitan Water Supply has been brought about by the authority at Spring Gardens. Had there been no County Council, and no authority to take the same line of conduct that we have seen pursued by the existing body, there would have been a far different state of things prevailing during the past summer than that of which complaint is made. But taking things at their very worst, what is the outlook? For the next ten or fifteen years—despite any likely achievement by the County Council—London must depend upon the present sources of its water supply. Common prudence demands that these sources should be developed to the extent which circumstances show to be necessary. Should the Royal Commission finally report in favour of the Welsh scheme, or something equal to it, that will not alter the present situation, or affect the necessity for enlarging the works of the Water Companies. If the Council were in possession, what would they do? Would they sit down and say: The water is coming all the way from Wales, and will arrive in London a dozen years hence. Would they not forthwith proceed to do something nearer home? Whatever this might be, the Water Companies may be trusted to do all that the County Council would undertake. Let the Water Committee of the Council propose present measures, and sketch a plan which shall prove effective throughout the next twelve or twenty years, and they may discuss their Welsh scheme at their leisure, leaving the Companies to do the immediate and the practical. But such a mode of proceeding is not part of the Council's programme.

Judging by the Bills of which notice has been given for the coming session, the Parliament of 1899 will have abundant opportunity for discussing the Metropolitan Water Question. The County Council come forward with their scheme for a reservoir in Hertfordshire and another in Brecknockshire, on the River Yrfon, with an aqueduct to connect the two. Those who rely on the purity of water derived from the Welsh valleys may observe that the supply is to pass through filter-beds at Edgware and Hendon. There are to be subsidiary aqueducts and other works, and there is to be power of contracting to give—or rather to sell—a supply to local authorities, corporate bodies, and "persons." The County Council Bill for the purchase of the undertakings of the Metropolitan Water Companies includes the famous arbitration clause, which though now somewhat amended



from its original form, is obviously designed to whittle down the value of the undertakings to the lowest possible point. Power is sought—of course, subsequent to purchase—for the execution of any works “necessary to enable water “from the River Thames or elsewhere to be used in particular districts which have been or are inadequately “supplied by the Water Companies or any of them, or “in which any dearth of water seems likely to occur.” Such power as this is exactly what the London County Council would deny to the Companies. The Metropolitan Water Companies have a Bill for improving and facilitating intercommunication between their works. This, of course, will be strenuously opposed by the County Council, however beneficial such an arrangement would be to the consumers or some of them. The reason for such opposition has been well expressed before the Royal Commission. In the first place, Sir Alexander Binnie strongly objected to the Council “being saddled,” in the event of purchase, with the expenditure of “half a million” which the Companies proposed to lay out upon their intercommunication scheme. The possible expenditure, we may just observe, is considerably less than half a million; and Sir A. Binnie omits to tell us what will be the cost of the works which the Council intend to carry out to guard against a future drought. But the special point consists in a remark by Mr. Balfour Browne, that if “we”—the County Council—bought the East London Company now, we should buy them as a defaulting Company, which “we” could not do if they were able to avail themselves of their intercommunication scheme. The consumer may perish that the Council may buy cheap. But we observe that the East London are not a defaulting Company. They are well within the provisions of the statute, which exempts them in all cases of unusual drought. Other Bills coming forward include two by the East London Company—one for additional works, the other to secure a temporary supply from the Thames in excess of their present authorization. The West Middlesex Company also have a Bill, as mentioned at their half-yearly meeting. Taken altogether, there is a busy time coming in respect to the London Water Question, and the County Council are preparing themselves for the fray by liberal drafts on the ratepayers’ purse; the Parliamentary Committee asking for a supplementary vote of £7000 in consideration of expenses to be incurred in the promotion of the Welsh scheme. The Water Committee, in a similar fashion, ask for another £1000, in consideration of analyzing the water and gauging the pressure in the mains. The manner in which public authorities have dealt with the London Water Question will read at some future time like a romance.

One portion of the able and incisive address which Mr. Boulnois delivered at the half-yearly meeting of the West Middlesex Company last week was particularly striking. We allude to the forecast of the position in which the Metropolitan Water Companies would be placed if the Legislature, by some untoward mischance, were to pass the County Council’s Purchase Bill with the clause making the property of the Companies that of the Council in six months after the passing of the measure. The shareholders are promised that they shall suffer no loss of income during the interval between the seizure of their property and the settlement of the price to be paid for it. But, as Mr. Boulnois showed, there is no security in such a case against loss of capital. At the end of the six months, the Council would be in a position to seize not only the works of the several Companies, but likewise the books, together with the staff. The Directors would be virtually “bundled into the street,” and the shareholders would be left defenceless. The Council would have full play to shape everything after their own will; and undertakings which cost millions would be at the mercy of an arbitration shackled with unreasonable and confiscatory stipulations. It is inconceivable that such a transaction can ever take place under the authority of Parliament. The audacity of the attempt ought to ensure its defeat. Supposing the Bill to pass its second reading, Mr. Boulnois cannot imagine that it would be approved by any Committee to whom it might be referred. As for the attitude of the Companies, little explanation is necessary. Throughout the period of their existence the County Council have opposed every Bill by which the Companies have sought to improve or extend their supply. Arbitrary and hard conditions have been imposed; and language of a most unjustifiable character

has been employed against the Companies—the attack being especially virulent against the Directors. Certainly, this was not the way to win the confidence of the Water Companies, or to draw them into negotiations. Sir Arthur Arnold, who treated the Companies courteously, saw reason to hope for a friendly settlement; but he found that any project of this kind was perilous to his own position in the Council. A regard for the consumer is put forward as a reason for hostility to the Companies. But it is impossible to conceive that the interests of the consumer are promoted by a policy which hinders every attempt to make the supply more abundant and secure. It is perfectly easy to foresee the opposition of the Council when the West Middlesex Directors apply to Parliament in the coming session for power to lay a big main between the Company’s works at Hampton and the reservoirs at Barnes and Barn Elms. Anything by which the Companies can benefit the consumer is especially distasteful to the Council, who prefer that the consumer should have a grievance, and who have a great dread of seeing the efficiency of the existing works maintained, fearful lest the undertakings should some day command a higher price because increased in value. But why are they so confident that the bargain will rest with them?

**The Cost of Acetylene Lighting in France.**—It is estimated by the acetylene gas companies in France that a cubic metre of acetylene gas costs 2 frs.; but as the light-giving power is fifteen times that of ordinary coal gas, the same unit of light is obtained with a consumption of acetylene fifteen times less than that of ordinary gas. Consequently, taking 30 c. as the price of a cubic metre of coal gas, there results, according to this calculation, an economy of lighting power of 50 per cent. in favour of acetylene.

**Adapting Oil-Lamps for Gas.**—The last number of “Le Gaz” contains an illustrated description of an appliance invented by M. Devinat for rendering oil-lamps useful for the consumption of gas. A metal cap, cut with two screw-threads—one at the bottom to fit ordinary lamps, and the other at the top to take the gas-burner—has at its side a supply-tap to which can be attached an india-rubber tube connected with the fittings. In this way the lamp is readily utilized for gas; and the appliance can be easily detached when oil lighting is reverted to.

**Professor Lewes on Acetylene.**—At the Society of Arts last night, Professor Vivian B. Lewes, F.I.C., F.C.S., gave the first of the series of lectures on “Acetylene” which, as already announced in the “JOURNAL,” are to form the opening course of Cantor lectures for the present session. The lecturer dealt in his peculiarly attractive style with the history of acetylene, its methods of formation, and its chemistry; and he then proceeded to show the important part it plays in flames. We shall deal with the lecture, which was illustrated by several experiments, at greater length in a subsequent issue. Next Monday, Professor Lewes will discourse upon the commercial production, the carriage, and the storage of acetylene.

**Deep Artesian Tube-Well in London.**—At Sir J. Causton and Sons’ new printing works in the Clapham Road, a 15-inch internal diameter tube-well has been sunk through the following strata to the depth of 425 feet: Top soil, 8 feet; gravel, 20 feet; London blue clay, 77 feet; black pebbles, 1 ft. 6 in.; green-sand, 3 feet; bed of shells, 1 ft. 6 in.; dead grey sand, 10 feet; mottled clay, 6 ft. 6 in.; loamy sand, 5 ft. 6 in.; hard mottled clay, 14 ft. 6 in.; congealed pebbles, 3 feet; greensand with black pebbles, 6 ft. 6 in.; greensand, 5 feet; hard grey sand, 9 feet; dark green sand, 11 feet; dark grey sand, 13 feet; black flints with chalk, 225 feet; hard grey chalk, 5 feet. The tube-well is all the more remarkable as the yield obtainable is 840,000 gallons of water per day—more than has yet been obtained by a single well in any part of London. A novel feature in this instance is the raising of the water, which is done by means of compressed air, dispensing with all pumping and complicated machinery. Messrs. Isler and Co. are the engineers.

**Manchester District Institution of Gas Engineers.**—The 116th quarterly meeting of the Institution is to be held at Bradford next Saturday, under the presidency of Mr. W. S. Haddock, of Warrington. We learn from the programme issued by the Hon. Secretary (Mr. S. S. Mellor, of Northwich) that on the arrival of the members they will find conveyances waiting to take them to the Frizinghall Chemical Works of the Corporation, which they will inspect by permission of the Gas Committee. Opportunity will thus be afforded of seeing the process there carried on of making muriate of ammonia from ammoniacal liquor. At the close of the visit, luncheon will be served at the Midland Hotel, in the reading-room of which the business of the meeting will be transacted. This will comprise the election of a member and of the President for the ensuing year, and discussions on the subjects of “Meter-Unions,” “Purification,” and “The Balance-Sheet.” The first-named question will come before the members on a resolution; the others will be introduced by Mr. R. G. Shadbolt, of Grantham, and Mr. J. H. Brearley, of Longwood, respectively. The members will afterwards take tea together.



## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1182.)

BUSINESS on the Stock Exchange last week was rather colourless. People have recovered to a great extent from their nervousness; but their long indisposition to launch into anything like enterprise still seems hard to throw off. Decided quiet has thus ruled the markets. But, in spite of this, the tendency was all in favour of higher figures; and prices in pretty well every department show an advance. This would have been better still but for movements in the Money Market, where, after five days of ease, the tightness of money in Berlin operated as a sharp astringent at the close. How far this may affect us is a matter of uncertainty; but it is fair to hope that the 4 per cent. Bank rate may be good enough to carry us through. Business in the Gas Market, which was really beginning to pick up a little, fell quite quiet again as if in sympathy with the other markets. There was no decided characteristic beyond the negative quality of nothingness. Two or three quotations receded, but only in consequence of special circumstances affecting them; and all the rest may be written down steady. In Gaslights, the "A" opened and closed at about 288; and all through the week prices ranged only fractionally above or below this figure. Nothing at all was done in the secured issues, except to restore to the 10 per cent. the point which was knocked off it during the previous week, and to draw the "G" quotation in closer. South Metropolitan was moderately dealt in. The tendency was somewhat uncertain; the best and the worst prices of the week being marked on the closing day. Commercial were quite untouched. Letters of allotment of the new capital issue were sent out to the proprietors on Saturday. In the Suburban and Provincial Companies, business was just as slack as in the others; and the only change was a further fall in British. Among the Continental undertakings, Imperial and European were steady and unchanged; but Union had a fall, in view of the approaching reduction in the dividend—a reduction rendered inevitable by the large falling off in the profits of the French Company, in which the Union is a large proprietor. Among the rest, a rise in River Plate was the only incident. Water was quiet and unchanged, except for a slight fall in New River. At the Mart, however, on Wednesday, some New River shares realized prices averaging a little above the quotation.

The daily operations were: Business in Gas was very moderate on the opening day; and prices showed no change. Gaslight "C," "D," and "E," recovered 1. Tuesday's transactions were even a little quieter; and prices again ruled steady. River Plate rose ½. Wednesday was much about the same; marked prices still showing no variation. But the quotations of Continental Union receded 2; ditto, preference, 3; and British, ½. Thursday was quite a slack day, without any incident at all. On Friday, the quotation of Gaslight "G" was drawn closer, involving practically neither loss nor gain. In Water, the buying price of New River was lowered 5. Saturday was quiet, and devoid of change.

### ELECTRIC LIGHTING MEMORANDA.

A Statement of Accounts Relating to the First Year's Working of the Shoreditch Vestry Combination Plant—Criticism—Grave Accusations.

ACCOUNTS relating to the first year's working of the Shoreditch Vestry electric lighting and dust destroying undertaking have been issued; and, of course, the statement is hailed by "London" as confirming the wisdom of the policy represented by this venture. The revenue account takes credit for electricity "sold to consumers" to the value of £8254, besides current "sold to dust destructor," £536. Miscellaneous receipts bring up the gross income to £9041. On the other side, working expenses charged amount to £3214; and interest and redemption, to £2641. This leaves a net "profit" balance of £3184, which our municipal contemporary unreservedly characterizes as "very satisfactory." With regard to the dust destructor part of the concern, the accounts show a saving of £1253 on the old cost of barging the refuse; but there is a debit balance against the destructor of £1758 which has to be set off, thus bringing out the "net profit and saving" at £2679 for the year. This looks mighty well; but the presentation of the accounts to the Vestry was not attended with that triumph for the Committee responsible for them which those gentlemen doubtless expected. Indeed, one recalcitrant vestryman declared that the accounts were "cooked;" and though the Chairman of the Committee "warmly repudiated this imputation," he appears to have subsequently admitted that the destructor plant had not done all that was expected of it. A curious feature of these proceedings, mentioned by the "Electrical Review," is that "the accounts are so highly satisfactory that no one feels it incumbent to append his signature to them."

Seeing how much fuss has been made over this Shoreditch scheme, and how anything that could be charitably interpreted as confirming the promises of those responsible for it is certain of advertisement far and wide, it will strike most people that

"London" might at least have made sure that these "satisfactory" accounts are reliable. As it is, we must caution our readers against taking the partial and imperfect report published in "London" as trustworthy. The report published in the current number of the "Electrical Review" is much fuller; and it is to be noted that both the leading electrical journals express the utmost reserve as to accepting the figures and statements of the Vestry Committee. It is worse than folly for a professed organ of Progressive municipalism to garble reports of the proceedings of Local Authorities with the object of keeping up a delusion certain to be exposed later, or to profess to regard as good evidence accounts which are not in the proper form and have not even been audited. Will it be believed that what "London" acclaims and describes as "the complete accounts for the first year's working of the combined dust destructor and electric lighting scheme," are not by any means "complete"? The accounts, such as they are, had not been forwarded to the Board of Trade; they were not in the detailed form prescribed by the Board of Trade; the charge for the public lighting is not disclosed; the Accountant to the Vestry disclaimed responsibility for them; and nobody knows who prepared them. When they were brought before the Vestry, one of the members flatly described the balance-sheet as a false one.

Mr. H. E. Kershaw, the Chairman of the Lighting Committee, has been advertised as the prime mover of the Vestry throughout this business. He has now been reminded that at the opening ceremony he promised that there would be a saving of £2200 a year by burning instead of barging the parish refuse. The Chairman of the Wharf Committee, who ought to know, contradicted the statement in the accounts that there had been a saving in the manner of disposing of the refuse. The destructor costs the parish more than the wharf. He proved the assertion by details. Whereas under the old system 14 vans daily in the summer and 20 in winter sufficed; for the present financial year the Vestry are employing 20 vans summer and winter. They had had to purchase additional horses, pay extra wages for 12 men, and provide further rolling stock; and the total expenditure amounted to £1712. "Before the dust was sent to the destructor, the wages paid annually were £315 less than they were at present." Moreover, the Lighting Committee did not want, and had not been able to use, the refuse sent to them, but had sent it to the wharf, and bought coal instead. Another vestryman stigmatized the alleged profit as "bogus;" and others wanted to know where the money was. In reply to criticisms, Mr. Kershaw admitted that his promise at the opening of the station had proved to be "erroneous." He offered numerous excuses for the shortcomings complained of, and is reported to have made the following statement: "The figures had been submitted to the Accountant, and he audited them." Thereupon "Mr. Ernst A. R. Adams, the Accountant, in reply to the statements made by Mr. Kershaw, said that he had not audited the accounts. The latter were sent to him to look over, with instructions not to make any alterations." It is evident that this matter cannot end here, though the Vestry eventually adopted the report. According to Mr. T. W. Baker, an outside critic of the Shoreditch Vestry performance, the utmost profit balance on the combined scheme, even according to the uncertified figures of the Electric Lighting Committee, is £344, without providing for depreciation or bad debts, full expenses of management, rates or taxes. The increased cost of the public lighting appears to be £1718 a year; and in order to lighten the charges upon the combined scheme, a sum of £1435 a year, for interest and repayment of the capital cost of the dust destructor, is paid out of the general rate, and not borne by the special undertaking at all. We all know what would be said of a company who conducted their finances in this fashion; but, of course, in the cause of Progressive Municipalism much is to be permitted.

### PROGRESS IN THE LIGHTING INDUSTRIES.

BERLIN at the present time is an excellent centre from which to observe the progress of the several great lighting industries; and Dr. Lux, the Editor of the "Zeitschrift für Beleuchtungs-wesen," has profited by the opportunity which residence in the city affords him to make some instructive comparisons. His words are the less likely to be tinged with bias, because his journal caters for all branches of the lighting industries; and one section or other of his heterogeneous array of readers would forthwith take him to task if his opinions could not be justified by reference to hard facts.

Recent events in Berlin, it is pointed out by him, have certainly afforded much food for reflection. A deputation which had been instructed to advise the Municipality whether an alteration in the charges for gas was practicable, and, if so, what should be the nature of the change, have presented their report. The price of gas supplied for illuminating purposes has for some years been 16 pfennige per cubic metre (4s. 6½d. per 1000 cubic feet); and that of gas for heating and industrial uses, 10 pfennige per cubic metre (2s. 10d. per 1000 cubic feet). The recommendation of the deputation is to the effect that in future there shall be but one price for gas in Berlin, and that this shall be 12 pfennige per cubic metre (3s. 4½d. per 1000 cubic feet). Now



as the gas sold for lighting hitherto has amounted to more than three times that sold for other purposes, the projected alteration means a very considerable reduction in price to a large majority of the consumers. Especially does it tend to place gas in a better position to compete with other illuminants. A reduction to three-fourths the former charge is bound to be appreciated by the gas consumers of a large city. For instance, how great an impetus gas lighting in London would receive if The Gaslight and Coke Company at one step reduced their present price of 3s. per 1000 cubic feet to 2s. 3d. Nor is the reduction in the price of gas the only benefit which is now promised to gas consumers in Berlin. The price of Welsbach mantles has been reduced to 6d.; and mantles for incandescent lighting are sold by other companies than the Welsbach at four-fifths this price. Self-lighting mantles, costing 1s. 6d. apiece, are about to be introduced; but it is doubtful if they will compete successfully with other automatic-igniting devices which may be used with the ordinary mantles.

But cheaper gas and cheaper mantles cannot fail to be the precursors of an unprecedented advance in the use of gas in Berlin—unless, indeed, the rival lighting industries are simultaneously offering equal or greater benefits to consumers. Let us, with Dr. Lux, glance at the immediate prospects of electric lighting. No considerable improvement in electric lamps can be observed; and except for the recent production of high-voltage lamps, there would be absolutely no advance to chronicle. The high-voltage lamps are said to effect a saving of one-third the current; but this saving is as nothing compared with the economy of gas which the Welsbach mantle effects. Moreover, there are no indications in Germany that these lamps will be at all widely used. Dr. Nernst has proposed to replace carbon filaments by electrolytes; but there are no signs that either his or Dr. von Welsbach's electric lamps will be of any practical utility yet awhile. Electric lighting technically stands in much the same position that it has occupied for several years past. It has no new inventions whereby it may keep pace with the immense strides which incandescent gas lighting has made during the last decade. Acetylene lighting does not even pretend to compete with ordinary gas in towns. The only important illuminant which remains is petroleum. Its application for lighting purposes has remained virtually unaltered in recent years; while the machinations of the oil-rings are fast deposing it from its vaunted position of being the cheapest of all possible illuminating agents for domestic use.

Berlin, therefore, teaches us one lesson before all others with regard to the lighting industries—viz., that the gas industry is the only one which is truly progressive at the present time. Electricity and oil can offer nothing to the consumer which is a considerable advance on what they could give him some years ago. With gas, it is otherwise. The incandescent system is developing potentialities in gas lighting which ten years ago would have been regarded as utterly unrealizable; and the most inveterate pessimist would not venture to prophesy that the climax in incandescent gas lighting has yet been approached. Moreover, while the illuminating duty of gas-burners is advancing by leaps and bounds, the manufacture of gas is also progressing apace. The improvements in the means for handling and carbonizing coal have cheapened the production of coal gas; and at the same time the alternative of producing illuminating gas by water-gas processes is at the option of gas engineers. Gas can now be made at a greater speed, on a smaller area, and by fewer hands, than at any earlier period; and the consumer must eventually reap the advantages of these improvements in the technology of gas manufacture during the closing years of the nineteenth century.

It must not, however, be assumed from the foregoing that electric lighting is on the decline in Berlin. The Company who supply current to the city report an increase of 17·2 per cent. in the number of incandescent lamps served during the last working year. To what extent this increase is due to the fact that the electric light is a private enterprise, while the greater part of the gas supply is in the hands of the Municipality, it would be difficult to determine. The projected reduction in the price of illuminating gas is causing some stir among the electricians in the city; while the question of the extension of the Electrical Supply Company's contract has given occasion for an ample discussion in the Municipal Council as to the general merits of private and municipal control of lighting undertakings. A majority of the Council, when the question of the electric lighting contract was put to the vote, proved to be in favour of private enterprise. Among the arguments in support of this view may be mentioned one drawn from the successful competition of the Imperial Continental Gas Association with the Municipal gas-works in certain quarters of Berlin. The Association have attracted customers from the Municipal supply, not by offering gas at a lower price, but by giving free the service-pipe to the meter and by letting fittings on hire. In a word, the Association have proved more accommodating than the Municipality, and have thus captured many consumers. On the other hand, it is not to be denied that many of the municipal gas and electric light undertakings in Germany and Switzerland are excellently administered. The projected reduction in the price of illuminating gas in Berlin is an indication that in this city gas will in the future be allowed better opportunities of proving its intrinsic merit and economy as an illuminant in the homes of both poor and rich alike.

## A FRENCH VIEW OF SOCIALISM AND ENGLISH TRADE UNIONS.

A BOOK by a French author, bearing the remarkable title "*A quoi tient la Supériorité des Anglo-Saxons*," is likely to arrest attention at home and abroad. An English translation of the book has just been published, with the title "*Anglo-Saxon Superiority; to what it is due*;" and as the work is really a study in social, industrial, and political economy, we propose to give readers of the "*JOURNAL*" the privilege of seeing themselves, as busy Englishmen, from the standpoint of a French observer.

A good deal of the book is outside our province; but an important section of it is devoted to a criticism of the influence of Socialism upon English working people of every degree; and this cannot but be interesting to the subjects of the study. We in England hear a considerable amount of socialistic chatter, chiefly in connection with what are called "*Labour*" politics. Very little else is talked at our Trade Union Congresses; and there are in the humbler walks of English public life a few politicians who would persuade the rest of the world that the communistic solution of the Labour problem, whatever it is, is the only possible one. It comes as a bracing piece of intelligence, therefore, when M. Edmond Demolins, the author of the book now in question, not only assures his readers that "*the Anglo-Saxons are more hostile to Socialism than the Germans and the French*," but shows conclusively that the race is not susceptible to this contagion. In comparison with the Continental peoples, the English and American nations are immune as regards the plague of Communism in all its forms and developments. We have our John Burns and Keir Hardie; but they are sporadic, not representative of anything truly national.

M. Demolins points out that Socialism is essentially a product of German origin and manufacture. Its centre of formation is in Germany; and from Germany it has permeated the world. Here it is to be met with in all classes. Taking all the varieties together, Socialists form the majority of the German Parliament. These different sects, of course, have various programmes and aims; but they all agree upon the test-principle of the necessity for referring all social and industrial questions to the action of the law, or the State. "*All dream of a Society in which the State should regulate and organize more or less labour, property, salaries, and should take upon itself to make happy one and all by playing the rôle of a great universal employer. The State is the new Providence found by Socialism.*" The apostle of the communion was Karl Marx, who taught that labour alone is the real measure of value of goods. Capital is consequently the product of labour only. Hence capital, as it actually exists, is the result of spoliation. The only remedy is the return of all capital, free or invested, to the State, and the constitution of the State as the universal employer of labour and distributor of every kind of produce.

The idea has taken hold of the public mind of Germany as it has nowhere else. Germany is tainted with Socialism from top to bottom; so that all the tremendous military and industrial forces of the empire are penetrated through and through with an influence that means in the end the paralysis of all individual effort. M. Demolins undertakes to supply the reason for this portentous condition of the German body politic. It is because the German Empire has been erected as an absolute central power over the ruins of provincial and local life. At the present time, Germany is entirely Prussian; and to be Prussian, is to be in the hands of the State. In point of fact, the Prussian State has long been applying the principles of contemporary Socialism. "*The great social barracks; the intricate and encroaching bureaucracy which form its ideal, are in many points very much like what Socialists dream of, and which they call the Society of the future.*" Very little more is needed to render the terms Prussian, and communistic, convertible descriptions of governmental forms. Consequently, the much-governed German people had little difficulty in conceiving of such an extension of their officialism as would make everybody an official of a Communistic State. "*The middle class and nobility were quite as well prepared for accepting this solution as the people themselves. The Prussian system, indeed, by developing à outrance militarism and officialism, first crushed them, and then instilled in them a disposition to consider the State as the unique source whence everything in social life emanates.*" In France, militarism and officialism are rampant, but not yet to the same degree as in Prussia. So far as they go, however, these influences, by destroying individual initiative, prepare the community for Communism. And wherever it is found, Socialism is admittedly and notoriously of German origin.

When the idea came to England, there was at first no soil proper for it to root in. A few "*faddists*" like the late poet William Morris, and Mr. H. M. Hyndman—"whom nobody listens to seriously"—took up with it; but for a long time it did not go any further. An acute foreign observer at this period recorded his opinion that "*the English are essentially individualists. They want to be left to manage their own affairs in their own way. They object by temperament to any enrolment, to any surrender of their own personal rule of conduct to some common action. Such is, I believe, one of the reasons which makes them hostile to Socialism.*" Yet in England, as well as in the United States, though the dominant Anglo-Saxon race was



observed to resist Socialism "as the American vines resist the phylloxera," there were a few recipients of the message found in the persons of Germans and Irish. The Anglo-Saxon spirit was, and is, deeply antagonistic to the Socialistic idea. The Anglo-Saxon always did, and always will, govern himself. With the German, the powers of the State have assumed an importance to which the Anglo-Saxon is a stranger." Germany is the greatest contemporary centre of authority; the Anglo-Saxon world is the greatest centre of self-help and self-government. The attraction of Socialism for the Irish is to be found in the path it opens to a political career.

So far M. Demolins. It is quite unnecessary to follow him through the details of his demonstration that German Socialism supplies no better solution of the labour problem than Anglo-Saxon "Particularism;" but the proof is worth reading in the text. What we wish to reproduce is his conclusion that "the more a man obeys an inclination to rely on help from others, from the community or the State, the less is his force of initiative developed, the less is he inclined to exert himself personally to make a livelihood. . . . The régime of Communism places man in a general situation which may be likened to that of administrative clerks or officials—and we know that such situations do not develop the working power. . . . Always and everywhere the communistic system has resulted in confining within narrow limits the scope of human industry, in promoting impotence, and maintaining inferiority."

When the socialistic missionaries first came to England from Germany, they discovered, to their astonishment and discomfort, that the Anglo-Saxon workmen declined to let themselves be "enrolled or led." This was largely because the same workmen had already, with the "forehandedness" of their race, which is so justly irritating to foreigners, organized themselves in a variety of ways. They had their provident clubs, their mutual assistance societies, their co-operative system, and their trades unions. Consequently, the earlier German Socialists, with their one idea of State interference with all that man does from his cradle to his grave, confessed themselves non-plussed in face of so much spontaneous activity on the British workman's part. M. Demolins rightly acclaims all this helping of themselves by the British working classes as radically opposed to Socialism. He enumerates the Trade Unions as particularistic and capitalist institutions. These trade societies, as the German Socialist emissaries found them in England, were "not like the German associations, tending to become international, or even only national affairs, with the ultimate aim of embracing the workmen of the whole world and undertaking to build Society anew. "They were purely trade societies, composed of workmen having a common calling, but only united in view of one distinct and limited end." Thus constituted, the English Trade Union was for its members a source of moral discipline, as well as a means of progress.

M. Demolins' mistake is in ignoring the change that came over English Trade Unionism, and first became manifest in 1889, when the so-called New Unionism showed itself. He does not seem to be aware that what the German socialistic missionaries failed to achieve, their local converts afterwards succeeded in accomplishing only too thoroughly. The British workman was not going to be fooled by the German dreamers of a communistic millennium; and while the prophets of this cult confined themselves to street-corner oratory, and to holding meetings in small temperance halls, they remained an out-at-elbows fraternity. Then, by a happy inspiration, one or other of them hit upon the policy of "permeation," and proceeded to carry it into effect. Putting their Socialism into their pockets, they insinuated themselves into the weaker Trade Unions, and got elected to Local Authorities of poor neighbourhoods. Once in positions of some influence they increased their notoriety by every means within their reach, especially by adroitly cultivating the art of self-advertisement. The result has been to change the aspect of those Trade Unions that came into the control of these masquerading Socialists. When they felt themselves firmly seated in the saddle, these gentry threw away the mask and proclaimed the new doctrine that Trade Unionism is one with Socialism. Hence we have in England at the present time, as developments of Trade Unionism, all those features which M. Demolins notes as absent from the old Particularist organizations which baffled the German Socialists. He remarks of the old Unions: "They do not form an immense machine placed in the hands of a few leaders, who work it for their own greater glory." What of the Trades Councils, and the Trade Union Congress? He quotes another witness as testifying that the old Unions "have remained animated with a spirit of professional independence, which has resisted every attempt at a general federation or joining together of the activity and resources of all members." But "Federation" is actually "in the air" at present, as a feature of the most advanced Trade Union politics, though there is not much likelihood of its coming to anything practical.

This is our present point. As M. Demolins shows, the old English Trade Unions grew into power and wealth before the irruption of German Socialism into their councils. So long as the Union executives stuck to their business, although everybody might not acquiesce in their ways and approve their objects, they gathered in the best workmen and strengthened their societies in means and influence. When the Socialists got the upper hand, things began to go wrong. Strikes for "principle," collusion with party politicians, the degradation of labour

to the "Union stroke," rebellion against the employers' function in management—all these silly and pernicious practices became identified with Trade Unionism, with which they had originally no connection. What has Socialism to offer in return for the solid Trade Union power which it has sapped, after having shown its incapacity for managing it? "Declarations of principles, revolutionary speeches, newspaper articles, and chimerical schemes for overturning Society—while the workmen go on starving." There is no help for the working man in Socialism. It is an essentially inferior formation. "The future undoubtedly is for the nations which have been successful in freeing themselves of communistic tendencies. It would be wise indeed to realize this truth, instead of wasting time in seeking a solution on old played-out lines the impotence of which had already been recognized in the time of the Pharaohs, and which nowadays is chiefly advocated by the most State-ridden nation in the Western World."

#### ILLUMINATING GAS FROM COKE-OVENS.

THE progress made during late years in the recovery of bye-products from coke-ovens has been from time to time recorded in the "JOURNAL;" and the effects of the competition engendered by this new source of tar and ammonia on the market value of these bye-products of the gas industry are familiar to all gas managers. It has also been known pretty generally that strenuous endeavours were being made, especially on the Continent, to utilize for illuminating purposes the gas evolved during the carbonization of the coal in coke-ovens of modern construction. In a few cases some of the gas is sold to neighbouring gas-works; and as recent developments of the coke making industry in America indicate that steps are being taken to dispose of coke-oven gas for the supply of towns, it may not be inopportune to give an epitome of a paper on bye-product coke-ovens written by Mr. H. O. Hofman for the "Engineering and Mining Journal," in two numbers of which it has lately been published.

The town of Halifax, in Nova Scotia, has for some months been supplied by the People's Light and Heat Company with gas from a block of ten coke-ovens on the Semet-Solvay system. Each oven is 30 ft. in length, 5 ft. 6 in. high, and 16 to 17 in. wide, and has three charging ports and two gas-outlets. Condensing and tar and ammonia extracting plant and gas purifiers are provided. The charge of coal per oven is 5 tons; and it is worked off in 20 hours. The discharging of the block of ten ovens occupies  $2\frac{1}{2}$  hours; and refilling, which takes the same time, is not commenced until the discharging is completed. The time between discharging and recharging permits the heats to increase so that coking commences with a high initial heat. A pressure of  $\frac{1}{2}$  inch of water is maintained in the ovens during coking; and the temperature is from 1800° to 2000° Fabr. The coal used is washed slack from Cape Breton; and it contains about 60 per cent. of fixed carbon. The portion of the gas which is, according to the readings of a jet photometer, of 16-candle power and upwards, is taken to one gasholder, and has an average illuminating value of 18 candles. It is sold as illuminating gas in the town at a price of \$1.40 (say, 5s. 10d.) per 1000 cubic feet. The gas of lower candle power is collected in another holder, distributed by a distinct system of mains, and sold as heating gas at \$0.40 (say, 1s. 8d.) per 1000 cubic feet. It has an average illuminating power of  $8\frac{1}{2}$  candles. The make of gas per ton of coal averages 9384 cubic feet, of which 32.26 per cent. is illuminating gas, and the remainder heating gas. As, however, 54.84 per cent. of the total make is used for heating the ovens, only 13.9 per cent. remains for sale as heating gas. About 10 gallons of tar and 5 lbs. of ammonia gas are obtained per ton of coal. The ammoniacal liquor is distilled with lime; and a saleable liquid containing 17 per cent. of ammonia is produced. The coke amounts to 75 per cent. of the coal, and is sold at \$4 (say, 16s. 8d.) per ton for domestic and boiler use; whereas the price of anthracite is \$4.25 (say, 17s. 8d.) per ton. These figures, which are taken from the record of the working in June last, give a fair idea of the procedure followed at present, and of the results obtained.

A scheme of far greater magnitude is now afoot for the supply of gas from coke-ovens to Boston, U.S.A. There are being erected in the neighbourhood of the city 400 Otto-Hoffmann ovens, capable of carbonizing upwards of 2000 tons of coal per day. Mechanical conveyors for transporting the coal and coke, and adequate condensing and purifying plant, are being provided. A gasholder having a capacity of 5 million cubic feet is being erected for the storage of the gas. The coke produced will be of a kind suitable for domestic and boiler fuel, unless a demand arises for blast-furnace coke. Preliminary large-scale trials of the coal which is to be used at Boston have been made at the works of the United Coke and Gas Company, at Glassport (Penn.). The plant at the works consists of four blocks, each comprising 30 Otto-Hoffmann bye-product ovens. Each oven is 33 ft. in length, 5 ft. 10 in. high, and 20 $\frac{1}{2}$  in. wide. In ordinary working, 10,000 cubic feet of gas are obtained from a ton of coal. Of this gas, 70 per cent. is used for heating the ovens, and the surplus is conveyed to a steel works  $1\frac{1}{2}$  miles distant, for the purpose of heating an open-hearth furnace.

The special trials for the Boston scheme were made in one



of the ovens, which was heated by the surplus gas from the other ovens in the block; but the products were kept apart from those obtained from the other ovens. In one series of trials, 40 tons of washed slack from Cape Breton were dealt with. It had been exposed for some months to rain and snow, and contained the unusually high proportion of 9.9 per cent. of water. A charge was worked off in 33 hrs. 56 mins. which gives 5 hrs. 35 mins. as the average time occupied in coking the amount of this coal equivalent to a ton of dry coal. The temperature of the oven ranged from 1750° to 1960° Fahr. The yield of gas per ton of coal was 10,390 cubic feet; and the specific gravity of the gas was 0.466. Of this gas the first 49.5 per cent. was not necessary for heating the oven; and this portion had the following composition in volumes per cent.: Marsh gas, 38.7; hydrogen, 38.4; nitrogen, 7.7; carbonic oxide, 6.1; olefines, 5.2; carbonic acid, 3.6; and oxygen, 0.3. Its specific gravity was 0.510. It had an illuminating power of 14.7 candles, and a calorific value of 686 B.T.U., assuming that the water in the products of combustion is condensed to the liquid state. About 66.69 per cent. of the weight of the dry coal was recovered as large (exceeding 1 inch in diameter) coke; 1.64 per cent. as small ( $\frac{1}{8}$  inch to 1 inch) coke; and 2.80 per cent. as breeze (less than  $\frac{1}{8}$  inch). Only the large and the small coke are marketable; and if the 2 per cent. of water usually present in commercial coke is added, the amount of saleable coke becomes 69.70 per cent. of the coal carbonized. The coke contained 8.91 per cent. of ash and 0.0041 per cent. of phosphorus. Extended trials of the coke from this description of coal in blast-furnaces, and a large number of analyses, showed that the amount of sulphur in it, though variable, was on the average low. The ash contained 50.60 per cent. of ferric oxide, 27.71 per cent. of silica, and only 1.03 per cent. of alkali. But as the iron was derived mainly from pyrites, it could be to a large extent eliminated; and the percentage of alkali would thus be increased, and an ash not liable to form clinker would result.

The tar obtained amounted to 3.38 per cent. of the weight of the dry coal, and had a specific gravity of 1.170. A fractional distillation of a sample gave the following products in volumes per cent.:-

|                                                               |      |
|---------------------------------------------------------------|------|
| Water                                                         | 2.3  |
| Light oil (176° to 338° Fahr.)                                | 3.7  |
| Middle oil (338° to 446° Fahr.)                               | 9.8  |
| Heavy oil (446° to 518° Fahr.)                                | 12.0 |
| Anthracene oil (above 518° Fahr.)                             | 4.3  |
| Pitch (specific gravity, 1.350; softening point, 188½° Fahr.) | 67.0 |
| Loss                                                          | 0.9  |

These figures indicate that the tar compares favourably with that derived from gas-works and other coke-ovens. The yield is, however, lower than would be obtained from the same coal in gas-works.

The gas liquor obtained amounted to 8.17 per cent. of the weight of the dry coal, and it contained ammonia equal to 0.34 per cent. Of the ammonia in the liquor, 96.6 per cent. was "free," and could therefore be recovered by simple distillation. The coal carbonized contained 1.51 per cent. of nitrogen; and therefore 18.5 per cent. of the nitrogen in the coal was converted into ammonia—a better yield than is usually obtained.

The sulphuretted hydrogen in the crude gas amounted to 686 grs. per 100 cubic feet, and the carbon bisulphide to 91 grs. per 100 cubic feet. Samples of the gas taken at intervals of two hours were analyzed, in order to observe the changes in composition throughout the process. The average composition of the gas produced in the first 14 hrs. 46 mins. after charging, amounting to 49.5 per cent. of the total make, is given above. The heating gas, amounting to 50.5 per cent. of the total, produced in the last 19 hrs. 10 mins., had the following average composition in volumes per cent.: Hydrogen, 50.5; marsh gas, 29.2; nitrogen, 9.1; carbonic oxide, 6.3; olefines, 2.4; carbonic acid, 2.2; and oxygen, 0.3. Its specific gravity was 0.421; its illuminating power, 9 candles; and its calorific value, 566.7 B.T.U. The results of the periodical analyses, and photometric and calorific tests of the gas, and of the observations of the volume of gas made at the different periods, indicate that three periods in the process of coking can be distinguished.

The first period is of nine hours' duration; and during this time the calorific value, and specific gravity decline, while the candle power drops from 18 to 13½. The second period extends from the ninth to the twenty-second hour; and the properties and quality of the gas remain almost constant throughout it. The third period extends to the close of the process at 33 hrs. 56 mins. from the time of charging. During this period the quality of the gas declines very rapidly. The gas might be advantageously separated according to these three periods, and applied thus: That made during the first period should be purified and used for illuminating purposes; that made during the second period should be used for heating the ovens; and that made during the last period should be purified, and then enriched with benzol or oil gas, and mixed with the gas of the first period. The gas of the last period is very rich in hydrogen; and it therefore forms an admirable carrier of hydrocarbon vapours.

The amount of gas used to heat the oven was measured, and its calorific value was ascertained. The heat required for the coking of 1 ton of coal was computed from these data, and compared with the calorific value of the gas produced at different periods. It appeared that up to, and including, the twenty-

ninth hour, the gas produced would more than suffice for heating the oven; but that if coking was prolonged after this period, the gas then produced would need supplementing by other fuel. If the coke were needed for domestic use only, coking could be interrupted at the 29th hour with advantage. Though three periods in the process of coking may be distinguished, it is simpler in working to separate the gas into two varieties only, as indicated by the analyses already given. The one, amounting to 49.5 per cent. of the total volume of gas, may be used for illuminating purposes; while the remainder will supply the heat required by the ovens. The heat needed for evaporating the 9.9 per cent. of water in the coal in question amounts to 8.3 per cent. of the total heat required for coking. The importance of using drier coal is thus clearly shown.

A coke-oven can be successfully heated with producer gas; and when the consumption of illuminating gas is great, it would pay to heat the ovens with producer gas and collect the whole of the coke-oven gas in one holder, and enrich it to the extent necessary to make it available for illuminating purposes.

The economy of the coke-oven process may be seen by striking a heat-balance by tracing the calorific value of the coal through the products of its distillation. A similar heat-balance has been given by Herr W. von Oechelhaeuser for German coal carbonized in gas-retorts. The results are shown in juxtaposition in the following statement of the distribution of the heat contained in 100 lbs. of dry coal:-

|                                         | German Coal in Gas-Retorts, Per Cent. | Cape Breton Coal in Otto-Hoffmann Ovens, Per Cent. |
|-----------------------------------------|---------------------------------------|----------------------------------------------------|
| In saleable coke                        | 46.4                                  | 72.3                                               |
| „ coke for heating retorts              | 10.1                                  | ..                                                 |
| „ tar                                   | 5.5                                   | 4.1                                                |
| „ saleable gas                          | 21.0                                  | 12.7                                               |
| „ gas for heating ovens                 | ..                                    | 10.7                                               |
| „ gas liquor, sulphur, and loss         | 17.0                                  | 0.2                                                |
| „ Heat used or lost in the distillation | 27.1                                  | 10.9                                               |
| „ Heat contained in the products        | 72.9                                  | 89.1                                               |

The economy of coke-oven practice compared with retort-house practice is thus very marked.

Mr. H. O. Hofman concludes his paper with the remark that "from the standpoint of chemical and thermal analysis, the production of illuminating gas in bye-product coke-ovens is upon a very sound basis; and much could be added to prove that this is equally true from a financial point of view." The data he gives are certainly very interesting, and show that an investigation of the course of carbonization has been made at Glassport which is of a more exhaustive and complete nature than any single investigation of carbonization in gas-works which we can call to mind. We look forward with great interest to the fruition of the enormous scheme which is about to be carried into effect for the supply of the city of Boston with coke-oven gas. The chief obstacle to the success of such a scheme is the great fluctuations in the demand for gas.

**The Output of Coal and Iron in the Past Year.**—According to the recently-issued report of Dr. C. Le Neve Foster on the output and value of minerals raised in the United Kingdom in the past year, the output of coal was 202,129,931 tons, while the imports were 37,000,000 tons—in both cases the highest quantities on record. The output of iron ore reached 13,750,000 tons.

**The Recent Incandescent Gas-Light Litigation.**—We understand that the New Incandescent (Sunlight Patent) Gas Lighting Company, Limited, have instructed their Solicitors to appeal from Mr. Justice Romer's decision, reported in another column, with reference to the De Mare patents, which the owners of the Kern patent burner claim to have purchased, subject to equal user-rights to the Sunlight Company. The Company are, we learn, on the point of bringing out a burner, under the above-named patents, for which they claim at least equivalent results to those achieved by the Kern burner.

**Projected Mining and Industrial Exhibition in Western Australia.**—It has been decided to hold a Mining and Industrial Exhibition at Coolgardie next year, and the Government of Western Australia will substantially support the undertaking by a money and land grant. The exhibition will be opened on the 21st of March, and remain open for at least three months. There will be seventeen groups of exhibits; three being devoted to gas and lighting (other than electricity), heating and cooking appliances, and prime movers. The Special Commissioner is Mr. E. T. Scammell, 18, Queen Victoria Street, E.C.

**The German Coke Industry.**—According to an article in "Stahl und Eisen," the production of coke in Germany since 1890 has increased by more than 3½ million tons, or by 55 per cent. This is exclusive of the coke produced in North German and Rhenish Westphalian works and in various cement factories. If all other coke were included, the total production of Germany would for 1897 be certainly about 12 million tons. It is in the Ruhr district that the chief coke production occurs, which shows a development from 341,033 tons in 1870 to 5,562,503 tons in 1895. The value has risen from 21 million marks in 1885 to 76 millions in 1897, or by 262 per cent. Of the estimated 12 million tons of coke turned out in 1897, about 9 millions remained in the country and only 3 millions went abroad, which, however, includes Luxembourg.



THE "ROBERT HUNTER FUND."

Second List of Contributions.

We have pleasure in acknowledging to-day further amounts received for the benefit of the widow and family of the late Mr. Robert Hunter, of Chester. As it is most desirable that Mrs. Hunter may, without much further delay, know on what she will have to depend in establishing herself in any business she is likely to undertake, a prompt response to the "JOURNAL" appeal from those who intend to contribute is much desired. The sums received to date are as under—

SECOND LIST.

|                                            |           |
|--------------------------------------------|-----------|
| Amount already acknowledged .. .. .        | £72 11 0  |
| An Old Friend .. .. .                      | 15 0 0    |
| Braddock, Mr. Joseph, Oldham .. .. .       | 5 5 0     |
| Davis, Mr. Joseph, Gravesend .. .. .       | 2 2 0     |
| Livesey, Mr. George, Reigate .. .. .       | 10 0 0    |
| Marsh, Mr. T. G., Willesden .. .. .        | 5 5 0     |
| Mobberley and Perry, Stourbridge .. .. .   | 1 1 0     |
| Ritchie, Mr. James, Middlesbrough .. .. .  | 5 5 0     |
| Stanton Iron-Works Co., Nottingham .. .. . | 1 1 0     |
| Woodward, Mr. John, Manchester .. .. .     | 1 1 0     |
|                                            | £118 11 0 |

OBITUARY.

Mr. THOMAS HOWDEN, of Wakefield, died on Monday last week, after a long and painful illness. He was Deputy-Chairman of the Gas Company; and prior to the purchase of the water-works by the Corporation, he occupied a similar position on the Board of the Water Company. Deceased, who was 74 years of age, had filled many public positions during the past quarter of a century.

PERSONAL.

Mr. F. J. BANCROFT, the Water Engineer to the Hull Corporation, has been voted a gratuity of £100 in respect of his work in connection with the gas undertaking, the first financial year of which will expire next March.

Mr. A. H. FORBES, of Chesham, has been appointed, out of 75 applicants, Borough Surveyor and Manager of the gas and water undertakings at Saffron Walden, in succession to Mr. G. W. Lacey, who, as already mentioned in the "JOURNAL," has secured a similar position at Oswestry.

At St. George's Church, Bloomsbury, last Thursday, the marriage took place of Mr. MAURICE GRAHAM with Miss NAOMI EDITH EDWARDS, third daughter of Mr. W. Edwards, of John Street, Bedford Row. Mr. J. Morton, with whom Mr. Graham is associated in business, was the best man.

The "Pall Mall Gazette" understands that Colonel MARK LOCKWOOD, M.P., has accepted the chairmanship of the East London Water Company. Our contemporary considers this a "happy coincidence with the decision of the Board to increase its capacities of supply, and gives promise of a reformed administration of the Company."

Mr. J. C. BELTON, who a few months ago relinquished his position as Manager of the Redhill Gas Company, under circumstances recorded in our columns at the time, has obtained the appointment of Engineer and Manager of the Chester Gas Company, in succession to the late Mr. Robert Hunter. Mr. Belton took up his duties yesterday.

On Friday, the 11th inst., the Chemical Society gave a banquet in honour of six of the Past-Presidents who had been for more than half a century fellows of the Society. It is interesting to note that three of them—Sir E. FRANKLAND, Professor ODLING, and Dr. A. W. WILLIAMSON—have for a large portion of the above-named period occupied conspicuous positions in connection with the two important industries with which the readers of the "JOURNAL" are associated.

NOTES.

Professor Ramsay on the Discovery of the New Gases.

Professor W. Ramsay has discoursed to the Pharmaceutical Society on the subject of the new gases of the atmosphere. He described the discovery of argon, as first published at Oxford in 1894. The atomic weight of this gas was about 40, and that of helium, discovered later in the gas given off by Cléveite, was about 4; so that between these two there was a vacant space in the periodic scheme of the elements. Professor Ramsay narrated how the search for the missing number was carried on in all sorts of possible sources, until the use of liquid air enabled argon to be liquefied. Not only so, but when the spectrum of the residue of boiling liquid air was examined, the spectrum of crypton revealed itself. When liquid argon was allowed to evaporate, the portion that boiled off first was found to have a

new spectrum. On this lighter portion being collected and cooled, some of it refused to liquefy; and this portion, which had a density of about 10, was the missing element. This gas was named neon; and as it contained some argon and helium, the problem arose how to separate it from these substances. Ultimately a process of fractionation was applied. The portion which boiled off last from the liquefied argon was also examined, and discovered to be heavier; hence the substance originally called argon was a mixture, though the bulk of it was true argon. This heavy portion had also a distinctive spectrum and a density of 32.5. There happens to be room in the periodic table for an element between bromine and rubidium; and Professor Ramsay believes that xenon, as the last-mentioned new element has been named, will after purification fill the space satisfactorily. There yet remains a gap to be filled between iodine and cæsium, which should be a liquid. In conclusion, Professor Ramsay said the history of the discovery of these new gases possesses no commercial importance, being of purely scientific interest.

The Diesel Gas-Motor.

It appears from a recent account of the Diesel gas-motor, published in the "Engineer," that this is an interesting example of the realization by mechanical engineering of a theoretical suggestion. The two chief advantages claimed for the Diesel engine are economy of combustible, and small size for the power developed. It is of the four-cycle gas-engine type; but at present the motive power is derived from oil. The idea is to inject a minute quantity of oil into a comparatively large volume of highly compressed, and therefore highly heated, air; the combustion being slow. Work is done during and after combustion by the expansion of the gases of combustion. Spontaneous ignition of the charge is ensured by the high temperature of the compressed air; and such complete expansion of the charge is obtained that the waste gases are expelled at a comparatively low temperature. Thus it appears that the principle upon which Herr Diesel chiefly depends for the realization of his object is the production of the highest temperature of the cycle, not by combustion, but by the compression of the air. The Diesel motor, in fact, is a high-pressure engine in which the air alone is compressed, and not the combustible charge needed to form the expanding mixture, as in other oil and gas motors. It is in contemplation to work the engine either with powdered coal, lighting or power gas, or oil. But up to the present time oil only has been actually used; the experiments upon other fuels not being completed. When the engine was first made, difficulties were experienced in getting the valves tight enough for the very high pressures employed. These have been overcome. It is claimed that new German patterns of this motor have yielded a brake horse power for the consumption of 0.43 lb. of petroleum. At this year's Munich Exhibition, four Diesel engines were shown; and it is recorded that they ran very quietly, without noise, and with scarcely any odour. The consumption of oil varies very little per horse power, whatever the size of the engine or the load; and this is an important point in its favour.

The Presumed New Gas "Etherion."

It has been notorious for some little time past that in the search for new atmospheric elements which, started by Lord Rayleigh and Professor Ramsay, has been followed up by chemists of all nations, America, in the person of Mr. Charles F. Brush, figures for the discovery of the new gas "Etherion." Doubts have been cast upon the existence of this reputed constituent of the atmosphere; but the fact of Mr. Brush having read a paper describing his new find before the Chemical Society of Cleveland, should silence cavillers. The author stated that at the very starting of his research he encountered difficulty in the absence of means of producing the very low pressures he needed; but to surmount these difficulties, he invented the best mechanism for this purpose yet used. When he came to examine air at very low pressures, and under certain conditions as to heat conductivity, Mr. Brush was brought to draw several lines on a diagram of pressures which no known gas would account for. Thus the existence of a new gas was indicated. Since etherion, as Mr. Brush names it, has no known chemical effect upon familiar elements, and will neither burn nor form combinations, it would probably have remained undiscovered if the usual chemical experiments only had been used in the research. It was detected by its exhibiting the characteristic of enormous heat conductivity at low pressures. Mr. Brush had noticed, in the course of a long series of high vacua experiments, that glass apparatus, when highly exhausted and heated, evolved gas for an indefinite length of time—rapidly at first, then slower, but never stopping until the temperature was reduced. Then rapid reabsorption took place, but was never complete. The latter process was therefore a selective one. Mr. Brush took to using pulverized glass for absorption purposes, and tested the evolved gas by its capacity for conducting heat. When a good vacuum was attained, something was found to be coming off which conducted heat twenty times as rapidly as hydrogen. Mr. Brush therefore believes that his new gas resides in, and not merely on, the surface of glass; and as the glass became "rejuvenated" in this respect by exposure to the air, he concludes that it is a constituent of the atmosphere. When he can get it pure, he expects it will show a power of conducting heat more than 42 times that of hydrogen, or 100 times that of air.

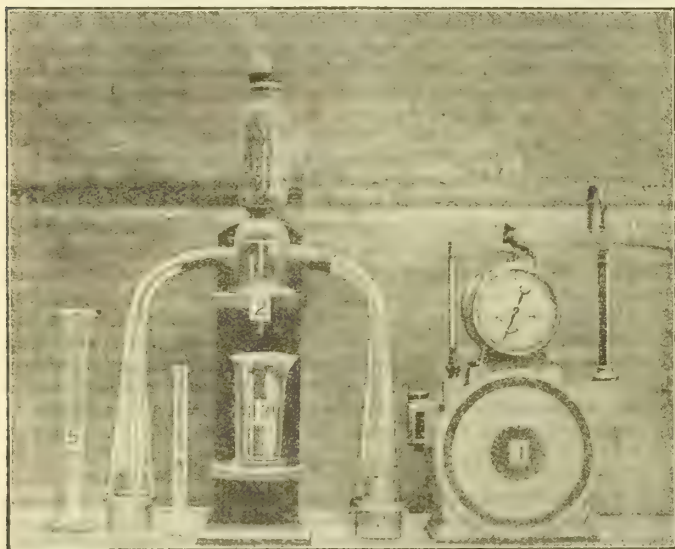


## COMMUNICATED ARTICLES.

## THE DOUBLE SULPHUR TEST FOR BISULPHIDE OF CARBON.

By S. CARPENTER, of East Ham.

The writer is aware that, in connection with what he is about to say on the work of the double sulphur test, a question may be raised by some as to the need of such test. But it was always needed; and he ventures to think that if it had been adopted when he first introduced it nearly thirty years ago, the sulphur would have been brought more under the gas manager's control. By making two tests in 24 hours, if anything went wrong with the lime in the purifiers, it would be shown at once, whether it were in the daytime or at night, that the chemical action of the lime had been interfered with. In the early days of the writer's testing for bisulphide of carbon, he found the double sulphur test very useful when he took two and sometimes three tests in 24 hours, as he could burn 5 cubic feet of gas in each test, which is the lowest quantity that should be used in any one test, to be relied upon. At the inlet of the first lime purifier the gas should be tested for carbonic acid and bisulphide of carbon. This would show what quantity of these impurities the crude gas contained before it entered the vessel. It should also be tested at the middle and the outlet of the purifier for carbonic acid. At the outlets of the first and second purifiers it should be tested twice in 24 hours for bisulphide of carbon. Before the gas is tested at any place, it should be passed through a small purifier charged with oxide of iron. If the gas is tested twice in 24 hours with the double sulphur test at the different places mentioned, the sulphur in other forms than sulphuretted hydrogen will be well under control, and the condition of the lime in each purifier can be ascertained with sufficient accuracy for practical purposes; thereby enabling the engineer to so regulate his



purifiers as to obtain steady results. By preventing atmospheric air and furnace gases from passing into the lime purifiers, the hitherto unaccountable variations in the chemical action of the material on the crude gas will be obviated. After the testing for carbonic acid and bisulphide of carbon has been carried on for a short time, the manager will be able to ascertain the right method of using the double sulphur test, and working the lime purifiers on the writer's principle, with sufficient accuracy for practical purpose. By noticing the quantity of lime in each purifier and the amount of gas passing through, and at the same time observing the reduction of the sulphur, it will be seen how much gas can be purified from carbonic acid and a portion of the bisulphide of carbon by a certain bulk of lime. This will be a great help to the manager, by showing him whether or not the purifiers are charged at the proper time.

The writer's method of working lime purifiers is as follows: Have two boxes at work at the same time. Every morning have a record taken of the sulphur from the outlets of the first and second purifiers, the quantity of gas which has passed through, and the time when the purifier was charged. By this means the manager will know the condition of the lime. If such a system of employing lime purifiers is adopted, it will prove of great advantage. The primary object to be sought at the present time is to utilize and perfect the existing process of purification; and it can be made to yield satisfactory results. If the lime and oxide purifiers are worked by the writer's rotation system, the whole of the carbonic acid and two-thirds of the bisulphide of carbon can be taken out.\*

The following is a description of the double sulphur test and the method of its manipulation: The large cylinder is furnished with two nozzles, to which are connected two trumpet-tubes, and

two burners, each passing half a cubic foot of gas per hour. By this means the writer was able to make two tests in 24 hours, which kept him well informed as to the condition of the lime in the purifiers, and to satisfy himself as to whether or not anything had happened to interfere with the chemical action of the lime on the crude gas, which would cause the sulphur to be high. The rate of burning the gas during the test is officially fixed at half a cubic foot per hour; but the writer prefers to pass double this quantity, so that the services may be kept in a more active condition. With regard to the apparatus, which is shown in the accompanying illustration, 1 is the meter for measuring the gas to be burnt; 2, the sulphur test proper; 3, a graduated beaker to receive the condensation water from the cylinder; 4, a long glass tube measuring 1000 grains; and 5, a glass beaker measuring a pint up to the marks shown. The trumpet-tubes convey the products of combustion from the two burners to the large cylinder where they are condensed. Provision is made at the burners for either sesquicarbonate of ammonia or liquid ammonia to be used. Sometimes the carbonate is very hard, and then it does not give off sufficient ammonia for the test. At such a time, liquid ammonia would be very useful. The writer prefers this, and he has provided for each burner a tin cup, through the centre of which there is a small tube, so that the burner can pass through it. The space round the tube is filled with liquid ammonia, which can be manipulated much better than the carbonate; but the apparatus is so arranged that one can be substituted for the other. The trumpet-tubes also convey the atmospheric air. The combustion products unite with the oxygen of the air and produce water, which contains the sulphur.

The whole of the ammonia and carbonic acid, and as much of the bisulphide of carbon as possible, should be removed from the gas. If an excess of ammonia or bisulphide of carbon is left, it is very destructive to fabrics. The beaker should be graduated into grains, as well as tenths and hundredths of grains, so as to measure accurately the number of grains of water condensed from the gas burnt in the test. If the temperature of the air in the room where the sulphur test is at work is about 60° Fahr., each cubic foot of gas burnt will produce from 380 to 420 grains of water. Measuring the water produced will show whether the gas which has passed through the meter has been properly burnt. There is a possibility of the gas escaping at the horizontal piece of tube which screws into the base of the burner. If this should occur, it would be registered and not burnt, and the sulphur would be low, because the gas had not been consumed, and the water would be of a dark colour, and there would be less condensation. The number of grains of water per cubic foot of gas will vary according to the temperature of the air where the test is at work. Where 10 cubic feet of gas have been burnt, the condensation water should measure from 3800 to 4200 grains. When the test is working properly, if the burners at any time show a luminous flame, it will be necessary to remove the top piece of the burner, and having gently hammered down the nozzle of soft metal, perforate it afresh, making as small a hole as will give passage to half a cubic foot of gas per hour.

When setting the test to work, ascertain that the india-rubber tube fits tightly on the trumpet-tubes, and also on the nozzles of the sulphur cylinder; and see also that the tube from the outlet of the meter to the burners is gas-tight. The meter will shut off the gas when 10 cubic feet have passed through. Then read off the number of grains of condensation water in the beaker. The cylinder and trumpet-tubes are to be washed out with distilled water at the end of each test. The liquor in the beaker and the water used in washing out the cylinder and the trumpet-tubes should be put into No. 5 beaker, and be well mixed and made up to one pint by the addition of a quantity of distilled water.

The following is the method of working off the results of the writer's cold sulphur test: Take 1000 grains of the solution obtained from the test, put it into a beaker, and treat it with sufficient hydrochloric acid to leave an excess of acid in the solution. By this means any carbonates there are in the liquid are decomposed. Next add an excess of a solution of barium chloride. The liquid should be allowed to stand until the thick white precipitate settles at the bottom of the beaker. The clear portion is then poured off, and passed through a paper filter. The sediment at the bottom of the beaker should be washed with distilled water by means of the wash-bottle, and filtered in the same way. The filter is then left to dry, after which it is transferred to a weighed platinum crucible, and heated over a bunsen burner to a bright red heat. When no black particles remain in the crucible, turn off the gas, and allow it to cool. The crucible and its contents are then re-weighed, and the increase in weight gives the number of grains of barium sulphate resulting from the test. Observe the quantity of gas consumed; then on referring to the table in the pamphlet already mentioned the number of grains of sulphur in 100 cubic feet of gas will be ascertained.

After long experience in testing according to the foregoing method, the writer has neglected corrections for temperature and atmospheric pressure. The difference in the results of the sulphur test caused by variations of the thermometer and barometer was so small that the correction was discarded to save time, which to him was valuable. With the thermometer at 60° Fahr. and the barometer at 30 inches (the standard temperature and pressure), there is, of course, no correction necessary; but if the thermometer falls to 52° and the barometer to 28.1 inches, the tabular number is 0.955. The result

\* For a short description of the method of working the sulphur test and a table for calculating the results, see the author's pamphlet on "The Purification of Coal Gas."



of the test being 12 grains, this would, by correction, be increased to 12.5 grains—a difference of half a grain. On the other hand, supposing the barometer remains at 30 inches, and the thermometer falls to 46°, the tabular number is 1.035. The quantity of sulphur is 12 grains as before; but this would, by correction, be decreased half a grain, making it 11.5 grains. The writer ventures to think that any practical gas manager will agree with what he is about to say in regard to the variations of the barometer and thermometer. Supposing there is half a grain of sulphur added to, or a like quantity deducted from, the 12 grains found in the gas tested, this quantity of sulphur in 100 cubic feet of gas is so small that it is not worth noticing or wasting valuable time upon.

As a comparison between the method of testing described above and the boiling process prescribed by the Gas Referees, the writer has made a series of tests by both systems; and the following figures show the closeness with which the results approximate:—

| Boiling Process.        | Carpenter's Method<br>(Cold Process). |
|-------------------------|---------------------------------------|
| 13.5 grains of sulphur. | 13.9 grains of sulphur.               |
| 13.7 " "                | 13.2 " "                              |
| 13.2 " "                | 13.2 " "                              |
| 11.4 " "                | 14.9 " "                              |

It will be seen that the average of the latter method is slightly higher than that of the former; showing that the cold process tends to extract the sulphur to the utmost extent, which it will be admitted is a merit.

The question may arise as to what advantage is gained by using the double sulphur test. In the first place, two reliable tests can be taken in 24 hours; 10 cubic feet of gas being burnt in ten hours. The writer does not put much confidence in the test when only 2 or 3 cubic feet of gas have been burnt. By using the double test, 5 cubic feet of gas can be burnt in five hours, which is the lowest quantity that ought to be used to get a reliable test. Secondly, by making two tests in 24 hours, the manager will be kept well informed as to the condition of the lime in his purifiers.

The gas should be tested at the inlet as well as the outlet of the scrubbers for ammonia, carbonic acid, and sulphuretted hydrogen; and that coming from the outlet of the scrubber should be passed through a purifier charged with hydrate of lime. Two lime purifiers, 28 feet square and from 5 to 6 feet deep, having four trays of grids in each, with about 12 or 13 yards of slaked lime on each tray, will be large enough to take a make of from 20,000 to 60,000 cubic feet of gas per hour. The lime in the first purifier will decarbonate the gas, and take out a portion of the bisulphide of carbon. The decarbonated gas should be passed into the second lime purifier (of similar size, and charged with lime in precisely the same way as the first), by which another portion of the bisulphide of carbon will be removed. These two purifiers will be sufficient for the purification of the gas from all the carbonic acid and two-thirds of the bisulphide of carbon. The gas should be tested at the inlet and outlet of the first purifier for carbonic acid, and at the outlet of the second purifier for bisulphide of carbon. Testing the gas at the lime purifiers will show when they are to be changed. When the carbonic acid or the sulphur is as high at the outlet as it is at the inlet, the first purifier should be shut off, and the second one made the first. A clean purifier should then be put on for the second one. If the purifiers are worked in this way, the sulphur will be kept right. The gas from the outlet of the lime purifiers should be passed through a series of oxide of iron purifiers, to eliminate the remaining sulphuretted hydrogen. In order to make sure of the gas being perfectly clean, a test should be applied at the middle and at the outlet of each oxide purifier; and these should continuously burn a cubic foot of gas per hour. The gas should be tested for sulphuretted hydrogen and bisulphide of carbon at the outlets of the station meter and gasholder. If atmospheric air and furnace gases are not permitted to pass into the lime purifiers, and the gas is tested at the places mentioned, no trouble will arise in purifying the gas, and it will be as pure as it can be made at the present time.

A few words may now be addressed to managers who are about to use lime for the first time for purification. They should proceed in the following manner: The gas from the outlet of the scrubbers should be passed direct into the lime purifiers, of which there should be two. After the first purifier (the function of which is to decarbonate the gas) has been in action for 24 hours, the gas should be tested for bisulphide of carbon. The first test will not be very low; clean lime having but little affinity for bisulphide of carbon. When the lime has become sufficiently sulphided, the second test will be much lower. Then set the second purifier to work; and it will take out the bulk of the sulphur. When the two purifiers are in action, and the lime is sufficiently sulphided in the second, the sulphur should be about 12 grains in 100 cubic feet of gas. The gas should be tested twice a day at the lime purifiers. If the writer's plan is followed, and the purifiers are worked in the manner he has described, the double sulphur test being used, the sulphur will never be high. Lime is never anything else than lime; and in itself it does not go wrong. It is something that approaches the lime in the purifier—something that is not coal gas—which interferes with the chemical action of the material. It may be that there is an excess of air or furnace gas, or the lime may have been too wet

when put into the purifiers. Either of these would interfere with the action of the lime.

A system of simple testing may be advantageously employed, by which the condition of the lime in the purifiers can be adequately ascertained. In the first place, it is advisable to frequently test the gas for carbonic acid in the middle of the first lime purifier, for carbonic acid and bisulphide of carbon at the outlet, and for bisulphide of carbon at the outlet of the second purifier. For detecting the carbonic acid, the writer employed an apparatus made with a two-necked bottle. Having filled the bottle half full of lime water, he first passed the gas through a small purifier charged with oxide of iron, and then through the lime water. The gas should bubble through it for about three minutes. If the water remains transparent, the gas is free from carbonic acid. Those who follow the writer's advice, and take out all the carbonic acid by the first lime purifier, employ a second one for removing the bisulphide of carbon, and keep atmospheric air and furnace gases from passing into the lime purifiers, will have achieved a great object in the purification of coal gas; while, by using the double sulphur test, considerable advantage will be gained in testing for sulphur other than sulphuretted hydrogen.

In conclusion, the writer has only to add that, as the result of his practical experience of the working of the double sulphur test for twelve years, he can confidently say that he found it to correspond with the single sulphur test.

## SLOT COOKERS AND ALL ABOUT THEM.

By E. W. T. RICHMOND.

### SECOND ARTICLE.

"We may boldly spend upon the hope of  
What is to come in."

"Henry IV., Part I., Act iv., Sc. 1.

1895.

COLONEL MAKINS,  
THE GASLIGHT AND  
COKE COMPANY'S  
MEETING.

The year 1895 opens auspiciously with the first official utterances by the Governor of The Gaslight and Coke Company (Colonel W. T. Makins), at the 166th half-yearly meeting, held on the 8th of February. He refers to 1500 meters fixed with 800 stoves, and congratulates the South Metropolitan Gas Company on their wonderful success, but fears no such record will be theirs, although he anticipates an eminently satisfactory business. The remarkable figures just published of The Gaslight and Coke Company show, however, that, wherever the public can be supplied with all they want to properly use gas both for lighting and cooking upon inclusive terms, even at a good round price, they will take it. They object to rentals and deposits, but willingly pay for all supplied in the price of the gas. The Colonel might well say with King Henry V.:

"What are thy rents?  
What are thy comings in?"

The marvellous field lying fallow among the working and lower middle classes may be judged by the fact that the 800 users of cookers referred to by Colonel Makins, supplied free with the automatic meters, has grown, as it were by the wave of a magician's wand, to over 70,000 in less than four years—an increased revenue from these cookers alone of £100,000 per annum (about 25s. each cooker annually), as, with an average consumption of 8000 cubic feet per annum, an annual day consumption of 560 million cubic feet is obtained, or as large a consumption as the total make in towns of the size of Bury St. Edmunds, Chorley, Dumbarton, Gainsborough, Haslingden, Kendal, Llandudno, Malvern, Warwick, and Waterford. The importance of this, our new oil competitor, is further emphasized by the promotion of the automatic meters and stoves to the first topic of Mr. George Livesey's speech to the South Metropolitan Gas Company's shareholders five days later.

MR. G. LIVESEY, SOUTH METROPOLITAN COMPANY'S MEETING. Mr. Livesey shows how in eighty years they had obtained 80,000 ordinary consumers, but that in two years the automatic consumers reached 20,000. He again takes the high ground of the desirability of gas companies consulting the needs of their customers, and congratulates all those companies who have adopted the system. In Worcester's words:

"It lends a lustre, and more great opinion, a larger dare  
to our great enterprise"

MR. F. G. DEXTER,  
WINCHESTER.

We now come to the address of Mr. F. G. Dexter, of Winchester, from the presidential chair of the South-Western Association, on the 30th of April, 1895. As might be expected from one of the apostles of incandescent street lighting, he treats the matter with a freedom which is refreshing in its candour, condemns the addition of an endless tax on the automatic consumer of 9d. or more per 1000 cubic feet, and advocates the opening of a "suspense account" against each consumer, and after the extra charge has wiped out the original outlay (based on cost of materials, labour free), he increases their supply to the same rate as that of the ordinary consumers. This system is one that



HOUSES SUPPLIED WITH SLOT COOKERS BY THE BRENTFORD GAS COMPANY.

NUMBER OF SLOT COOKERS FIXED BY THE COMPANY, 12,600.



BETTER-CLASS HOUSES, BERRYMEAD GARDENS, ACTON, W.

Rentals of "slot" houses vary from 3s. per week to £35 per annum.  
Number of cubic feet of gas for 1d. . . . . 22½  
Extra charge per 1000 cubic feet to prepayment consumers . . . 8d.



CHEAPER-CLASS HOUSES, BECKLOW ROAD, SHEPHERD'S BUSH, W.

Rentals of "slot" houses vary from 3s. per week to £35 per annum.

calls for thoughtful treatment; and more will, I believe, be heard of it. It means, of course, a good deal of extra book-keeping—in Mr. Dexter's case about half the time of a junior clerk at an expense of less than 10s. per week. But the advantage on the side of really equitable dealing is manifest, and, moreover, is greatly appreciated by the Winchester consumers. He fixes cookers, too, of the best type, believing—and correctly so—that they will wear longer, and give better cooking results. Five per cent. interest on the cost of these is permanently added to the gas rental. I would respectfully recommend engineers to obtain from Mr. Dexter full details of this novel and admirable system.

Colonel Makins, in August, 1895, again draws attention to the advantages of the automatic meter cookers in the following happy statement: "He had heard that bakers in the East-end of London were complaining of a falling off in their business.

EAST-END BAKERS. They had been in the habit of cooking the artisans' dinners; but now, since the working classes had got the automatic meters and gas-ovens, they had commenced to cook their own dinners. That was a straw showing the direction in which the wind was blowing; and he was glad to see it was blowing in the right direction."

Mr. H. C. WARD. On the same day, Mr. Howard Charles Ward, the Chairman of the Brentford Gas Company, alludes to "the increase in their district from 800 automatic stoves to 2740." This Company were then charging an annual rental of 2s. 6d., which I am glad to note has been since abandoned; and the Company's Engineer, Mr. J. Husband,

HOUSES SUPPLIED WITH SLOT COOKERS BY THE WINCHESTER GAS COMPANY.

NUMBER OF SLOT COOKERS FIXED BY THE COMPANY, 350.



BETTER-CLASS HOUSES, ST. PAUL'S TERRACE, WINCHESTER.

Rentals per week . . . . . 10s. 6d.  
Number of cubic feet of gas for 1d. . . . . 22



CHEAPER-CLASS HOUSES, ST. JOHN'S BACK ROAD, WINCHESTER.

Rentals per week . . . . . 6s.

Mr. J. HUSBAND, AT BRENTFORD. is well satisfied that this abolition of the rental is responsible for the large increase during the last twelve months in their slot cookers. To quote the words used by Colonel Makins, this is another "straw showing the direction in which the wind was blowing." May it increase to half a gale, carrying rentals clean away, greatly advantaging the day consumption of all gas departments.

"BIRMINGHAM DAILY GAZETTE." A *propos* of this, the "Birmingham Daily Gazette," in September, 1895, stated, on the authority of a South Yorkshire Colliery Company, that the then existing depression in the coal trade was chiefly attributed to the use of gas cooking-stoves in the London districts.

The next important contribution to the question—now fully recognized as a "burning" one—is the meeting of the North of England Association, held at Hexham in October, 1895. It

Mr. H. LEES, HEXHAM. finds a friend in the President, Mr. Herbert Lees, who refers to the fixing of a griller or a small cooker as an advertising medium for gas cooking. I have Mr. Lees' permission to state that he finds the cooker pays better than the griller, allowing for the extra outlay, and that it gives greater satisfaction.

Mr. J. HOLLIDAY, SCARBOROUGH. There then follows an admirable paper, full of useful statistics, by Mr. J. Holliday, of Scarborough, bearing signs of the careful compilation we have learnt to expect from one so well trained as Mr. Holliday has been. "The Encouragement of Small Consumers" in Scarborough has only reached at present the supply of a griller with an automatic meter. Doubtless the small consumption—about 8000 cubic feet per annum—will be greatly increased when Mr. Holliday introduces "cookers free," which they have now, Mr. Holliday writes me under date Oct. 24, decided to do.

A very interesting discussion followed, in which Mr. H. Tobey (Malton), Mr. E. H. Millard (Durham), Mr. J. Whyte (Seaham



HOUSES SUPPLIED WITH SLOT COOKERS BY THE  
TUNBRIDGE WELLS GAS COMPANY.

NUMBER OF SLOT COOKERS FIXED BY THE COMPANY, 1226.



BETTER-CLASS HOUSES, ST. JAMES'S PARK, TUNBRIDGE WELLS.

|                                                                    |       |
|--------------------------------------------------------------------|-------|
| Rentals per week . . . . .                                         | 11s.  |
| Number of cubic feet for 1d. . . . .                               | 21    |
| Extra charge per 1000 cubic feet to prepayment consumers . . . . . | 11½d. |



CHEAPER-CLASS HOUSES, BERKSHIRE COTTAGES, CAMDEN  
ROAD, TUNBRIDGE WELLS.

|                            |         |
|----------------------------|---------|
| Rentals per week . . . . . | 5s. 6d. |
|----------------------------|---------|

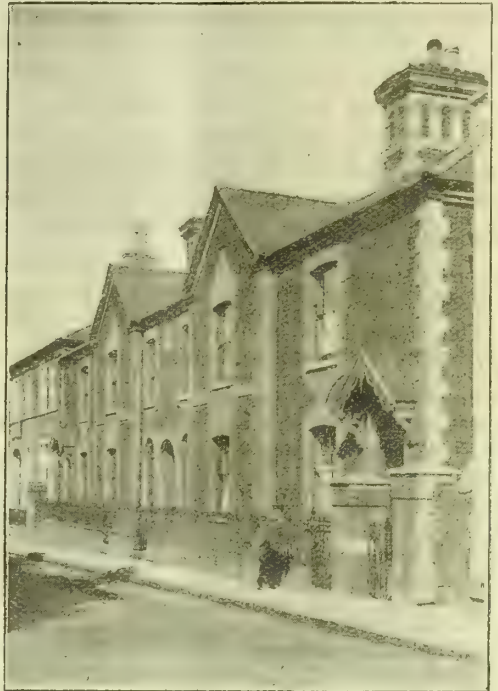
Harbour, Mr. Hall (Pelton Fell), Mr. T. Bower (West Hartlepool), Mr. J. H. Penney (South Shields), Mr. W. Ford (Stockton-on-Tees), Mr. Coates (Ottawa), and the President took part. With the exception of Mr. H. Lees, who took occasion to state that without the griller the automatic consumption did not pay, and that where cookers had been fixed they paid well, we find grillers are at this date chiefly the aids to the day consumption of gas in the North Country.

Mr. J. YOUNG, HANLEY AND NORWICH. The last contribution for this year, but by no means the least important, is the address by Mr. J. Young (then of Hanley, now promoted to Norwich) on "Two Years' Experience of Prepayment Meters." In common with many engineers at this time, Mr. Young had not made up his mind to supply either gas fittings or stoves, being in doubt as to the need of it, and, further, as to the fairness of charging the same price to those who had fittings already as to new consumers who had to be fitted up complete. (Possibly Mr. Dexter's method might have solved the problem.) As one might have expected, however, Mr. Young's commercial instincts have triumphed; and at Norwich he has come over to the majority, and now fits up houses complete, including three lights and a cooking-stove. The placard underneath the 5-foot burner in the British Gas Company's window at Hanley was a happy idea; and exposing the meter's mechanism was a specially good notion, and has recently been followed in the Plymouth Gas Company's show-room. Nothing draws a crowd like a moving figure in a window; and, after all, publicity is what is needed in gas as well as in other commercial businesses. The writer was struck with Mr. Young's statement that the average of 8818 cubic feet supplied through the prepayment meter was a little in excess of that of their ordinary meter consumers.

In the subsequent discussion, excellent speeches were made by Mr. F. W. Cross (then of Wellington, now of Lea Bridge)

HOUSES SUPPLIED WITH SLOT COOKERS BY THE  
NEWMARKET GAS COMPANY.

NUMBER OF SLOT COOKERS FIXED BY THE COMPANY, 150.



BETTER-CLASS HOUSES, SUSSEX COTTAGES, NEWMARKET.

|                                                                    |     |
|--------------------------------------------------------------------|-----|
| Rentals per week . . . . .                                         | 8s. |
| Number of cubic feet of gas for 1d. . . . .                        | 20  |
| Extra charge per 1000 cubic feet to prepayment consumers . . . . . | 6d. |



CHEAPER-CLASS HOUSES, BLACK BEAR LANE, NEWMARKET.

|                            |     |
|----------------------------|-----|
| Rentals per week . . . . . | 2s. |
|----------------------------|-----|

and Mr. W. North (Stourbridge). Mr. Cross urged the adoption of shilling-in-the-slot meters, which I may note, in passing, were first placed on the market in any quantity during the spring of this year, although recommended in 1888—seven years previously—by Mr. Price, of Hampton Court, at the Southern District Association Meeting.

MESSRS. CROSS,  
MEIKLEJOHN, AND  
NORTH.

Mr. C. Meiklejohn (Rugby) and Mr. North condemned the shilling-in-the-slot meter as being beyond the means of consumers catered for by the penny meters. Mr. North described the excellent results following his liberal treatment (compared with Mr. Young's) of his consumers as regards gas-fittings; and since then he has added to the benefits cookers at low rentals.

1896.

The year 1896 takes us into the heart of the movement as far as the Metropolis is concerned; and we feel the pulsations extending all over the country. Those gas companies and corporations who do not of themselves move are requested to do so by numbers of their would-be consumers; and the inquiries and orders roll



into the meter makers faster than they can be dealt with—the deliveries to The Gaslight and Coke Company alone at one part of this year being 16,000 meters in arrear. The law of supply and demand, however, soon regulates matters; and now orders can be executed from stock. Strange to remark, however, the deliveries of stoves were never far behind, and frequently we find stoves delivered waiting for meters.

At this time, five undertakings—The Gaslight and Coke, South Metropolitan (whose figures have already been recorded), Brentford, Liverpool, and Ipswich Companies—have orders now totalling, after an average of less than three years' working, to upwards of 150,000, about 60,000 of these having cookers fixed; but the proportion of just over one cooker to three meters will now be found to have increased considerably, averaging about two cookers to three meters.

**BIRMINGHAM DAILY POST.** Early in January, an interesting article appeared again in a Birmingham daily paper—this time the "Birmingham Daily Post." The writer sketches the history of small consumers from 1877—showing that they never paid until the adoption of the automatic meter, along with a boiling-burner; and he suggests the desirability of adopting a small cooker. When the public Press advocates such a course, it is not long before some active steps are usually taken in the desired direction.

**MR. G. LIVESEY CHARGES METERS AND STOVES TO CAPITAL.** At the South Metropolitan Gas Company's half-yearly general meeting, held in February, Mr. George Livesey gave some valuable information as to the financing of the new system. "Meters and stoves," being removable, were charged to "capital." "Gas fittings and piping," and other materials, were charged to a "suspense account," to be liquidated by the extra charge made for gas supplied on the automatic system. The labour used in fitting up was charged to "revenue." At this time, their 43,000 coin consumers had only £31,000 debited against them in the suspense account—a very satisfactory showing.

**MR. I. CARR, WIDNES.** Lancashire now makes its voice heard, and this time through the well-known personality of Mr. Isaac Carr, who, in his Presidential Address to the Manchester District Institution, in March, described the results of the coin-free meter in Widnes. True to his well-earned character as a purveyor of the cheapest coal gas in the world, he supplied 30 feet for a penny (since increased to 36 feet), and he still reserves an extra 1s. per 1000 cubic feet for interest and sinking fund on fittings supplied. I am very glad indeed to note that, though commencing with the usual boiling-ring, Mr. Carr now fixes cookers at a small rental.

**MR. W. R. CHESTER, NOTTINGHAM.** No presidential pronouncement would now be complete without a reference to this system; and we find that Mr. W. R. Chester, in his address to The Gas Institute in June, refers to the satisfactory result attending its introduction into Nottingham without "artificial inducements." From Mr. Chester's remarks in the discussion on the paper by Mr. A. Dougall, of Tunbridge Wells, on "Popularization of Gas," read the following day, it is evident that this meant the supply of fittings and cookers. The "artificiality" of supplying a growing demand on a paying basis is, however, scarcely apparent. Mr. Chester is not usually slow to appreciate a good thing, and the excellent results obtained wherever inducements, *natural and not artificial*, have been given, will doubtless convert him. Certainly the paper by Mr. Dougall just referred to should lead to good results. There is quite

**MR. SIMPSON, NOTTINGHAM TO EXETER.** difficulty enough attending the introduction of new methods among many gas companies and corporations without the leaders of the gas industry holding back. The introduction of the prepayment meter into Nottingham attracted the attention of a Mr. Simpson, a mechanical engineer, who was then engaged in perfecting sewing machines, typewriters, &c. He devoted his energies to improving the irregularities of the then existing patterns of meters, with the result that his meter has established a reputation for simplicity and accuracy second to none. Messrs. Willey and Co. took up the patent, and, as a natural sequence, Mr. Simpson removed from Nottingham to Exeter, and is now engaged in superintending its manufacture there.

**MR. A. DOUGALL, TUNBRIDGE WELLS.** The writer has referred to the Tunbridge Wells Gas Company as a provincial pioneer of "gas cookers fixed with slot meters." Mr. Dougall's "Popularization of Gas" paper contains a comparative table giving the consumption of 225 houses, fixed complete with cookers ranging between 3000 and 64,000 cubic feet per annum, and 541 without cookers with consumptions from 1000 to 25,000 cubic feet per annum, is most instructive. *The average works out to 14,409 cubic feet per annum with cookers, and 6773 cubic feet per annum without.* The paper is worthy of a place as a standard of reference among the commercial statistics of gas distribution. The author points out that instruction should be given in gas cooking with these stoves, as, after a failure, the inexperienced housewives may go back to the old fire-grate; but when they once properly use a gas cooker they never give it up. His suggestion that cooks, when married and settled down, instead of going out to char might give homely demonstrations in slot districts,

under the gas company's auspices, is worthy of adoption. Mr. Dougall evidently agrees that—

"A woman sometimes scorns what best contents her;  
Send her another, never give her o'er."

The interest displayed in the discussion, which covered also an admirable paper by Mr. Norton H. Humphrys, of Salisbury, on "The Hiring-Out of Gas Apparatus"—a subject just outside the limits of these articles—was remarkable; proving beyond doubt the immense strides made by the system since 1894. Those present will remember the following gentlemen who took part in the discussion: Mr. G. Anderson (London), Mr. H. Lees (Hexham), Mr. W. A. Valon (Ramsgate), Mr. I. Carr (Widnes), Mr. W. D. Child (Romford), Mr. T. N. Ritson (Kendal), Mr. Alderman Miles (Bolton), Mr. R. Porter (Elland), Mr. J. Andrews (Langley Mill), Mr. W. Carr (Stalybridge), Mr. R. G. Shadbolt (Grantham), Mr. A. Graham (Mansfield), and the President (Mr. W. R. Chester).

These gentlemen, representing districts North, South, East, and West, gave their experience of the system; and several recommended the supply of cookers, including Mr. Lees, who fixed old pattern ordinary cookers free, to the satisfaction of all concerned. Mr. Isaac Carr, remarked that "any engineer who felt his business required a filip could obtain it by the introduction of the system of hiring-out stoves with penny-in-the-slot meters;" Mr. Alderman Miles "was quite sure a great field even yet existed for cooking-stoves with slot meters;" and Mr. Andrews "agreed that it would be to their advantage to adopt gas cookers with coin meters, as far as they possibly could." Thus finished a discussion showing a practically unanimous approval of the system, assisted by the use of cookers, by representative speakers, which cannot fail to move those who "listen but speak not."

Shortly after the Institute meeting, there appeared the annual report, covering the twelve months ending March 31, 1896, of the Manchester Corporation Gas and Electricity Department—prepared with Mr. Charles Nickson's usual care—containing an important paragraph detailing the fact that the supply of brackets and boiling-rings was much appreciated, and that the 3383 consumers used 22,700,000 cubic feet of gas in the year—an increase of 2402 users in that period. It is worthy of note that had cookers also been fixed, an additional consumption (based upon London experience of 8000 cubic feet for cookers) of 27,000,000 cubic feet, or practically double might have been obtained by increasing the outlay from, say, 30s. to 40s.

**SOME LARGE TOWNS FIXING SLOT COOKERS.** After this clarion call, surely Manchester must march into line with Bath, Brentford, Bournemouth, Coventry, Dover, Eastbourne, Hereford, Huddersfield, Hull, Ipswich, Leeds, Leicester, London, Norwich, Plymouth, and many other large towns, not to mention scores of medium-sized and smaller ones, such as Aldershot, Barry, Caterham, Dartford, Dorking, Falmouth, Grantham, Irthlingborough, Kidderminster, Littlehampton, Maidstone, Matlock, Newmarket, Romford, Stafford, Swindon, Tonbridge, Tunbridge Wells, Uxbridge, Wellingborough, Widnes, and Yeovil, &c. A few of these towns still charge a small rental for slot cookers; but every year sees the number reduced. Take, for instance, Lille, with 300,000 of a population in its lighting area, and only 14,725 consumers, or one to 49 of its inhabitants (Dublin, our smallest average,

**SMALLER TOWNS.** has one consumer to 21 inhabitants), had increased its consumers 22 per cent. in one month; and the Engineer, M. Melon, hopes to double his consumers by the year 1900—thus reaching to one consumer for every ten inhabitants, which is Bristol's average. It is worthy of note that M. Melon has 2894 cooking-stoves fixed with prepayment meters.

**MR. CORBET WOODALL.** Returning again to the Metropolitan Gas Companies, the shareholders of the Tottenham and Edmonton Company were informed in August, 1896, by their gifted Chairman, Mr. Corbet Woodall, that in fifty years they had secured 5764 ordinary consumers, but that three years of the automatic meters had brought 3380 extra customers. "This result, in conjunction with the remarkable increase of gas used for heating and cooking, made the future of the Company bright and promising."

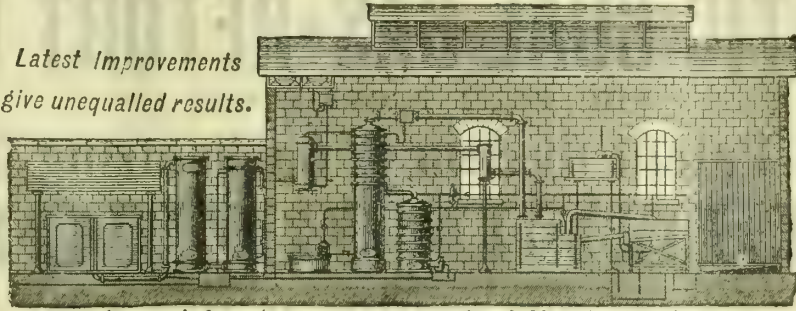
**MR. C. H. NETTLETON, DERBY (CONN.).** Mr. Charles H. Nettleton, of Derby (Conn.), in a paper read in November, 1896, to the American Gaslight Association, referred to the success attending the supply of stoves and fittings free by the South Metropolitan and other English gas companies, and stated that he found, after careful inquiry, that an average cooking-stove consumption (by an ordinary consumer) with dollar gas (\$1 per 1000 cubic feet) varied from 15,000 to 20,000 cubic feet a year; while the lowest return with gas at a considerably higher price was 8000 cubic feet. This information agrees with our own experience as regards the lowest (8000 cubic feet), and this by small 12-inch oven cookers with only two boiling-burners. But we can show more than a 20,000 cubic feet average on ordinary cookers with cheap gas. Although the system is not as yet generally adopted in America, we find it now going through the stages there that the year 1894 witnessed in England. Williamsburg is one of the pioneer towns, with an average consumption of 1700 cubic



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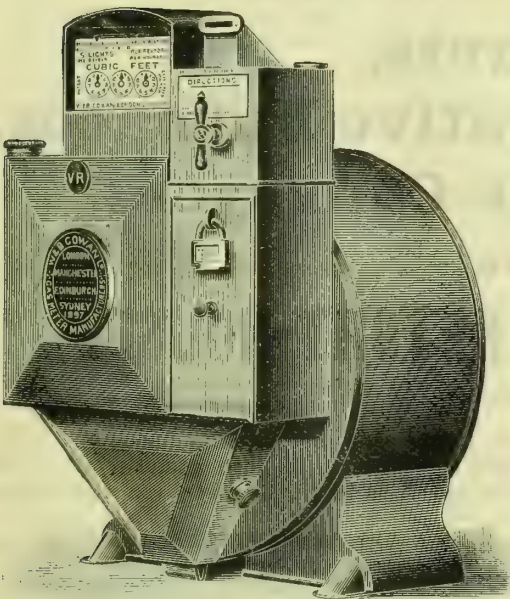
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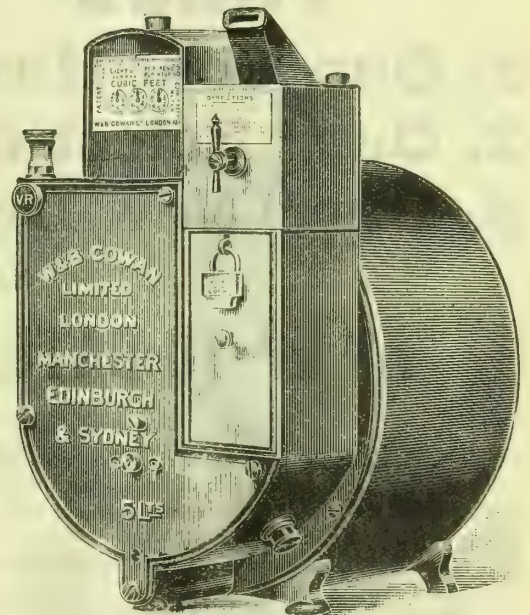
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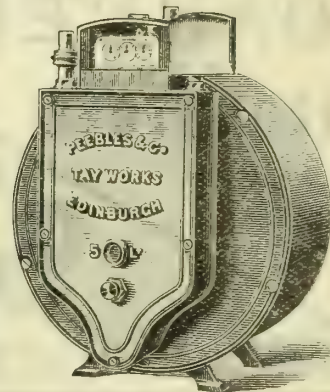
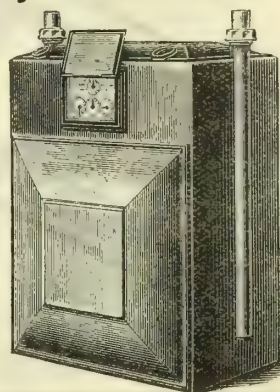
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feet per month, or 89 per cent. more than their average 3-light meter consumption.

One of the last public references to the prepayment system in 1896 was Mr. J. H. Penney's, of South Shields, in his address from the chair of the North of England Association. He thus sums up its advantages: "It bids fair to be one of the greatest conveniences of modern times."

STOURBRIDGE. The selection of any special towns now becomes very difficult, as the reports referring to the system coming from gas companies and corporations are full of interest. I cannot, however, omit the mention of Stourbridge—a typical moderate-sized gas-works (with cheap coal competing), making just over 100 millions with 2500 consumers, and a population of about 9500. In 1896, the Gas Department, under enterprising management, had 1300 slot meters out; and the number has since been increased to 2200—500 with slot cookers at small rentals.

The views interspersed throughout this week's article, with accompanying foot-notes, detail various interesting facts as to the progress made by Provincial Companies and Corporations, several of which are not otherwise referred to in the text.

So ends the year 1896, in which was seen an unmistakable desire on the part of the public to have cookers with their meters; and the conviction has gradually grown up among Gas Departments that the desire should be encouraged. In it also shilling-in-the-slot meters came to the front; and it seems probable that their use for gas fires and cookers may become general with ordinary consumers of gas, who desire, equally with the suppliers, to prevent the waste so often resulting from an unchecked consumption.

"And since this business so air is done,  
Let us not leave till all our own be won."  
"Henry IV.," Part I., Act v., Sc. 5.

(To be continued.)

## TECHNICAL RECORD.

### AMERICAN GAS LIGHT ASSOCIATION.

Twenty-Sixth Annual Meeting at Niagara Falls, N.Y.

This meeting was held on the 19th, 20th, and 21st ult., under the guidance of the President, Mr. J. B. Crockett, of San Francisco. The list of applicants for membership was unusually large, including no less than 53 active and 14 associate members. The resignations, &c., were only 12, so by the acceptance of these proposals, the Association shows a net increase of 55 names on the members' roll.

The report of the Council recognized the special exertions of Mr. Walton Clark in carrying on the work of the Committee on Education, and recommended the appointment of a Board of Trustees, to administer the funds and have full charge of the educational work. The Board is to consist of three members appointed by the Association and of the President and Ex-President *ex officio*; and Messrs. Walton Clark, E. Vanderpool, and W. F. Donthirt were recommended for appointment. The report of a Special Committee of the Council appointed to devise means for continuing the educational work of the Association, formed an appendix. It recommended the Board of Trustees above mentioned, who should be authorized to engage a competent Secretary to act as instructor. The expenses were to be met by voluntary contributions, from companies and others, to extend over five years, the total to be not less than £600 per annum. A circular and subscription form had been issued, and had already brought in promises equal to £640 per annum; and it was recommended that this list should be kept open, as any balance in excess of present requirements could be invested as a permanent fund for the benefit of the trust. The Secretary's salary would be £600 per annum, and the incidental expenses about £50; and they recommended a grant from the funds of the Association to meet the latter item. They were open to receive donations from those who did not feel at liberty to undertake a five years guarantee, which could either be invested and the interest alone used, or expended at the rate of not more than one-fifth in any one year. The report went on to suggest that the present Secretary of the Association be elected Secretary to the Trust, and stated that he was prepared to work the two positions together. The report of the Education Committee set forth that the class at present consisted of 77 members; and the Chairman, Mr. A. C. Humphreys, made a detailed statement as to the raising and administration of the fund, which was received with repeated applause. The Research Committee presented a report, in which they mentioned several matters as suitable subjects for papers to be submitted at the next meeting, and stated that a table of house piping had been prepared and issued to the members, as directed at the last meeting. They also recommended that the standards for gas-works castings, as suggested by the Society of Gas Lighting, should be adopted by the Association.

The President, in his inaugural address, remarked that most

of his experience had been gained on the Pacific Coast, under conditions very different from those which prevailed in the neighbourhood where they were then assembled, and where materials and factories for the supply of plant were close at hand. He believed that the time was near when all the gas interests throughout the country would have to combine and make common cause against the growing impression that all so-called public utilities should be acquired and worked by the municipalities, which was advocated by writers on political economy, and had received prominent attention at the convention of mayors from various cities, which was recently held at Detroit. Even there a question was raised, however, as to the accuracy of the reports on municipal enterprise. The need for a uniform arrangement of accounts was insisted on; and it was also remarked that in common fairness the companies should be allowed to send their best representatives to argue their side of the question. After referring to Detroit and Philadelphia as examples of unsuccessful municipal enterprise, the President went on to argue that, fairly compared on an equal basis, the cost of municipal production and delivery would be found greater than those of companies. The municipal gas-works could be made into a vast political machine; but that did not tend to secure profitable or economical management. Great Britain had been frequently cited as an example in support of municipal ownership; but he had not met with any proof that, comparing towns of similar size and circumstances, the municipality could supply better or cheaper gas than a company. The question of long distance transmission of electricity generated by water power was next discussed at length, in the light of actual practical experience; and the conclusion was that long line transmission, as at present conducted, would not hurt the gas business. A passing reference to the competition of electricity led up to a consideration of the various methods available for encouraging the sales of gas. The plan of letting out stoves free at a guaranteed consumption per month was highly recommended. The necessity for some combined action on the part of the gas interests, to watch, and if necessary oppose, the action of legislators as affecting the industry, was strongly insisted on. Electrolysis of mains and services was the next topic; the experiences in this direction at San Francisco and at Spokane being particularly instanced. Mr. W. H. Preece, speaking on the subject in London, had stated that the whole of London was disturbed by the leakage of electricity from the City and South London Electric Railway; but that in no single instance was the disturbance such as could not be remedied by simple and ordinary precautions. The proposals of the Educational Committee were fully considered, and strongly recommended as deserving energetic support. In concluding, the President said the future of the gas industry looked exceedingly bright.

Mr. H. L. Doherty, of Madison, (Wis.), read a paper entitled "How can we Make the Use of Gas More Universal." He thought that the reasons why the use of gas-stoves during the summer months was not more general, were a want of appreciation of the real merits of this system of cooking, exaggerated ideas as to cost, procrastination, cost of installation, the use of bad gas-stoves, fear of a gas-stove and dislike to abandoning a satisfactory coal or oil range, the want of an economical and efficient means of heating circulating hot water systems by gas, and the difficulty of disposing of garbage. The reasons why they were not used throughout the whole year were a failure to perceive advantage in the use of gas except in hot weather, no provision for heating the kitchen other than the cooking stove, and the economy of solid fuels when heat was also required. He was strongly in favour of advertising, soliciting, and demonstrating the advantages of gas-stoves; and also carefully inquiring into all cases of complaint as to high bills. The two-meter system was very useful, as assisting in locating the actual consumption. Excessive draught on the oven burners was a cause of extravagance, and a patent arrangement for reducing or checking draught was described. Insufficient pressure was the cause of waste of gas, though this might seem anomalous. Half a gallon of water heated over burners consuming 4 and 12 cubic feet per hour respectively would be brought to boiling point, not only in less time, but also with less gas, by the larger, than by the smaller burner. Giving away stoves, or selling them greatly below cost, was a short-sighted and unbusinesslike policy. It led to undesirable ideas as to the Company's margin of profits, and was not appreciated, nor did the free stove meet with much care or patience in using. Once get the public well acquainted with the merits of the stove, and the cost would not stand in the way of its adoption. The use of a main stopcock on the supply-pipe was objectionable, as likely to lead to accidents, as also was the plan of arranging for the door to fly open in the event of an explosion. If a safety vent was desirable, it should be at the side or back. The hot water question was not yet nearly solved. Many of the high-pressure heaters on the market were crude, clumsy, and ineffective; and gas companies would do well to test these appliances both for efficiency and for consumption of gas. They should put at least 75 per cent. of the theoretical heating value of the gas into the water; but many of them did not yield 35 per cent., and the rate of consumption had a marked effect on the efficiency. The solution of this problem was exactly in the line of steam boiler practice. Instantaneous heaters were more efficient; but they were costly, troublesome, complicated, unsuitable for insufficiently ventilated rooms, soon out of order, and would only deliver the hot water at the place



where they were located. He greatly preferred a combination of both principles, consisting of a long coil of brass tubing situated directly above a number of large bunsen burners, with automatic gas-regulator and pilot jet. There should be a supplementary water storage tank, and the whole of the boiler, piping, &c., should be coated with non-conducting material. Several suggestions were offered as to securing the all-the-year-round use of the gas-cooker; and the author summed up the question, as including every care in respect to the efficiency of stoves in use, and active canvassing, advertising, and demonstrating to attract the attention of those who did not at present use gas. Newspaper advertising was probably the best; circulars and handbills being of doubtful value. A poor canvasser was worse than useless, but a good one was beyond description. Ordinary districts should support a canvasser to each 5000 inhabitants at the very least.

Mr. R. M. Searle commenced the discussion by remarking that most of the hindrances mentioned in the paper arose from ignorance, and illustrated the need for canvassing and demonstrations. The place for an inefficient stove was the scrap heap; and a serious difficulty in his district (Atlanta, Ga.) was the failure of the servants to keep the stoves clean. It was the policy of the company to keep the stoves in good repair, and he had a staff of six men to look after 4000 stoves. He did not agree that free installations were a mistake, as one of the best records in the country was secured on that line; and he knew results covering 30,000 stoves in various companies, all of whom were paying good dividends. In Kansas, 12,000 stoves were fixed on the free system in eighteen months. Mr. G. Clarke said that the population of Kansas was 200,000, and there was also much personal canvassing, and a gas rate of only 2s. 1d. per 1000 cubic feet. Mr. Paul Doty believed that the question asked by the title of the paper might be answered in as many different ways as there were different circumstances and individualities. He strongly advocated the education of the consumers, and the encouragement of the use of the gas-stove in public and private cooking schools and classes. He had placed a stove in a registry office, and arranged that servants waiting for employment could be instructed in its use; and also distributed cookery books and pamphlets. The remedy for excessive consumption was a knowledge of how to read the meter. He advocated free service and fixing; but not a free stove. It should be sold at the regular trade price, and local dealers could then be allowed a commission on every stove sold. He dealt in gas-fittings of all kinds, and had five canvassers at work on commission. As the result of this policy, he had sold this year, up to the present date, 635 stoves and 321 hot-plates. The appliance department paid for itself, including the exclusive services of a lady lecturer who gave demonstrations at the offices, superintended a free lunch on the discount days (the 14th and 15th of each month), investigated complaints, followed up new users, &c. As to advertising, gas men had not always the ability to get up good advertisements, and he advocated the formation of a central advertising bureau for supplying suitable matter and cuts. Mr. H. H. White had been very successful with heating by means of the Wolfe gas-radiator; but he could not report equally good results in respect to cooking-stoves. Seven of the largest churches in his city were heated exclusively by gas. Mr. Littlehales said that at Syracuse, N.Y., he had placed 2000 cookers in two years. Canvassing, properly done, gave the best results, and he believed in the two-meter system, whether there were two prices or not. Mr. Graves reminded the meeting that every gas manager did not use a gas-cooker in his own house for the whole twelve months, and that example was stronger than precept. As to canvassers, a good salesman earned his salary and more. Mr. Pinckney believed in encouraging cooking classes, and had seen practical evidence as to the value of such a course in his own family. Mr. Pratt saw to the placing of every stove, and followed it up by a visit from an experienced lady instructor. Mr. Harbison had followed the maxim of "practice what you preach" for years; and not even a pound of coal was used in his house. As to water heating, he had an efficient instantaneous apparatus made by a firm in Chicago. He was at present laying services to a row of flats, in which gas would be used exclusively for cooking. Mr. A. E. Forstall had tried a gas bath-heater in his own house, but it was not such a success that he could recommend it to his friends. The President was doing very well on the hire system. At first he put out 1000 stoves, and the results were so satisfactory that another 2000 were placed. The average consumption of gas per annum was 20,000 cubic feet per stove; and the cost involved in their maintenance was a mere trifle.

Mr. Doherty, in replying, said that, of course, it was easy to get rid of a large number of stoves by supplying them free; but he preferred the policy indicated in his paper. As to removing all objections on the score of cost, to do that it would also be necessary to give away the gas. The advantage of charging for everything at a fair price was that the cost of the gas was not loaded, and it could be sold at a low figure. He agreed that cookery schools and classes should receive every possible encouragement and support, also with taking payments for stoves by instalments, as many users of such appliances could not, or did not care to, pay the whole sum at once. A central advertising bureau might be a good thing; but every manager should know best how to deal with the conditions governing his own district.

(To be continued.)

## THE PRESENT POSITION OF ACETYLENE LIGHTING.

Dr. Paul Wolff's Berlin Lecture.

(Concluded from p. 1104.)

An illustration of the complete Pictet-Wolff plant is given in the diagram, fig. 1. The carbide is introduced by hand through the shoot *a*, and falls down the inclined plane *b* on to the sloping grid *c*. The gas is thereupon generated, and, rising vertically upwards, is prevented by the water-seal from escaping through the shoot whereby the carbide is introduced. There is an overflow-cock *G* on the tube *B*; and an overflow-pipe *H*, provided with a cock *J*, on the top of the generator also leads into the admission shoot. The outlet *K* leads to the purifying plant; while a second outlet goes direct to the gasholder. Each of these outlets can be closed by a cock. When the generator needs cleaning, both cocks are shut, and the cock *J* opened. Water

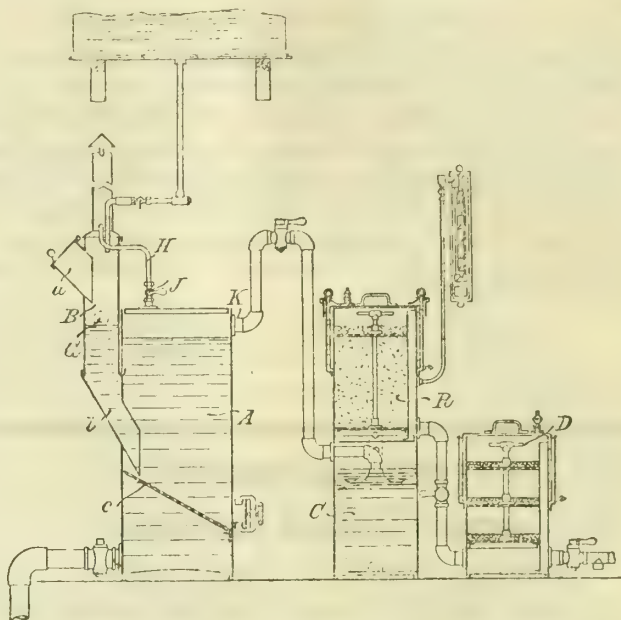


FIG. 1.

is admitted until it overflows at the admission shoot. By this means all the gas is driven out of the generator, and escapes by the chimney. The lime water may now be run off, and air allowed to enter the generator, as no trace of gas can be present in it. Similarly, after cleaning, the air is expelled from the generator by admitting water until it overflows at the admission shoot. The cock *J* is then closed, and the cock on the pipe which affords direct communication between the generator and the gasholder is opened, and gas is allowed to flow from the latter to the former, and force out water from the generator until the pressure of the gas is equal to that of the water-seal. The space above the level of the water in the generator is thus filled with purified gas. Carbide is then introduced, and the gas generated forces more water out by the overflow-pipe, until the working level of the water is established. The overflow-cock is then shut. The acetylene generated is thus quite free from air, and an explosive mixture of air and acetylene cannot be produced in the generator.

The acetylene passes from the generator into the washer *C*, which contains a solution of calcium chloride, which removes ammonia and a part of the sulphuretted hydrogen from the gas. The phosphuretted hydrogen is but little affected by this operation, and it is abstracted in the purifier *R*, which contains chloride of lime (bleaching powder) either alone or mixed with other substances. One such purifier answers in small installations; but several of the purifiers in series are required in large installations. The gas is dried and freed from the chlorine which it has taken up from the bleaching powder in the vessel *D*, and then passes on to the gasholder, station meter, and governor. In large installations, condensing apparatus is placed between the generator and the washer for the purpose of cooling the gas, and removing from it aqueous vapour and particles of lime and carbon.

The extremely high illuminating power of the acetylene flame is caused by the large proportion of carbon in, and the high temperature of combustion of, acetylene. The large quantity of carbon, which when raised to incandescence gives the gas so high an illuminating power, causes difficulty, in that the atmospheric oxygen fails to reach the carbon in the interior of the flame. Thus a portion of the gas is apt to escape complete combustion, and the flame appears smoky. The trouble occurs with other substances, such as oil gas, benzol, ligroin, &c., which are rich in carbon. If acetylene were burnt from an ordinary gas-burner, the smokiness of the flame would be very much in evidence. The mixing of air with the gas must be much more intimate than it is possible to secure with the ordinary burners. Various means are adopted in order to compass this end.



When acetylene is consumed in an ordinary gas-burner, the air only reaches the exterior parts of the flame, and in the core combustion is not secured. If the orifices of the burner are narrowed so that the thickness of the flame is reduced, while its surface remains undiminished, contact of air with the gas may be obtained throughout the flame. Or the pressure at which the gas issues from the burner may be increased in order to induce a stronger flow of air to the flame. It has then to be decided at what point the admixture of air and gas can best be carried out. Another method of securing more intimate contact between the air and the acetylene is by the dilution of the latter with another gas. Either incombustible diluents, such as air and nitrogen, or combustible diluents such as hydrogen and methane, may be employed. Owing to the wide limits within which mixtures of air and acetylene are explosive, air cannot with advantage be mixed with the gas until the latter has reached the burner. An air supply such as is afforded in the Bunsen type of burner may be used, provided it is so regulated that a non-luminous flame is not produced.

The faults of most acetylene burners are that they become choked in a comparatively short time, and that the flame is smoky. These troubles are in no way due to impurities in the gas, but occur with pure acetylene, though impurities may accelerate the choking of the burners. The ease with which acetylene decomposes is the real cause of the troubles. The heat of the flame causes a polymerization of the acetylene to take place even within the burner, and the products block the orifices. Burners in which the gas issues from a slit, such as are commonly employed for coal gas, cannot be used for acetylene, as the slit very rapidly becomes blocked up. Burners with two orifices, such as the fishtail burner, answer rather better, and small Bray burners were at first used almost exclusively for the consumption of acetylene. In the Bray burner, the inclined perforations from which the gas issues are in porcelain-like material encased by brass. The burner gives an elegant flame, and affords a high photometric efficiency; but it becomes blocked up in a short time, and frequently needs cleaning. When burnt from such small orifices, acetylene will inevitably block them up; but, for the reasons stated above, larger orifices are useless for the combustion of pure acetylene. Hence the only practicable alternative is to mix the acetylene with other gases; and of these air is the most convenient, as the admixture can be effected in a species of bunsen burner. The construction of the burner can be modified considerably.

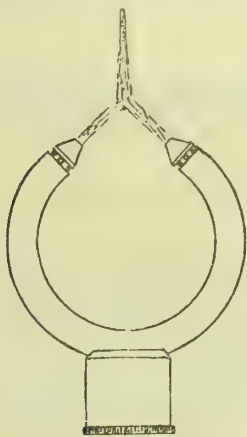


FIG. 2.

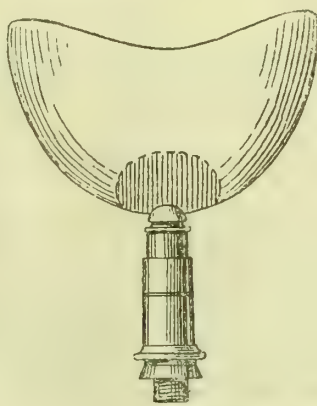


FIG. 3.

Two forms of this type of burner which have been found in Germany to answer well are shown in figs. 2 and 3. In the former, the two metal tubes incline towards one another at an angle of 90°, and each is provided with a steatite cap, in the lower part of which is the fine orifice from which the gas issues. This is surrounded by four holes, through which the jet of gas draws air; and the mixture of acetylene and air issues from the wide orifice in the top of each cap of the burner. The two jets then impinge on one another, and form a butterfly flame above the burner, and not in contact with it. The burner openings thus remain comparatively cool; and as they are not very small, they can be cleaned without difficulty. The burner shown in fig. 3 is an ordinary hollow-top slit burner mounted on a metal case, in the base of which is the gas orifice surrounded by air-inlets. This burner has answered extremely well. The efficiency of the burner shown in fig. 2 is from 35.5 to 41.4 English candles per cubic foot of acetylene; and that of the hollow-top burner from 38.5 to 41.4 candles per cubic foot.

The heat of combustion of acetylene greatly exceeds that of coal gas, being as 140 : 55; and consequently a very high temperature can be obtained from acetylene when burnt in bunsen burners specially designed for its consumption for heating purposes. Several of these burners which answer well can now be obtained. Difficultly fusible metals, such as copper and nickel, can be fused in a crucible by an acetylene bunsen flame.

The calculations of the cost of acetylene lighting which have hitherto been published are for the most part fallacious; they have been the work of partisans. It is, however, difficult to make an exact computation, as the price of carbide varies very much. A price of 40 pfennige a kilogramme (equal to 2.18d. per

pound) will not be far from correct, though a reduction may be expected within a year or so. The practical yield of acetylene is about 300 litres per kilogramme (4.86 cubic feet per pound) of carbide. If 10 per cent. be allowed for amortization and loss, the cost of a cubic metre of acetylene becomes in round figures 1s. 6d. (=about £2 2s. 6d. per 1000 cubic feet). Coal gas costs on an average (in Germany), 17 pfennige per cubic metre (4s. 9½d. per 1000 cubic feet). Then assuming that 0.443 cubic foot of acetylene gives, on an average, a light of 16 English candles, and that 7.41 cubic feet of coal gas in an ordinary batwing burner, and 1.29 cubic feet in a Welsbach burner, produce the same light, then the cost of the light will be as follows: From acetylene, 0.226d.; from coal gas in a flat-flame burner, 0.41d.; and from coal gas in the Welsbach burner, 0.074d. The same light from incandescent electric lamps would cost, on an average, 0.48d. Acetylene, therefore, is cheaper than coal gas (at the price assumed above) consumed in ordinary burners, but is considerably dearer than that gas when consumed in the Welsbach burner; and statements to the contrary are calculated merely to delude the public, as they cannot be substantiated. It should, however, be remembered that a 16-candle light cannot be obtained by a Welsbach burner; while acetylene affords flames of considerably lower illuminating power if desired. Moreover, the mantles and chimneys of the Welsbach light frequently need renewal. Researches made recently by the author indicate that an acetylene light on the Welsbach system can be produced, and is more economical than the open acetylene flame.

Acetylene has at present no prospect of competing with coal gas in large towns. In small towns, in the country, in factories, at railway stations, and in lighthouses, and wherever gas and electricity are not obtainable, it should have no difficulty in supplanting petroleum. One advantage in decorative lighting which acetylene has is that the pipes for the supply of the burners are very much smaller than those for coal gas, because the consumption is so much less.

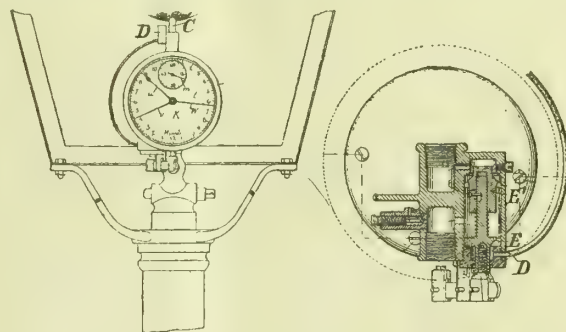
As an instance of the progress acetylene lighting is making, it may be mentioned that installations for 1000 and 2000 burners have recently been supplied to two small towns in Germany.

## REGISTER OF PATENTS.

**Lighting and Extinguishing Gas-Jets in Street-Lamps.**—Frossard, J., of Parrentury, Switzerland. No. 24,013; Oct. 18, 1897.

This invention comprises the combination of wheelwork with a device intended to connect or disconnect alternately, at fixed hours, the inlet and feed pipes for the gas, and connect at other times the feed pipe and the pilot pipe, by a double-seat valve connected with a valve-operating lever acted upon by mechanism secured to a vertical supporting plate.

The apparatus is shown as attached to a street-lamp column, and (to a larger scale) in vertical section. The points of novelty comprise: (1) A double valve E E', with a spiral spring and a pin provided with a taper as shown. (2) Wheelwork, the driving-spring of which acts, on the one hand, upon a train intended to indicate the hour, and, on the other hand, upon a train intended to work the device for cutting off the light. (3) The combination of a wheel provided with pins with a lever and spring acting upon the device for cutting off the light. (4) A stopping and



starting device composed of a lever and bolt; the latter acted upon by means of the lever for stopping the butterfly, and the lever being combined with a barrel-wheel and with discs intended to release the butterfly at predetermined hours. (5) A device intended to heat the whole apparatus so as to prevent the oil used for lubricating the mechanism from freezing. (6) A case formed of a non-conductor of heat, and intended to protect the mechanism against the action of the sun. (7) The combination of a lighting-tube with a box D containing spongy platinum. (8) The lighting-tube provided with holes forming a line of gas reaching from some kind of mechanical lighting device (acted upon by means of the lever) to the burner C.

**Prepayment Meters.**—Cowan, W. & W. H., of Edinburgh. No. 24,049; Oct. 19, 1898.

These improvements in prepayment coin-freed gas-meter mechanism, constitute modifications of, or additions to, the invention described in patents No. 13,200 of 1895, and Nos. 18,098 and 28,828 of 1896; the object aimed at being to "simplify the construction and manufacture of the prepayment mechanism, and also to enable the gas-valve to be closed more abruptly than hitherto, when the amount of gas paid for by the insertion of a coin or coins has been almost consumed, whereby the whole, or nearly the whole, of the gas can be supplied without any appreciable diminution of light, prior to the complete closing of the valve."

On next page is shown an elevation, a plan, an end elevation of a portion of a meter illustrating the improvements applied thereto (the covers

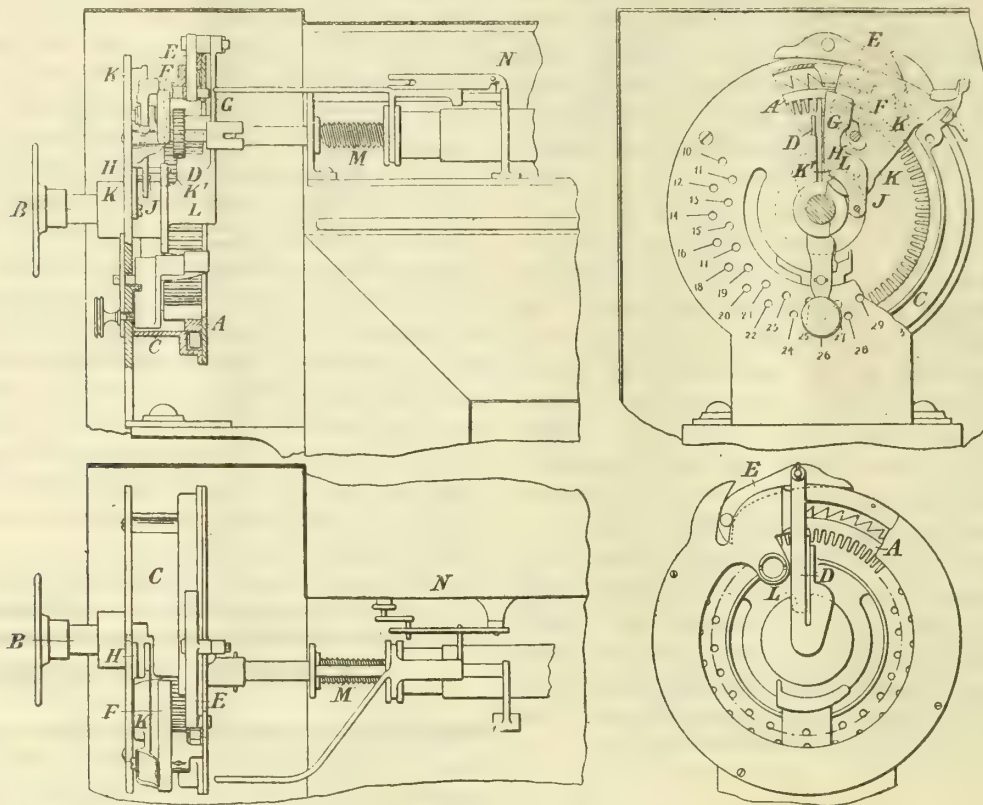


being removed for the sake of clearness), and a rear end elevation or back view.

In accordance with the first part of the invention, the patentees dispense with the toothed prepayment wheel as constructed hitherto, and substitute for it an internally toothed band or ring A, mounted concentrically with the outer or actuating shaft B, and retained in position within the casing C by a recessed flange and cover. The coin-carrier or pocket D (access to which is obtained by a slot in the side or front of the operator, as formerly) is mounted within the casing in such a manner that, upon the insertion of a coin into the carrier, a portion of it projecting beyond the pocket immediately enters between, or engages with, the

teeth of, the band or ring A, thereby enabling the band to be rotated through the medium of the handle of the shaft B, to actuate the valve mechanism, and thus place at the disposal of the consumer a quantity of gas equivalent to that paid for by the coin inserted.

In order to re-set the internally toothed band A, and ensure the teeth being in a position to receive the coin upon each occasion that the mechanism is operated, a pawl E, as described in the second patent of 1896, is employed, but the periphery of the band itself is provided with teeth into which the pawl engages. The pawl, which works through an opening in the casing, is kept out of gear during the forward movement of the carrier D, by its pin mounting and bearing against the outside of the casing.



The internal teeth are extended sideways beyond the edge of the band, and a pawl F is provided at any suitable position upon the outer casing, by which direct communication is effected with the screwed rod of the measuring-out mechanism of the meter (as described in patent No. 21,108 of 1894), by providing the extremity of the rod with the pinion G, which gears with the internal teeth of the ring.

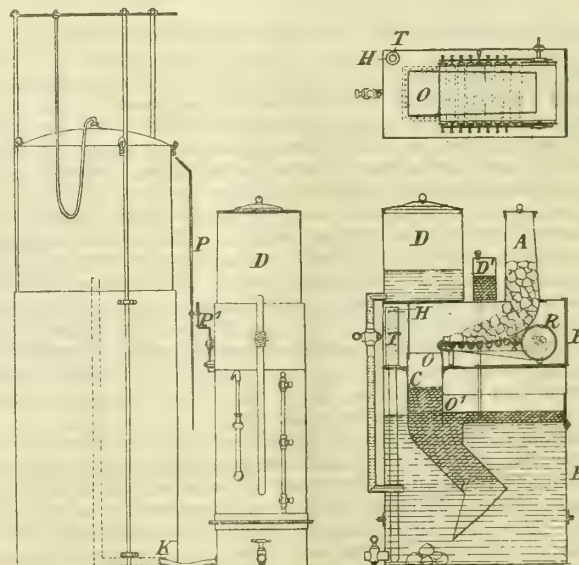
The operating handle is constructed so as to have a "little play" on the shaft (as described in patent No. 18,141 of 1891). When so arranged, it carries a shield, which closes the entrance to the slot before the coin pocket can be moved out of the normal position. Otherwise, a shutter is employed (arranged as shown), consisting of a shield H pivoted to the inside of the casing, and having a pin or projection J working into, or engaging with, a slot formed in a weighted portion K, also pivoted to the casing. The portion K is also provided with a pin or projection K', which, when the carrier is in its normal position, enters, by the weight of the portion K, a notch or recess L formed in a disc, which moves with the coin-carrier—thus keeping the coin-slot free. Immediately, however, that the knob B is actuated, and the disc rotated, the pin rises out of the recess L, and rides on the periphery of the disc. The movement thus given to the portion K is communicated to the shield H, thereby closing the coin-slot. The portion K is also provided with a trigger, by which the shutter can be actuated by a rod, which advances through the medium of the screwed rod or tube M for actuating the valve or stop of the meter (as described in patents Nos. 21,108 of 1894 and 28,828 of 1896) when the full number of coins have been inserted. This keeps the slot closed until a quantity of gas at least equal to the amount supplied for a single coin has been consumed, when the rod is retracted and the slot again opened. The face of the trigger is inclined so that the rod coming in contact with it displaces it, and causes the portion K to rotate slightly upon its pivot, in the same manner as when actuated by the notch and pin before referred to.

In accordance with the second part of the invention, a double-armed or bell-crank lever is employed, pivoted upon the side of the supplementary valve-box or casing N. The lever, which has one arm considerably longer than the other, is so situated that, upon the working back of the tube M, a pin or projection upon an extension carried by the tube is caused to come in contact with the shorter arm of the lever, and so lowering the other arm, which engages with the crank of the valve-shaft, and closes the valve. By reason of the unequal lengths of the arms of the lever, the valve can be closed with a shorter travel of the screwed tube than when the projection engaged directly with the valve-crank—thus enabling the valve to be held full open for a longer period than hitherto. In cases where it may be desirable to employ the lever to open the valve as well as close it, the end of the longer arm is fashioned as a "fork," which engages with the pin of the valve-crank. When so arranged, the pin or projection which operates the lever should bear slightly against the underside of it, while gas is being consumed, till it enters a notch or recess just as it begins to press on the lever's shorter arm. The pressure of the pin then brings the lever into an angled

position, and closes the valve. The valve is again opened, upon a fresh purchase of gas, by the pin working out of the notch; thus causing the lever to resume the horizontal position, during the continuance of which the valve will remain open.

**Acetylene Generating Apparatus.**—Reibel, J., of Angouleme, France. No. 27,288; Nov. 20, 1897. Date claimed under International Convention, May 14, 1897.

This apparatus for generating acetylene is said to work "without any appreciable development of heat and in an automatic manner, to suit the demand of gas required for use." The first point is achieved by causing the carbide fragments to fall, one by one, into a large volume of water. The second point is attained by a transmission device controlled by the descent of the bell-shaped slide cover of the gasholder. The apparatus (as shown) comprises a gas generator and a holder. The former is composed of two sheet-iron boxes B B', placed on top of one another, with an interposed layer of felt. The gasholder has an interior tube, arranged along the axis of the slide cover, which serves for carry-



ing off the gas at K. The carbide is enclosed in a receptacle A; and it rests upon the curved sheet-iron base, so as subsequently to pass upon an endless leather band running over rollers R. The sections gradually increase in the downward direction. The band serves to draw the carbide towards the discharge opening O.



The carbide fragments fall into the box B<sup>1</sup>, and pass into a conduit C, which conveys them into the water. In this box a large volume of water is stored. If no special provision were made, the moisture set free by evaporation and passing through the orifice would attack the carbide contained in the box B. This inconvenience is, however, guarded against by pouring on top of the water, a liquid of lesser density and not subject to act upon the carbide—such as petroleum-oil. The conduit has two angular bends. Thus, when the carbide comes in contact with the water, the disengaged gas is prevented from leaving through the orifice. A few bubbles only traverse the petroleum layer at O<sup>1</sup>. The remainder escapes above the water surface. The gas is collected at the upper part of the cylinder H by means of a tube T (which is made sufficiently wide to avoid variations of pressure in the generator), and then re-descends across the volume of water.

In order to ensure that the movement of the band may not commence until the bell-shaped slide cover in its descent has reached a certain point, the connecting-rod P is provided at its lower part with a slotted guide; and the lever P<sup>1</sup> is stopped at one point by a catch. A counter-weight has the tendency of constantly bearing against this catch.

The upper box B carries, besides the carbide receptacle A, two cylindrical receivers D and D<sup>1</sup>. The small receiver serves for the introduction of petroleum oil into the generator; the large one, for the supply of water. At the bottom of the box B<sup>1</sup> is a discharge-cock, to expel the water charged with lime and impurities.

**Ignition Device for Gas-Burners.**—Jurgens, E. & J. F. C., of Hamburg, and the Automatic Universal Gas Lighter, Limited, of Cophall Avenue, E.C. No. 29,828; Dec. 16, 1897.

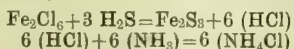
This invention relates to the manufacture of igniting-bodies having platinum-black carriers that are said to be more porous and less affected by high temperatures than others heretofore made. The patentees take 48 to 50 parts by weight of pure and finely levigated infusorial earth (siliceous marl—such as is employed in the manufacture of dynamite—which is capable of taking up one-and-a-half times its weight of liquid), alone or with an addition of about 4 per cent. of carbonate of magnesium, or kaolin, and a binding agent. The mass is stirred up with water and well kneaded; and from this plastic mass small "pills" are formed which are dried in the air. The pills are then rendered red hot in a muffle-furnace, and are impregnated, while in a perfectly dry condition, with platinum chloride until they have taken up 50 parts by weight of pure platinum. Then the pills are again dried in the air, and afterwards heated (with exclusion of air) in a current of pure dry hydrogen or water gas, so as to convert the platinum chloride into platinum-black, which "then remains in the pores of the pills in a state of extremely fine sub-division."

**Impregnating the Packing Material employed for Gas-Pipe Joints, &c.**—Rosenthal, K. E., and Billwiller, J., of Berlin. No. 16,042; July 22, 1898.

The object of this invention is similar to the one described below; the claim in this case being for "a process for impregnating the packing materials used for joints, &c., in pipe conduits, gas-reservoirs, and the like, the distinguishing feature of which is that the packing materials are impregnated with bodies of the kind which enter into combination with the component parts contained in the gases or other specially introduced gases or substances, so that by chemical reaction an increase in volume occurs, and thereby a gas-tight closing is produced at any permeable spot."

**Rendering Gas-Tight the Sides or Walls of Gas-Reservoirs, Pipe-Conduits, and the Like.**—Rosenthal, K. E., and Billwiller, J., of Berlin. No. 16,043; July 22, 1898.

For the purpose of limiting as much as possible the loss of gas which occurs by its diffusion through the sides or walls of such receptacles as those named above, the patentees suggest dissolving in alcohol, metallic salts—for example, chloride of iron—and impregnating the sides of the reservoirs, pipes, and the like, with the solution. The alcohol evaporates, leaving the salts in a very finely-divided condition; and this penetrates into the pores of the material to be made gas-tight. When the receptacles are charged with gas, there is formed (in consequence of the component parts, such as ammonia and sulphide of hydrogen, found in all illuminating gases) either oxyhydrates or sulphates, the volume of which is considerably greater than that of the salts dissolved in the alcohol. Where there is a sufficient quantity of ammonia contained, the process runs according to the following equation:—



the resulting end-product being sulphide of iron and ammonium chloride.

The gas-reservoirs, pipe-conduits, and the like, can also be made gas-tight by coating the surfaces with tar with which an alcoholic solution of Fe<sub>2</sub>Cl<sub>6</sub> is previously mixed, and after the alcohol has evaporated introducing a charge of gas. In this case, the chemical re-action is slow.

If the tightening effect is to be brought about quickly, the reservoirs, &c., prepared with the impregnating body are charged, previously to being used, with a mixture of ammonia and sulphide of hydrogen, and kept for some days under pressure.

[The above patent, as well as No. 16,042, were referred to in the "JOURNAL" for the 8th inst., p. 1034.]

#### APPLICATIONS FOR LETTERS PATENT.

- 23,363.—KINSEY, H., "Generating acetylene gas." Nov. 7.  
 23,369.—BEESE, R., and PERLICH, A., "Improvements in gas-burners with self-igniting Auer filament." Nov. 7.  
 23,385.—MÖLLER, J. C. H., and SCHAEFER, C. W. C. L., "Acetylene lamps." Nov. 7.  
 23,389.—SAPY, S., STETTNER, G., HEGEDÜS, L., and GYURICH, S., "Water-meters." Nov. 7.  
 23,404.—CLEEK, A., "Incandescent lighting and heating." Nov. 7.  
 23,451.—PAUL, F. W., "Improvements applicable to the passages and valves of gas-fired heating or melting furnaces." Nov. 8.  
 23,547.—SIMPSON, S., "Governors for gas and other fluids." Nov. 8.  
 23,559.—ASTRESSE, P., "Gas-engines." Nov. 8.

- 23,576.—SMITH, F. W., "Generating acetylene gas." Nov. 9.  
 23,625-6-7.—THOMPSON, W. P., "Four-stroke gas and like motors." A communication from the Gesellschaft für Automobilwagenbau Gesellschaft mit beschränkter Haftung. Nov. 9.  
 23,675.—THIERSANT, H. DE, and COULSON, W. A., "Generators for acetylene gas." Nov. 10.  
 23,683.—GOLBY, F. W., "Automatic gas-lighting devices." A communication from R. S. Lucas. Nov. 10.  
 23,686.—NOBES, G., "Automatically shutting off the supply of gas in case of fire." Nov. 10.  
 23,730.—ATKEY, A. R., "Acetylene lamps." Nov. 11.  
 23,908.—GLOVER, R. T. & J. G., "Pad and other locks and like fasteners, with means for preventing surreptitious opening of same." Nov. 12.

### CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

#### The Carburation of Coal Gas.

SIR,—Being interested in the solution of the difficulties arising from naphthalene deposits, I naturally read with much pleasure the paper on the subject communicated by Mr. Botley to the Southern District Association of Gas Managers, and the discussion which followed, as reported in your issue of the 15th inst.

The members taking part in the discussion appeared to be perfectly satisfied that Mr. Botley had proved that his process was an effective remedy for naphthalene deposits; but they all seemed to have some difficulty in getting at the manner in which the result was brought about. Mr. J. W. Helps, of Croydon, made it fairly evident that the question of naphthalene deposits is one of variation of temperature, leading to a variation in the vapour tension, and indicating that an explanation of the action of the process will be found in the study of these conditions. Ever since reading a description of Mr. Botley's process in one of your former issues, I have had no doubt but that it would prevent naphthalene being deposited in the solid state—simply because the application of the process brings into action the conditions of temperature and vapour tension referred to by Mr. Helps.

The first stage of the process is to compress a portion of the gas to be acted upon to a pressure of 75 lbs. per square inch. The mechanical energy expended in thus compressing the gas is converted into heat energy. The gas becomes heated; and this sensible heat is more or less dissipated during its passage into, and through, the compressing reservoir. The second stage in the process is to employ the compressed, and more or less coated, gas to drive into the bulk of the gas, in an extremely minute state of mechanical division, a quantity of hydrocarbon oil, the greater part of which has a vapour tension so low that it cannot vaporize into the gas, and must necessarily remain in the liquid condition, though in an extremely fine state of mechanical division.

Now what are the conditions that are thus brought about? Although modified in degree, they are yet exactly those which have been employed when it was desired to extract hydrocarbon oil from coal and shale gases by lowering their vapour tension till they assumed the liquid form. The highly compressed gas, on expansion and doing work, becomes suddenly reduced in temperature, and chills the gas into which it is allowed to expand. This sudden lowering of temperature reduces the vapour tension of the water vapour diffused through the gas, and causes a part of it to be precipitated in the liquid form, which accounts for the water found, resulting from the action of the process; but the precipitation of this water has nothing to do with the naphthalene. The same conditions, however, which caused the precipitation of the water vapour would also reduce the vapour tension of other volatile substances diffused throughout the gas; and naphthalene, being one of these, would be precipitated. But to these physical conditions, there would be superadded, in the case of hydrocarbon vapour diffused through the gas, the solvent affinity of the liquid oil in an extremely fine state of division; and each minute particle would take up in solution a small portion of the hydrocarbons diffused through the gas. As the naphthalene would be the main hydrocarbon with the lowest vapour tension, it would be taken up in solution in the greatest quantity; and there is no doubt that, just as stated by Mr. Browne, the larger liquid oil particles, on becoming thus loaded with naphthalene and other hydrocarbons, would drop out and be found in the drip-wells, while those in a sufficiently fine state of division would be carried forward in the current of gas, and, if not mechanically rubbed out against the sides of the pipes or fittings, would reach the burners.

It will thus be seen that the result, instead of being due to an artificial, unexplainable vapour tension being created, and the naphthalene so carried forward, the reverse is the cause of the deposit being prevented. The real cause is the lowering of the vapour tension of the naphthalene—not the raising of it—in presence of a liquid that can take it up in solution, and keep it in the liquid form whether it is deposited or carried forward. That this is the theory of the action of the process, is further borne out by the fact that the portion of atomized oil which is precipitated is heavier in gravity, and has a pungent smell characteristic of naphthalene and other hydrocarbons dissolved out of the gas.

It will thus be seen that the system resolves itself into a modified scrubbing process applied to the gas subsequently to its leaving the governors—in short, a scrubbing process carried out in the mains, services, meters, and fittings—and that part of the scrubbing fluid, when in a fine enough state of division, accompanies the gas through the burners and assists in giving more luminosity to the flame, while the other portion of the scrubbing fluid, not being in a sufficiently fine state of division, falls or is rubbed out of the gas, and is deposited all over the distributing plant. While it is quite true that the naphthalene is not deposited in the solid form, it is yet deposited, and very probably to a greater extent than it otherwise would be, owing to the solvent affinity of the atomized oil lowering its tension. But, though deposited, being held in solution in the accompanying liquid oil, it does not stop up the pipes, because the portion dropping out in the mains and services will flow into the drip-wells, and can be pumped out and conveyed back to the works. The portion, however, dropped or rubbed out in the meter and internal fittings, may not be so easily disposed of.

WM. YOUNG.

Peebles, Nov. 19, 1898.



## LEGAL INTELLIGENCE.

## HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, Nov. 15.

(Before Mr. Justice ROMER.)

## Hayes v. The New Incandescent Gas Company.

Mr. FLETCHER MOULTON, Q.C., Mr. LEVETT, Q.C., and Mr. WALTER appeared for the plaintiff; Mr. NEVILLE, Q.C., Mr. RUFUS ISAACS, Q.C., and Mr. G. F. HART represented the defendants.

When the hearing of the case was resumed this morning,

Mr. Duncan was re-called, and further examined by Mr. HART. He said up to Nov. 19, 1897, Mr. Tiano had not stated definitely that the patents were to be purchased by an American company; and therefore he was not at all indisposed, as he said in his letter of that date, to let the negotiations go off. In his reply, Mr. Tiano said he was told the purchase was by an American gentleman to launch a company in America. This was the turning point of the negotiations. Before that, Mr. Tiano only said what he thought, or conjectured; but after that he spoke as from positive knowledge. On Nov. 26 Mr. Tiano wrote that he had just met the American gentleman, and on the following day he saw him in Paris. The litigation in England did not affect the De Mare patents, which were for burners; it only affected the mantles. On Nov. 29, they met again; and the formal offer of Mr. Tiano in the letter of that date was made and sent by witness to London, with a recommendation that it be accepted. But for Mr. Tiano's representations, the defendants would never have entertained the offer. He had no idea that the Welsbach Company or Mr. Moeller were interested in the purchase. The principle of the De Mare burner was involved in the new burner now being introduced by the Welsbach Company; and therefore it was of the greatest importance to the defendants that the De Mare patent should not be in the hands of this Company. Witness produced one of the Welsbach Company's new burners.

Cross-examined: The new Welsbach Company was formed in 1898. The defendants bought the English De Mare patents from the Liquidator of the French Company in February, 1897. They had not made any use of them, and at the time had no idea of doing so, except as regarded the colloid process. After the beginning of the negotiations with Tiano, he attached some importance to the burner patents. Witness, when cross-examined as to his intentions in selling the patents, maintained that he was willing to take the risk of an American company competing against his own Company and the Welsbach Company in England; but he would not have entertained the idea of selling them to the Welsbach Company.

In re-examination, witness further explained how the ownership of the De Mare patents affected the business of incandescent gas lighting.

Professor Vivian B. Leves was called; and a question was put to him as to the principle involved in the De Mare patent No. 10,497 of 1894.

Mr. LEVETT, however, objected; and an argument ensued as to the admissibility of such evidence.

Mr. NEVILLE contended that he was entitled to give the evidence to show the materiality of the misrepresentations alleged, and that defendants would be injured if the contract were specifically performed.

His LORDSHIP decided that he could not go into evidence to show whether the Welsbach Company were now making a burner in accordance with the De Mare patent.

Mr. NEVILLE said that, under these circumstances, he could not carry the evidence further, and must deal with the case as it stood. He then submitted, in the first place, that there had never been a clear acceptance of the offer; but on this point his Lordship decided against him. He then proceeded to argue further the principal point he had made in his opening—viz., misrepresentation and concealment of material facts.

Mr. MOULTON, in reply, contended that there had been no misrepresentation; that there was no evidence that the Welsbach Company were benefited by the contract; and that the only object for which the defendants could desire to retain the exclusive right to the De Mare patents, were that they might be in a position to bring blackmailing actions.

His LORDSHIP, in delivering judgment, said this case was in some respects a difficult one; but the conclusion he had come to was that the plaintiff was entitled to relief. The first point he had to decide was whether there had been a binding contract between the parties. Undoubtedly when the letter of Dec. 3 was written it enclosed a Solicitor's letter of Dec. 1; and the acceptance contained in the letter of Dec. 3 must be taken to have been subject to the points set out in that enclosed letter. The question was whether the points so set out were accepted by the plaintiff; and in his opinion they were. The acceptance need not be in writing. All the plaintiff had to show was acceptance; and after what had passed it would be impossible for him to hold that there had not been acceptance. The draft assignment of the patent, and the draft licence in pursuance of the contract, were sent on behalf of the plaintiff to the defendants; and the draft assignment was returned to the plaintiff, and by him engrossed and executed. After that it appeared to him impossible to say that the plaintiff had not accepted the condition, and that there was no binding agreement. The next point raised by the defendants was that there was in substance a misrepresentation as to the persons for whom the patents in question were bought. After all that had been said with reference to the decided cases, the law could not be better expressed than in the language of Lord Justice Fry: "The law seems now to be that where one person is deceived as to the real party with whom he is contracting, and that deception either induces the contract or renders its terms more beneficial to the deceiving party or more onerous to the deceived, or where it occasions any other loss or inconvenience to the deceived party, there the contract cannot be enforced against him; but that where none of these circumstances can be shown to follow from the deception, the contract may be enforced." The points raised by the defendants were, first, that there was concealment—that the contract was negotiated on behalf of the plaintiff by Mr. Tiano, who well knew that the defendants were only willing to sell the said patents on the condition that they should not be used by their trade rivals, or by any person in opposition to them, and who concealed from the defendants the fact that the plaintiff, for whom he purported to be acting,

was the mere nominee of the Incandescent Gas-Light Company, and that he was purchasing the patents for the benefit of the last-named Company or some person or persons connected therewith. The essence of this was that the real buyers were the nominees of the Incandescent Gas-Light Company, and that the purchase of the patents was made for the benefit of the Company. Now he did not mean to say that there were not some suspicious circumstances connected with the case, which personally he should have been glad to see cleared up. But he could only take the evidence as it stood; and in doing so, he could see no sufficient reason for distrusting the statement of Mr. Robinson, when he said that the purchase was made to protect himself and his partner Mr. Kern, as the owners, of what were called the Kern patents, and that the Incandescent Company had nothing to do with it. Even if he had seen his way to admit the evidence which the defendants sought to adduce, to the effect that the present Welsbach Company were now using a burner made substantially on the principle of the De Mare patent, this would not, in his opinion, have advanced the defendants' case; so that the conclusion he came to was that the substance of the plea on the ground of concealment—namely, that the purchase was for the benefit of the Incandescent Company, or some person or persons connected with them—had not been established. It could not be said, in his opinion, that Messrs. Robinson and Kern represented that Company, or were connected with them in the sense implied in the phrase. All that Robinson and Kern had to do with the Company was that they had, as owners of the Kern patent at the time, given to the Managing-Director of the Incandescent Company, in his own name, an option (which at that time was not executed) of purchasing the Kern patents. No doubt Mr. Robinson stated that his object in buying the De Mare patents was to protect the Kern patents, and to prevent anybody attacking them. The next point in the defence was that Mr. Tiano represented that the purchase was being negotiated by him on behalf of a person in America, who was buying gas patents for the purpose of floating a company in that country, and that they were not intended to be used in opposition to the defendants; whereas in truth the purchase was being negotiated on behalf of the Incandescent Company for the purpose of competing with the defendants. As he had said with regard to the former point, this was not established; and on the evidence before him he could not find that any misrepresentation of any kind was proved. The purchase was being negotiated by two American gentlemen. No doubt their object was to protect the Kern patents. But they bought the patents in question themselves; and even if it were a material statement at all for the purpose of the action that Robinson and Kern intended to float a company in America, it was not proved to be untrue. The misrepresentation alleged, therefore, was not proved. Now that the facts were all out, and one knew exactly what it was the defendants complained of, it only came to this—that by the defendants parting with the De Mare patents, the Incandescent Company, or their assignees the Welsbach Company, supposing the option which existed to buy the Kern patents was exercised, were enabled to get the benefit of the Kern patents, because it prevented these patents being interfered with by means of the De Mare patents. It did not appear to him that this was an injury which was directly referable to, or directly concerned with, the representation made, even assuming it to have been not strictly true. He must accordingly grant the relief asked, and decree specific performance in the usual form, with costs. The counter-claim would be dismissed.

Mr. LEVETT said he did not ask for damages; and as the assignment had been signed and sealed, he should simply ask for an order that on payment of the £750 it should be delivered.

Mr. ISAACS suggested that it should be referred to Chambers to settle the form of licence under the contract.

His LORDSHIP said the plaintiff must undertake to grant a licence, to be settled in Chambers, if necessary.

Mr. ISAACS then asked for a stay of execution.

His LORDSHIP said he could see it was an important case.

Mr. LEVETT suggested that if a stay were granted, some terms should be imposed. The defendants had commenced an action against the Welsbach Company claiming to be owners of these De Mare patents; and if a stay were granted, the proceedings in that action should be stayed.

Mr. ISAACS said he did not know that Mr. Levett appeared for the Welsbach Company.

Mr. LEVETT replied that he did not; but the defendants had no right to carry on proceedings as owners of a patent which the plaintiff had been declared entitled to.

Mr. ISAACS said he would give an undertaking that the action should not be proceeded with.

His LORDSHIP thereupon granted a stay of execution on the usual terms as to the payment of costs.

## GREENWICH POLICE COURT.—Wednesday, Nov. 9.

(Before Mr. G. G. KENNEDY.)

## London County Council v. South Metropolitan Gas Company.

## A Question as to the Exemption of Gas-Works from the London Building Act.

In this case, the South Metropolitan Gas Company were summoned by the London County Council for an alleged infraction of the London Building Act, 1894, by the erection of a coal-shed at the Rotherhithe Gas-Works within the prescribed distance of 20 feet from the centre of the roadway, and without having first obtained the consent of the Council.

Mr. F. F. DALDY appeared for the County Council; Lord ROBERT CECIL (instructed by Messrs. Blyth, Dutton, Hartley, and Blyth) represented the Company.

Mr. DALDY, in his opening statement, called attention to the provisions of the London Building Act of 1894 which affected the case. He first quoted section 13 of part 2 of the Act, which provided that no person should erect any new building within the prescribed distance without the consent, in writing, of the County Council. Section 5, sub-section 4, defined the "prescribed distance" to mean 20 feet from the centre of the roadway, where such roadway was used for carrying traffic. There had, said Counsel, been some correspondence between the parties; but he did not think there was any question about this point as to the building which the Company had erected being within 20 feet of the centre of the



roadway. He would therefore leave that, and at once read a letter which Mr. Frank Livesey, the Chief Engineer of the Company, sent in reply to one written by Mr. Norman Scorgie, of the Rotherhithe Vestry. Mr. Livesey's letter, which was dated June 15, 1898, stated the position which the Company took in this matter. He wrote: "In answer to your letter of the 13th inst., referring to the building being erected in Rotherhithe Street, in addition to the exemption of gas-works from parts 6 and 7 of the Building Act, 1894, there is also a clause (No. 205) which we interpret in this way: That having, by a Special Act of Parliament, power to erect gas-works on this land, this new Act does not 'in any way take away, alter, prejudice, or affect any of the powers, rights, or privileges conferred upon a Gas Company by any Act of Parliament, and as existing immediately before the passing of this Act.' I may also remind you that land has already been purchased from the Company to widen the road at this point on the opposite side to that on which we are building; and we are still prepared, if absolutely necessary, to sell land on that side again. I therefore propose going on with the work." This letter gave a very good indication of the nature of the question between the parties. The Company had been good enough to furnish the Council with the section of their Act under which they said they possessed the statutory power or licence to enable them to put up the building in question within the prescribed distance of the centre of the roadway; and they relied upon this Act putting them in a statutory position different from that of an ordinary owner of property. The Act was the Surrey Consumers' Gas Act of 1854. The Surrey Consumers' Company afterwards became amalgamated with the South Metropolitan Gas Company; and he did not see the slightest ground for disputing that the South Metropolitan Company now possessed all the powers which the Surrey Consumers' Company previously held, whatever they were. Section 38 of that Act gave the Company power to purchase, by agreement, any lands which they thought requisite and proper for the purposes of their undertaking; and section 39 provided that, "Subject to the provisions in this and the said incorporated Acts contained, it shall be lawful for the Company to maintain, alter, and enlarge their existing works, and, from time to time, to construct and maintain such additional gas-works, gasometers, retorts, drains, sewers, machinery, and other works and apparatus, and such houses, buildings, and approaches upon the lands belonging to them, or which they may acquire under the powers of this Act, and to make and supply gas, or to contract for the making and supply of gas in such manner as they shall think proper," &c. The general scope of this section was to give the Company statutory powers to carry on their business; but there was another section which was rather important in his view. That was section 61, which provided that: "This Act, or anything therein contained, shall not extend, or be deemed or construed to extend, to prejudice, diminish, alter, or take away any of the rights, powers, privileges, or authorities of any commissioners, trustees, vestries, persons, or bodies whatsoever, under, and by virtue of, any Act or Acts for lighting, watching, cleansing, paving, or repairing any road, square, street, or other place whatsoever within the limits of this Act; but all such rights, powers, privileges, and authorities shall be as good, valid, and effectual as if this Act had not passed." To put it shortly, he thought this clearly showed that, under this Act, if the Company acquired a piece of land, they did so subject to the general liability of an ordinary owner of land. The position was this: That under the Surrey Consumers' Act of 1854, the Company obtained the right to buy land, which was, in general terms subject, he should say, to any Local Acts under which the vestries looked after the streets. Then in 1878 came the Metropolis Management Act, which was afterwards incorporated in the London Building Act of 1894. The 1878 Act bound the Gas Company just in the same way as a private owner. In support of his case, Counsel quoted the cases of the *City and South London Railway Company v. London County Council*, in 1891; *London County Council v. London School Board*, in 1892; and *Hampton District Council v. Grand Junction Water-Works Company* this year (*ante* p. 381). In conclusion, he submitted that this was not a case in which the Gas Company could fairly claim anything in the nature of a specific privilege or power within the meaning of section 205 of the Building Act of 1894.

Mr. W. G. Perkins, of the Surveyors' Department of the London County Council, put in plans of the Rotherhithe Gas-Works, showing the position of the building in question. It had been erected for the storage of coal, and was about 141 feet long, 36 to 40 feet in depth, and 34 feet high. The old boundary wall partly formed the external wall of the new building, which was less than 20 feet from the centre of the roadway. No consent had been given by the County Council to its erection.

Cross-examined: The boundary wall formed the side of the street; and partly the external wall of the new building. He did not know how long this boundary wall had been in existence, nor could he say anything as to the position of affairs in 1879.

At this point the hearing was adjourned.

### Wednesday, Nov. 16.

Mr. Perkins (recalled) said that, during the adjournment, he had again surveyed the works; and it seemed to him there was plenty of room for the storage of coal independent of the new building.

Cross-examined: He was not a gas engineer. The new building partly extended over the site of one that formerly existed.

Mr. J. J. Stokes, who had been Clerk to the Rotherhithe Vestry since 1863, stated that Rotherhithe Street was widened by the Vestry about 1881; a portion of the land required being purchased from the Gas Company. (Witness put in a plan showing the old roadway as it existed before the widening took place.)

Cross-examined: As Clerk of the Vestry he had had no communication from the Company that they were prepared to spare a piece of land on the opposite side of the street if required for widening it. Rotherhithe Street varied in width a great deal.

Mr. KENNEDY: Will it make any difference if the Company are willing to give land on the other side of the street for its improvement?

Lord ROBERT CECIL said the Company were very anxious not to appear obstructive to any public improvement. They maintained that they had an absolute right to do as they had done; but if it was desired to widen the road, then they could sell a piece of land on the north side. On the south side, it was not possible, in the interests of their business, to spare any ground.

Mr. DALDY: That is not a formal defence to the point as to the centre of the roadway.

Lord ROBERT CECIL remarked that he would examine his witnesses before addressing his Worship.

Mr. A. F. Browne, Superintending Engineer of the Rotherhithe Gas-Works, was first called. He said the carriage way opposite the new coal-store was about 21 feet wide; but the street narrowed considerably in places. The boundary wall was erected at the time of the widening. Both to the east and west of the new coal-store, there were standing buildings in line with the boundary wall. The coal-store was behind the line of frontage of the two other buildings. It was not built on the boundary wall, but close to it. It was absolutely necessary that the Company should get as large a coal storage as possible—certainly up to six weeks' maximum winter consumption. Even with the new buildings, he would not have more than three weeks' storage of the maximum consumption. In the severest weather, it would not more than meet seventeen days' requirements. It was absolutely necessary that this store should be built for carrying on the business of the Company. The coal-store could not be situated anywhere else.

Cross-examined: The storage for coal would be increased by the new building from about 8000 to 9000 tons, or an addition of 1100 tons. Before they made the alteration, there was no other place on the works in which they could store an additional 1100 tons. For several winters past, he had had to put coal in all positions on the works where he could find space for it. Besides, they had to deal with a large quantity of coke; and the area of the works was so limited that it was absolutely essential to reserve more storage for coke. Witness's attention was called to the open spaces on a plan of the works, with the view of showing that storage for coal might have been obtained in other positions; but he maintained that they were required for storage of other material and for traffic. The coal storage, he insisted, could not have been increased in any other position if the business of the Company was to be properly carried on. With physical inconvenience, he might possibly have increased the storage by 150 or 200 tons; but he had only about 50 per cent. of his proper storage now. Even if the Company desired to acquire another site for coal storage, they could not get the land; and, besides, the coal-stores must be alongside the retort-houses. There was no room for the storage of coal on the north side of the road. The land there was used for the storage of bricks, retorts, pipes, and so on. Even if there was room on that side, the coal would not be immediately available for the purpose of gas manufacture. He would not have too much storage if he had accommodation for 15,000 to 18,000 tons of coal. So far as he knew, the West Greenwich works had not sufficient storage. In stress of weather, all the Company's works experienced the same difficulty of getting coal.

Re-examined: The open spaces to which reference had been made were as necessary to carry on the business of the Company as the buildings themselves. The time when they wanted coal most was the time when they were least able to get it. If he was now designing these works, he should not be contented with coal storage of less than 15,000 to 18,000 tons.

Mr. H. E. Jones, M.Inst.C.E., the Engineer of the Commercial Gas Company, said the new addition to the coal storage at the Rotherhithe works was imperatively necessary—in fact, they would be in great danger without it. They had carbonized 525 tons of coal a day at this station; so that 9000 tons storage was only equal to seventeen days' consumption. In laying out new works, he should not regard this as sufficient; the rule being that the storage should be equal to six weeks' consumption. The store could not possibly have been erected in any other position. The other spaces, which were small for works of the size of those at Rotherhithe, were required for the ordinary purposes of dealing with coke, breeze, and rubbish, which was constantly being produced on a gas-works. With such limited space, there must at times be great difficulty in carrying on the operations.

Cross-examined: If the Company could get them, larger premises would be desirable. The site of the new coal-store was a convenient and proper place for it. The width of the building, including the original store was some 40 feet. The new portion would be roughly about 21 feet, and the old part 18 feet. If the store had been widened by 16 feet, it would have been an improvement on the old arrangement; but it would have made a difference of about 300 tons in the storage. It was a rule to give 2 acres of land for every million cubic feet of gas produced; but at Rotherhithe they had much less. He did not think they could have found room for the storage of another 300 tons of coal on other parts of the works; and, even if they could, it would have entailed much greater expense and inconvenience. In his opinion, it would be impracticable for the Company to acquire extra land for storage unless it absolutely joined the works.

Lord ROBERT CECIL, in addressing his Worship, said that, even if his friend were successful, the London County Council would not enlarge the street for traffic, because there was a boundary wall there. If he might venture to say so, this was a perfectly futile summons in any case. He had been instructed, on behalf of the Chairman of the Company (Mr. George Livesey), to say that they would be prepared to give up a piece of land on the other side of the street in order to widen it, if necessary. He mentioned this to show that Mr. Livesey was not obstructing a public improvement; but he must protect his Company's rights. The first ground on which his learned friend was not entitled to succeed on this summons was that the Company were exempt from the provisions of the Building Act by section 39 of their Act of 1854, which said, shortly: It shall be lawful for the Company to construct such houses, buildings, and approaches upon the lands belonging to them, or which they may acquire under the powers of this Act, in such manner as they shall think proper. This clearly gave the Company power to construct such buildings on their land as they thought proper—and of this the Company were the best judges—subject to the proviso that the buildings must be reasonably necessary for the purposes of their works. His friend had quoted section 61 of the Act in support of his case; but he did not contend that it deprived the Company of any exemption they might have under the Act. He said that the existence of this section showed that the Company were to be placed in the position of ordinary owners; but, with great respect, he (Lord Robert) maintained that it showed the opposite. But for the existence of section 61, they would be exempt from "lighting, watching, cleansing, paving, or repairing." The Legislature, however, desiring that they should be subject



to these things, put in section 61; but it did not affect the case for building. Therefore, he submitted that the argument to be drawn from the section was the converse to that which his friend had put forward. The real question was whether section 39 was sufficiently wide to exempt the Company from the provisions of the Building Act; and he contended that it was. Having dealt with the cases cited by Mr. Daldy, Lord Robert proceeded to say that, if his Worship was prepared to find that some extension of the coal-store was necessary, and that, commercially, its position was the only one in which it could be put, then the Company were entitled to the decision. It seemed to him to be a question whether this was a case which came within section 13 of part 2 of the Building Act. In this instance, it was a building with a space between it and the highway; and he submitted that so long as the Company did not advance their boundary wall into the highway, they were entitled to build up to the boundary wall, subject, of course, to the rule of the line of building, which it was not suggested they were infringing. It seemed an unreasonable proposition that the Legislature should object to them building on their own ground, when it was merely a question of dealing with the street for traffic purposes. The material point was whether they had narrowed the road by their action; and they had not. Therefore he could not see that the section applied to this case at all.

Mr. DALDY, in the course of his reply, said it was very curious that the Company, being so tight up for room, should be able to offer land on the north side of the street for widening purposes. Regarding the "saving clause" (No. 61) of the Act of 1854, in his opinion it clearly showed that the rights of the Company were to be subject generally to rights such as Vestries would have under Improvement Acts.

His WORSHIP reserved judgment.

#### Seizure of Gas-Stoves for Debt.

At the Wandsworth County Court on the 7th inst., an interpleader action was heard which raised an interesting point in connection with the above subject. The Chatham Mission Hall, in the Battersea Park Road, of which Mr. Frank Cable was tenant, contained two gas-stoves, belonging to The Gaslight and Coke Company; and a short time ago the contents of the hall were seized for rent by the High Bailiff, acting on behalf of the London, Chatham, and Dover Railway Company, and sold by auction. The Gas Company now claimed the stoves seized, or their value. Mr. Hodges appeared for them; Mr. H. R. Jones represented the High Bailiff; and Mr. McClaskie attended on behalf of the Railway Company, the execution creditors. From the opening statement, it appeared that the Gas Company supplied the stoves to Mr. Cable for use in the hall. On them were affixed two plates stating that they were the property of the Company; and Counsel contended that for this reason the bailiffs should not have seized and sold them. On the day of the sale, Mr. Cable gave notice that the stoves belonged to the Gas Company; but notwithstanding this they were sold, and fetched only £1 14s., though they cost £9 9s. each. Mr. McClaskie said he made no claim to the stoves, and a similar statement was made by Mr. Jones. Mr. Cable, who described himself as a house decorator, of Battersea, stated that while he was away in Yorkshire the goods in the hall were seized. Each of the stoves bore the Gas Company's label, and on the day of the sale he gave notice to the officials of the County Court that the stoves were the property of the Gas Company. Counsel for the Railway Company submitted that there was no case against them as they had no notice until after the sale. They were never in possession of the stoves, and never claimed them. His Honour held that the Railway Company were not liable; and he gave judgment for the claimants, with costs of proving the title.

In an action brought by the Gas Company against the Railway Company and the High Bailiff, the evidence given was of a similar nature to that reported above. Mr. Jones contended that his client was not liable for making an honest distraint, which he had done in the present case. George Downton, one of the Court bailiffs, said he seized the stoves, but did not notice upon them a small plate setting forth that they were the property of the Gas Company. Since the sale, he had searched again, and found a small plate at the back of the stove, and away under a pipe. His Honour pointed out that notice was given to Mr. Bradley (his clerk), at the Court, that the stoves were the property of the Gas Company. Mr. Jones contended that Mr. Cable, who gave the notice, was not the owner. Any claims must be given in writing. His Honour held that there was no obligation on the part of the High Bailiff to thoroughly inspect the stoves for the name of the owner; and he was not bound by the information received from Mr. Cable, who was the debtor in the case. It appeared to him that the officer of the Court had used every ordinary and reasonable precaution in the matter. Judgment was given for the High Bailiff, with costs. It was, however, mentioned that the case would probably go to appeal.

**Gas Stokers' Wages at Rawmarsh.**—On the recommendation of the Gas Committee, the Rawmarsh District Council have granted their head stokers an advance of 2s. a week, and the ordinary stokers 1s. 6d.

**Public Lighting of Singapore.**—In the circular accompanying the warrants for an interim dividend for the half year ending the 30th of June last, at the rate of  $2\frac{1}{2}$  per cent. per annum, free of income-tax, the Directors of the Singapore Gas Company, Limited, inform the shareholders that, though nothing has been settled with regard to the purchase of the Company's works and plant by the Municipality of Singapore, a further contract for public lighting for one year, dating from Jan. 1, 1899, has been made with the Commissioners.

**Conveying Plant at the High Wycombe Gas Works.**—The Directors of the High Wycombe Gas Company, Limited, have resolved to lay down, on the suggestion of their Manager and Secretary (Mr. J. Fred Wicks), some coal and coke conveying plant, to facilitate the transmission of coal from the low-level stores and retort-house to the new high-level regenerative retort-house. The plant will consist of tramways, weighing-machine, hydraulic lifts, turn-tables, and direct-acting high-pressure duplex pumping-engine, capable of working up to 500 lbs. per square inch; also specially designed revolving trolleys. The construction and fixing of the plant has been entrusted to the Chester Hydraulic Company, Limited, of London and Chester.

## MISCELLANEOUS NEWS.

### THE EXPLOSION AT THE SALTLEY GAS-WORKS.

#### Death of an Injured Workman.

The explosion in the exhauster-house at the Saltley Gas-Works of the Birmingham Corporation on the 13th inst., as reported in the "JOURNAL" last week (p. 1122), has unhappily resulted in the death of one of the two injured workmen—John Watson Smith—which took place in the General Hospital on Wednesday, as the result of shock to the system. An inquest was consequently held last Friday by the City Coroner (Mr. I. Bradley); Mr. S. H. Knyvett, Her Majesty's Inspector of Factories for the district, being in attendance. The Chief Engineer of the station (Mr. H. Hack) and the Superintendent (Mr. J. W. Morrison) were present.

According to the evidence given by Mr. Morrison, he was in bed when the explosion occurred; but hearing the report, he was quickly on the spot. The engine-room was then enveloped in flames. With assistance he got the hose out, and a supply of water was soon brought to bear on the fire. One engine was "running away" owing to the increased pressure. Witness got into the building, and with great difficulty succeeded in bringing it to a standstill. The place was full of steam, and he could scarcely see. He burnt his right hand badly by shutting one valve, which was red hot. He also turned off the supply of gas. The Fire Brigade were quickly in attendance, and the flames were got under. Mr. Morrison produced two broken plates off the cylinder through which the gas escaped. One was simply a plain plate, bearing the name of the maker of the engine, and the other was part of the cylinder cover. Both were  $\frac{3}{4}$  inch thick, and the metal was perfect. The cylinder was 3 ft. 8 in. in diameter, and there was a pressure of 1 lb. per square inch. Witness said he knew that the men had been in the habit of "propping" the engines with pieces of timber in a certain position when they stopped them, in order that the weight of the exhaust cylinder would re-start the engine when required without anyone pulling on the fly-wheel. One piece of wood was placed in a horizontal position on the top of the cylinder (a vertical one), and another piece was fixed in a perpendicular position—one end resting on the former piece and the other against a projecting part of the machinery against the piston-rod. The system was introduced by the men themselves, and had only been in vogue a few months. If the piece of wood in the horizontal position went right across the cylinder, so that the pressure was borne by the sides and not merely the cover, witness had no objection to the practice. The piece of wood generally used for the purpose (a big piece) could not be found after the explosion; and witness was afraid the deceased did not use it. Two small pieces were discovered in the cylinder. As one of these was generally used as the perpendicular prop, witness concluded that deceased had only used these two bits. The piece thus placed in the horizontal position would not reach across the cylinder, and the pressure when the piston-rod descended was too much for the cover—the wood being forced straight through it. The gas then rushed out and exploded.

Evidence was given (including depositions by Gilbey, the other injured man) showing that deceased had evidently tried to bring the engine to a standstill without any assistance, as he was alone in the exhauster-house when the cylinder broke. Gilbey heard the crack, and, rushing in, found deceased trying to shut off one valve. Deceased told him to turn off the other, and he was doing so when the explosion occurred. Both men were shockingly burnt; but they managed to run out into the yard. They were attended to very promptly; but it was stated that the ambulance dressings used were brought by the police. Mr. Morrison said dressings were kept in various parts of the works, some being very near to where the explosion occurred. Both men were taken to the General Hospital; and Gilbey was progressing fairly well, but not quite so satisfactorily as could be wished.

In summing up, the Coroner said it was worthy of consideration on the part of the management whether some better information could not be posted up throughout the gas-works, showing the exact spots where ambulance dressings could be obtained. He thought the only verdict the Jury could bring in was one of "Accidental Death." The Jury did so; and added a rider to the effect that they considered the practice adopted by the men highly improper, and hoped that if the Authorities had not already put a stop to it, they would do so at once. Mr. Knyvett said that in the course of his duties he frequently had illustrations of the terrible results of the loss of presence of mind after an accident. During the sixteen years he had been in his present position, he had never come across an instance of greater presence of mind than that shown on this occasion by Mr. Morrison, who, in the face of extreme danger, rushed into the building, stopped the engine, and turned off the valves. Mr. Hack expressed the great regret felt by the Gas Committee at the result of the accident, and said he had no doubt they would do what they could for the poor widow. The suggestions with respect to the ambulance stations would be carefully carried out.

### CAMBRIDGE GASLIGHT COMPANY.

#### Mr. Peed's Defalcations—Settlement of the Claims.

An Extraordinary Meeting of the Cambridge Gaslight Company was held on Monday of last week—Mr. E. H. PARKER presiding—for the purpose of submitting to the shareholders proposed terms for the settlement of claims made against the Company under alleged mortgages and stock certificates fraudulently issued by the late Secretary (Mr. Peed).

The CHAIRMAN said, in pursuance of the policy declared at the last meeting of shareholders, the Board had negotiated with the defrauded mortgagees and shareholders; and they were now unanimously prepared to recommend the shareholders to sanction a compromise. It would be in their recollection that there were three forged mortgages—one for £1800, another for £2000, and the third for £1300; making in all £5100. There were also forged certificates—one for £800 original stock, which had a market value of £250 per cent., equal to £2000, and



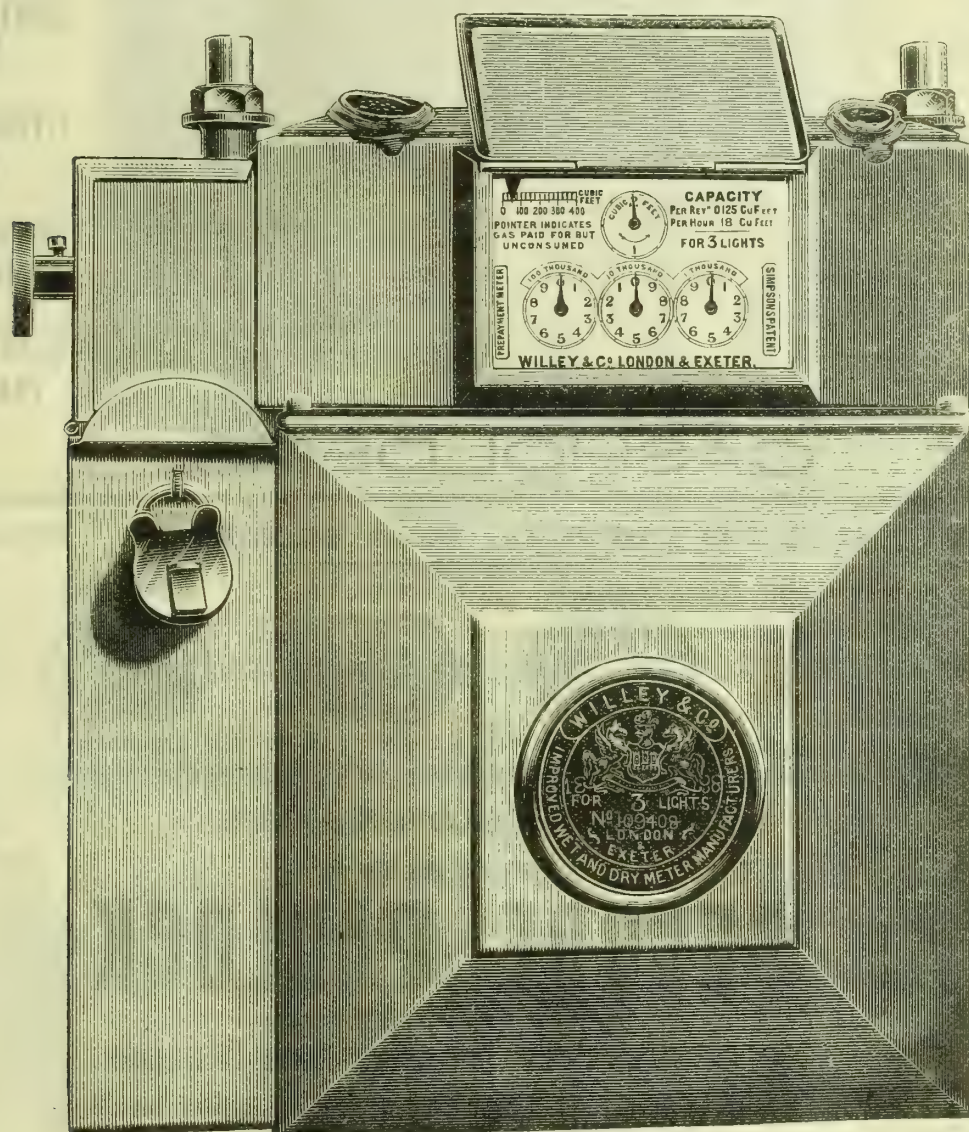
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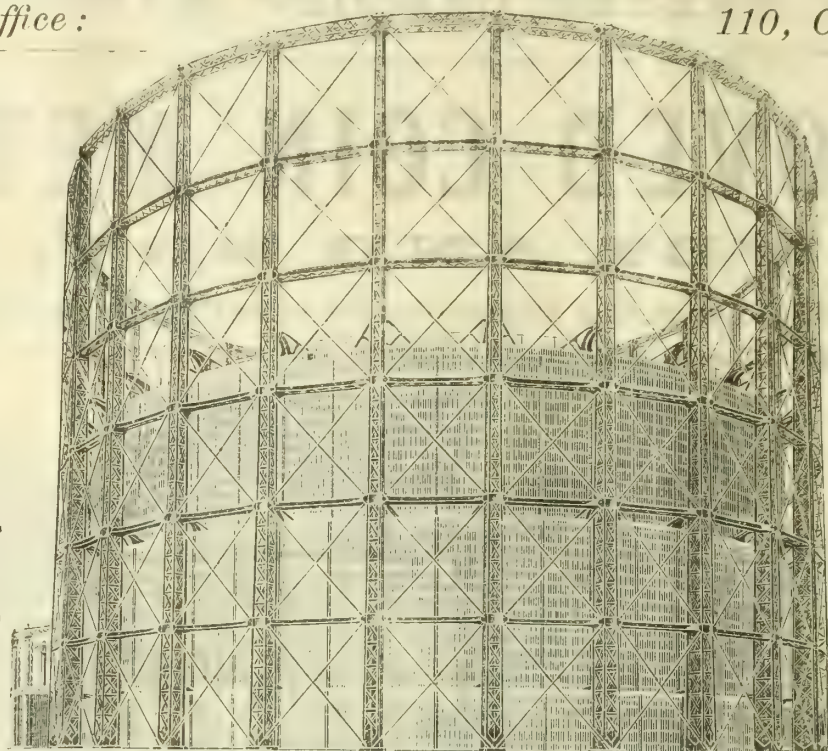
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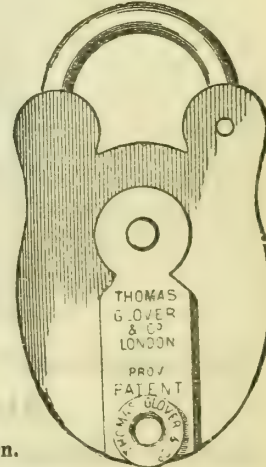
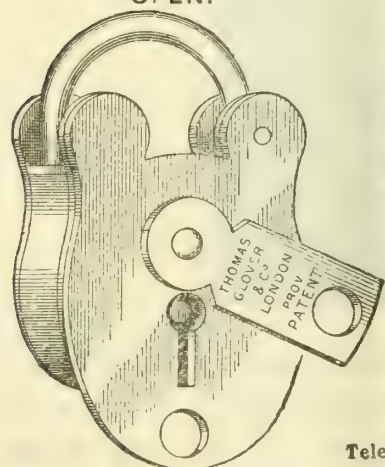
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for consolidated stock for £1060, which, taken at the market price, equalled £1855. The Company had also been directly robbed by the late Secretary of £4500. So they had total liabilities through his defalcations amounting to £13,455. The Evans mortgage, of which they were directly robbed by the late Secretary, had been settled at once with £4500. This left them to deal with the other forged mortgages and certificates. He did not know whether "forged" was exactly the word to use; they were fraudulently issued, which was, perhaps, the better expression. They were now prepared to ask the shareholders to sanction a compromise of the forged mortgages for the sum of £1700; being one-third of the principal money purported to be secured by the mortgages, with interest at 3½ per cent. per annum upon that sum. This meant £1780 to get rid of the liability. With regard to the certificates, they recommended that, in the case of the £800 original stock, the holder of the certificate should be paid one and three-sevenths of the face value; and with regard to the 7 per cent. consolidated stock, that the face value be paid. They were obliged to offer a good deal to compromise the claim for £800 of original stock, because the stockholder had been on the register for two years; and it was doubtful whether the claim could be legally contested. The result of the whole thing would be that they would have to pay the sum of £3982 15s., plus costs as between solicitor and client, whatever they might come out at. He did not think they would reach £100. They might take it, then, that the compromise would cost the Company £4000. The Directors had very carefully considered the matter; and one and all had thought it right, expedient, and politic to compromise the matter. The Company were £8500 poorer; but the Directors hoped to be able to continue to pay the maximum dividend. He might say every effort was being made to increase the business of the Company. They had turned their attention very seriously to heating and cooking stoves; and they had introduced the prepayment system during last month, with very satisfactory results. Since Oct. 1 they had sent out 82 cookers and 97 heating-stoves, besides 175 slot meters for stoves and lighting. Not long ago, there were only 300 gas-stoves in existence in Cambridge; but since Oct. 1 they had sent out 329 on the two systems. The Chairman concluded by formally proposing a resolution, authorizing the Directors to settle the claims in the manner stated.

Mr. BARRON (an ordinary shareholder) seconded the motion.

The CHAIRMAN, in reply to a question, said the Directors had negotiated with the people who lost money; and they were all willing to accept the terms named.

Mr. MATTHEWS said this involved a curious question in law, which had not been settled. Take the case of the Great Northern Railway Company, who were so fearfully robbed, and also of The Gaslight and Coke Company, the Directors met the innocent sufferers not like criminals, but as respectable people; and in due course they paid them their stock certificates in full.

The CHAIRMAN: That, I am afraid, is impossible here. The Company are not strong enough to do it.

Mr. MATTHEWS said he understood the certificates of the transfers were not forgeries; they were simply bogus certificates, signed by the Chairman and sealed. Could the Chairman tell him of any Company in Great Britain where certificates signed by the Chairman and Directors were not binding?

The CHAIRMAN was afraid he could not answer the question with regard to any particular company; but they had had the advice of different Counsel they had consulted on the subject. If they had fought the case, they would have had to go to the House of Lords, and that was one reason he thought it important to settle by compromise.

Mr. MATTHEWS considered the Directors had acted legally, most business-like, and gentlemanly. Still, he for one would like to see the question fought out in the House of Lords, and the point as to what was a stock certificate settled once for all.

The motion was unanimously agreed to.

The CHAIRMAN, in acknowledging a vote of thanks, said the Directors thanked the shareholders for the way they had co-operated with them in this matter. It was a very unpleasant affair; but he thought they had now heard the last of it.

#### ORIENTAL GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held on Wednesday last at the Offices, Finsbury House, Blomfield Street, E.C.—Mr. J. BLACKET GILL, Chairman of the Board, presiding.

The SECRETARY (Mr. H. J. Luff) read the notice calling the meeting; and the report and statement of accounts were taken as read.

The CHAIRMAN said he did not think he need detain the shareholders very long that morning, and what he had to say would be mostly of a congratulatory nature. He thought they would all agree with him that the statement of accounts presented on that occasion was, in every sense of the term, very satisfactory. First and foremost, they would notice that the loans on debentures, according to the balance-sheet, had been reduced to £1950; but he had better news than this, because since the date of the balance-sheet they had been enabled to pay that off, so that the Company were now entirely free from debenture debt. They must all be very pleased at that. When they reflected that ten years ago they owed £44,120, and previously considerably more than this, they had good cause to congratulate themselves on the complete extinction of the debt, especially as during the whole of that time they had enjoyed good dividends. The exchange, as they were aware, was a very important figure in their accounts, and he supposed it would be so to the end of the chapter. This year, however, it had been somewhat more favourable than in the previous twelve months. As they were aware, a Committee of the House of Lords was now sitting upon this very ticklish question; and, as the Board were uncertain respecting the future course of exchange, they had considered it right to put £3500 to the exchange equalization account, which would, no doubt, serve them in time of need. It was not for him to pass any opinion upon the exchange question; but, of course, the keeping up of the value of the rupee in Calcutta had tended to improve their accounts this year. Whether it was wise or not, it was not for him to say. It would be noticed by the accounts that, in the price of coals, they had saved something like £268; while at the same time they had the very satisfactory increase of £2284 in rental. Coke and tar showed an

increase of £896. These were not large amounts, but still were on the right side. The new consumers for the year numbered 157; and they had about 689 additional lights. Unfortunately, the plague paid them a visit, though he was glad to say, from the last official return he read, that Calcutta was now declared to be free from it. It gave their Manager, Mr. Niven, some trouble, as the men were inclined to leave their work; but he seemed to have such good control of the men that he soon got over the difficulty. The Board had concluded an arrangement with the Commissioners of Howrah to light some of the streets there with incandescent burners for 14 years. The terms were settled some time since, and the Board wired over some months ago thinking that the Commissioners might be in a hurry; but although the terms had been all arranged, the Directors had not yet had the contract before them. He did not think there was any need for apprehension on this score. The fact was, it had to be submitted to the Government Department; and the gentlemen there seemed to take very long holidays. Indeed, he was often reminded of the Eastern proverb, that nothing was so marvellous as to-morrow. It seemed to be a cardinal principle at Calcutta that whatever could be done to-morrow should not be done to-day. As they knew, the Company's contract with the Municipality of Calcutta terminated in 1901. He had nothing definite to say about the matter, except that the Board had entered into correspondence with the Municipality, and expressed themselves desirous of continuing on the present amicable terms for a further period. They had had no direct response to this reply yet; but there was every reason to hope that they would come to terms with the Municipality. There was no reason why they should not. The Board were anxious to light Calcutta with the Welsbach burner, of which this Company were agents for Bengal; and there was no reason why Calcutta should not be a well lighted city, if proper arrangements were come to. He was very much struck during a visit to Dresden, only a week or two ago, by what he saw of the lighting of the place. There they had the arc electric light and the Welsbach burner, about half and half; and no unbiassed person could possibly fail to see that the light given by the latter was by far the superior of the two. He therefore could not see any reason, that being so, why they should not be able to agree with the Municipality of Calcutta to improve the lighting of the city on mutually satisfactory terms. Their Manager reported that the works were now in good condition; and he might add that they had recently sent out a new washer—a somewhat expensive instrument. They wanted to see if they could not do some business in sulphate of ammonia. It had never been attempted hitherto, but the Board wished to see if they could not develop a profitable trade in it there. Another little matter he thought they would be pleased to hear was that the Board had started a reserve fund. It did not appear in the accounts, because it had only been started within the last week or two. The Directors had bought £6000 of a gilt-edged security—Birmingham Corporation stock—to commence the fund, which might help them in the future if ever the proverbial rainy day should come upon them. It had been a matter of great regret to the Board that such a fund was not started many years ago. The Company would have been in a better position to-day if it had been. Now that they had a chance of starting such a fund, the Directors thought they should lose no time in doing so; and he believed the shareholders would agree with them that they could not take any step which would be more conducive to the best interests of the Company. He concluded by moving the adoption of the report and statement of accounts as submitted to the meeting.

Mr. ROBERT HESKETH JONES, in seconding the motion, said with reference to the renewal of the contract with the Municipality of Calcutta for public lighting, the shareholders should understand that it was not the same kind of thing as the renewal of a concession on the Continent. Assuming they lost their contract with the Municipality, they would still retain the private lighting of the city, although that was a somewhat small item in Calcutta. The only disappointing feature in the accounts was the item for meters, fittings, and services. The Chairman had alluded to the fact that they had taken over the agency for the Welsbach burners, and consequent on this they had been put to a good deal of expense, which, it was hoped, would not occur again. In taking over the stock, and fixing some of these burners for public lighting, they had necessarily been put to some small loss.

Mr. SPENCER remarked that everything likely to be said on the shareholders' side of the table could not fail to be of a laudatory character with regard to the attention given to the business. He wished to ask for some explanation with reference to the purchase of coal, which, as stated in the report, had resulted in a reduction in the cost of the quantity carbonized. Was he to understand that they had been using a superior kind of coal to that formerly used; and, if so, what was the difference in price? Then with regard to his allusion to Dresden, it would be interesting if the Chairman had a comparative statement as to the cost of the two kinds of lighting—the arc electric and the Welsbach.

The CHAIRMAN replied that he had not. He was merely on a visit to Dresden for pleasure; and from what he saw of the lighting of the town, it struck him that the Welsbach burner was very superior to the arc light. No doubt it was very much cheaper as well as better. As to their coals, he should say that their contracts ran on for another six months. They were using the same coal as before.

The report was then agreed to.

On the motion of the CHAIRMAN, seconded by Mr. H. D. ELLIS, a resolution was passed approving of a dividend of 8 per cent. for the twelve months ended June 30 last, the same to be paid on the 15th prox., less the 3½ per cent. paid on June 4.

The retiring Directors and the Auditors having been re-elected, the proceedings closed with the usual votes of thanks.

**The Lighting of London Parks.**—Last Wednesday, Colonel Wheatley, R.E., Ranger of Home Parks under the Government Office of Works, and Mr. G. F. L. Foulger, the Distributing Engineer of The Gaslight and Coke Company, visited Liverpool for the purpose of inspecting the street lighting, principally in connection with the incandescent gas system. It is understood that they are preparing a report on the lighting of the London parks. The visitors were accompanied in their tour of inspection by Mr. C. Petrie, Chairman of the Lighting Committee of the Corporation, and Mr. C. R. Bellamy, Superintendent of Street Lighting, who gave them much useful information.



## THE CARBURETTED WATER-GAS QUESTION AT FALMOUTH.

It may be remembered that in the course of the report presented to the Corporation of Falmouth by Mr. A. Silverthorne, on the gas and water works purchase question, a summary of which appeared in the "JOURNAL" for the 25th ult., he expressed the opinion that the supply of water gas by the Gas Company was most undesirable. This adverse opinion was expressed in such strong terms that it gave rise to some discussion in the local papers; one of them giving a special article on the subject. Before noticing this, it will be well to reproduce the portion of Mr. Silverthorne's report dealing with this matter. It is as follows:—

The supply of water gas in a locality like Falmouth upon any proportion is most undesirable, as the poisonous qualities of carbonic oxide gas, even when diluted, are well known. Under no circumstances should I advise the Corporation to continue the supply of water gas, which, unfortunately, they are powerless to prevent directly the plant is complete. This water-gas plant is designed to produce 150,000 cubic feet per 24 hours. This was actually the mid-winter production of ordinary coal gas per 24 hours in 1895; and it will be useless to endeavour to convince the ratepayers that the object of this plant is merely to enrich gas. I assert positively that the purpose of it is to furnish a mixed supply of coal gas and carbonic oxide. These water-gas plants in London have occasionally been erected and kept in reserve as a menace to labour on account of the rapidity with which they can be brought into operation. They are also advocated on the grounds that they can supersede manual labour to the extent of 70 per cent., and that, by finding a new outlet for coke, they enable the Company to secure a higher price for this article in the locality from coke consumers.

Reverting to the article, the writer, after describing the process of making carburetted water gas, went on to say that in the Garston district of the Liverpool United Gas Company its manufacture had "aroused considerable feeling, as some fatalities were traced to its introduction." Birkenhead, Blackburn, Manchester, and Southport were cited as places where it had been used "in proportions varying from 50 to 95 per cent." The writer urged that there was little doubt of the gas being "dangerous to life in these proportions"; and he went on to say that though consideration of this fact was not allowed to have much weight in America, so long as money could be had out of it, it might be worth considering whether the Corporation of Falmouth, in the event of their succeeding in the purchase scheme, "would tolerate for one moment the introduction of a gas which, by reason of its nefarious reputation, was likely to keep visitors away from the town." He added that the Corporation were powerless to prevent the introduction of this gas, in whatever proportion; but he was given to understand that, in the event of the purchase scheme being sanctioned, they would be advised not to use the plant under any circumstances.

To the statements in this article the Gas Company's Engineer and Manager (Mr. J. W. Buckley) promptly replied. He said its object was obvious; but his Directors had come to the conclusion that the writer knew little, if anything, of the subject he had dealt with. As he had not attached his name to the article, the inference they drew was that he was afraid to do so lest he should prove the justness of their conclusion. Mr. Buckley pointed out that carburetted water gas is being made at about sixty gas-works in Great Britain, including those belonging to the Corporations of Belfast, Birkenhead, Birmingham, Blackburn, Edinburgh, Halifax, Manchester, Middlesbrough, Southport, Stockport, and Stockton-on-Tees—one of the towns named being a health and pleasure resort; while at Scarborough an important addition was being made to the works in the shape of water-gas plant. He urged that there was wisdom in the Councils of these important boroughs; and he pointed out that, with the able scientific advisers they possess, the matter had received most careful attention. He quoted from the address of Mr. Stelfox at the meeting of The Gas Institute in Belfast last June to show that, in this gentleman's opinion, carburetted water gas had been "the greatest and most successful departure from old methods of gas making that has characterized the last decade of the century." He further cited Mr. Stelfox to emphasize the fact that if people will blow out their gas, or prefer to turn on their taps before finally retiring to rest, the vendors of a useful commodity, supplied for external use only, are surely not to be blamed for such negligence. He added that carburetted water gas—which, he pointed out, was a totally different thing from water gas—had "come to stay;" and that, after visiting many of the most important installations of plant in this country, he had not the slightest hesitation in recommending its adoption to his Directors.

The writer of the article replied to Mr. Buckley. He said his point was that carburetted water gas was dangerous to life, if inadvertently inhaled in the proportion in which it was supplied; and particular attention was drawn to the significant fact that the plant for its production at Falmouth was on a scale approximating to the mid-winter daily make of ordinary gas. He cited the following passage from Professor Lewes's report to the Birkenhead Corporation: "Carbon monoxide is the most dangerous gaseous poison there is; and the attempts made by some supporters of carburetted water gas to gloss over this fault are as mistaken as they are mischievous;" and went on to say that it was quite impossible to accept the views of interested persons on this point, for with even the limit which the Professor thought must not be exceeded—viz., 17 per cent. of carbon monoxide—which should, on a proper mixture, yield a limit of 50 per cent. of the water gas, fatalities were constantly occurring. He therefore thought it was impossible to conceive a more dangerous course than to introduce water gas into Falmouth, as it would keep away visitors—and it would do so likewise at Scarborough—directly it was known, and would in other ways be injurious to gas interests.

Mr. Buckley replied to this article by quoting the following sentences from Professor Lewes's report: "That there is no danger in sending out as a town supply a mixture of 50 per cent. of carburetted water gas. That mixtures containing 50 per cent. and under of carburetted water gas are, for all practical purposes, as good as cannel and coal gas; while for use in incandescent mantle lighting they are superior." He also brought forward the testimony of Professor Crum Brown, as contained in his report to the Gas Commissioners of the Edinburgh and Leith Corporations, to the effect that "the increased amount of carbonic oxide is no real objection to the introduction of carburetted water gas for illuminating purposes in place of coal gas." He further pointed out that in many of the most important health resorts in this country—viz., Bath, Bexhill,

Brighton, Folkestone, and Hastings—water-gas plant is in use. Dealing with Mr. Silverthorne's report, Mr. Buckley said he thought that gentleman was displaying exceedingly bad taste in posing, with his limited experience, as an authority on the subject of water-gas plants. It would, he said, be interesting to know what plants, if any, the author of the report had seen before he inspected the one at Falmouth. Mr. Silverthorne might consider he was doing a fine thing by his attempt to handle this matter; but he (Mr. Buckley) knew that, as a matter of fact, he was defeating his object. His own advice to the Corporation, as an engineer, as a ratepayer, and as a consumer, was to make the best possible use of the plant, supposing the purchase schemes were successful. After offering some explanatory observations on the recent case of suffocation at Belfast, Mr. Buckley closed his letter by asserting that no evidence could be brought forward to prove that in any single case of suffocation in Great Britain, from a town supply, it could be traced to the admixture of carburetted water gas with coal gas. To talk about keeping visitors away was, he said, ridiculous in the extreme.

The subject was taken up by a visitor to the town, who had been much amused at the attempts of the writer of the article above alluded to and Mr. Silverthorne to "create a panic over the introduction of carburetted water gas." He pointed out that if there were any basis for Mr. Silverthorne's scare, the largest cities in the kingdom would not be found supplying carburetted water gas in ever-increasing quantities, while the larger towns were following suit with all possible rapidity. He thought it was evident the object was to depreciate the value of the gas-works; but he considered it was a pity that, in attempting to accomplish it, the reporter should have displayed his ignorance of the process he so fiercely slandered. "Visitor" thought that, after all, the final word rests with the Board of Trade, who are investigating this subject, and in whose hands the safety of the public health was well secured.

The writer of the article above noticed returned to the subject in a letter published on the 5th inst.; the principal point dealt with being the alleged danger attending the supply of water gas. He said he believed it could be shown that gas companies have no statutory authority for supplying "mixed gas with unusual toxic properties;" and he ventured to assert that Mr. Buckley and his Directors would "stand absolutely alone in defence of this surreptitious step." He went on to say: "Not a single voice will be raised by consumers to support the introduction of the death-dealing carbon monoxide, in whatever degree, but still capable of suffocating its victims in the night-time for no greater omission than not turning a tap properly off. No one would be killed by an ordinary escape of coal gas; but resuscitation from carbon monoxide poisoning seems out of the question, according to the authority of medical experts. It is upon this grave aspect of the question that the introduction of this gas will be judged and, I expect, condemned by public opinion. Already in Falmouth there are many consumers declaring openly that if coal gas is in future to be supplied mixed with carbon monoxide, they will banish gas from their houses."

In his reply to this letter, Mr. Buckley characterized the last statement as all "bluff;" not a single consumer having raised a voice in such terms at head-quarters, though many of them believed the new gas had been supplied for months. To upset some of the theories advanced by the writer of the article, Mr. Buckley cited again the case of Birkenhead, and Professor Lewes's report to the Corporation to the effect that "there is no danger in sending out as a town supply a mixture of coal and cannel gas with carburetted water gas, provided the carbon monoxide in the mixture does not exceed 17 per cent., which with the two gases as at present made would give a limit of 50 per cent. of water gas." He quoted the opinion of the Special Sub-Committee of the Corporation, as given in the "JOURNAL" for the 3rd of May last, that if the mixture of coal and water gas were distributed with the same care and attention to pipes and fittings as had been bestowed in the past, there could be "no reasonable or valid objection to the supply of the mixed gases." He went on to show, by another quotation from the "JOURNAL," that uncarburetted water gas was to be used for incandescent lighting at the General Hospital in Vienna, accommodating about 3000 persons. He urged that a mixture of carburetted water gas is better fitted for use with incandescent mantles, as it requires a slightly lower proportion of air for complete combustion, and there is certainly less liability to blacking the mantle. He contended that the manufacture of water gas not only gives satisfactory results to the producers, but also yields to the consumer a better, brighter, and purer light. He quoted Sir E. Frankland to the effect that water gas can be "used with safety both in public buildings and private houses." With regard to the much-talked-of carbon monoxide, Mr. Buckley said: "Dr. John Haldane has given us the only data of practical value on the effects of carbon monoxide on life. He found that 0.05 per cent. (1 in 2000) of it in air begins to have an appreciable effect, but can be inhaled for four hours without any marked symptoms. It is possible to breathe air containing 0.1 per cent. for a considerable period without danger; but it must be remembered that both coal gas and carburetted water gas contain hydrocarbons, the toxic action of which is but little understood. For all practical purposes, 0.05 (1 in 2000) may be taken as the margin of safety. I will endeavour to show that under ordinary circumstances, with proper ventilation, it is almost impossible for death to occur even in a small room with the gas-tap full on. For instance, take a small bedroom 12 ft. by 12 ft. by 7 ft., equal to 1008 cubic feet of air space. This room contains a fireplace, a door, and a window. The two latter being closed, and no fire in the grate, the whole of the air in the room is probably changed at least twice in an hour. If gas escapes into a room of the above capacity at the rate of 6 cubic feet per hour, while the air of the room is changed twice in the hour, then after three to four hours the percentage of gas will rise to 0.3, and the rate of leakage and removal by the changing air will become constant; and the percentage of the gas will not rise above that point, however long the leakage may continue. It has been shown above that 0.05 per cent. of carbon monoxide may be inhaled for four hours without dangerous symptoms; and this amount will be present if it constitutes one-sixth, or 16.6 per cent. of the gas escaping in the room." In view of the decision in the Plymouth case, reported in the "JOURNAL" last week, Mr. Buckley added a few remarks with reference to that unfortunate occurrence, which has been seized upon by several papers in the West of England as an instance of the danger attending the use of water gas. He referred to a fact not generally known—that gas consumed in Scotland, made from coal alone, contains as much as 10 to 11 per cent. of carbon monoxide; and he



pointed out that many towns are supplied with an admixture of carburetted water gas and coal gas in which the constituent in question does not exceed the percentage above mentioned. He thought Mr. Silverthorne would do well to ponder over this fact. Mr. Buckley closed his letter with the remark that the discussion was more suitable for a scientific publication than an ordinary newspaper; and he invited the anonymous writer of the article, if he was desirous of benefiting the gas consumers of the country, to read a paper before The Gas Institute, the Institution of Gas Engineers, or the Institution of Civil Engineers, at any of which places he (Mr. Buckley) and many others would be glad to meet him.

### NEWBURY CORPORATION GAS UNDERTAKING.

#### The Manager's Resignation.

In the "JOURNAL" last week, it was mentioned that Mr. R. M. Couper, the Gas Manager to the Newbury Corporation, had tendered his resignation of this position, which he has held for about seventeen years. The reason for this step came out at the meeting of the Corporation on the 15th inst., when some correspondence which had passed between Mr. Couper and one of the consumers appeared, at the request of the former, upon the minutes presented by the Gas Committee. It appears that some fitting work was done for the consumer at the cost of 7s. 4d., which had not been paid. When he sent a cheque in payment of his gas bill, deducting the usual discount, it was returned to him by the Manager with an explanatory note to the effect that, as the 7s. 4d. was still outstanding, he could not accept it; the practice being not to allow discounts to consumers in arrear. The consumer replied that the fitting work did not relate to the premises for which he was paying for the gas. He therefore sent back the cheque, and said if it was again returned he should bring the matter before the Committee. The Committee decided that inasmuch as the sum in question had not been added to the account sent in, the discount should be allowed. There was a further squabble with this consumer about the rent demanded of him for a slot-meter. The Manager was charged with "high-handed conduct" in this matter, though he had only carried out the instructions of his Committee; and the affair culminated in Mr. Couper sending in his resignation on the 3rd inst. It was addressed to the Mayor, Aldermen, and Burgesses, through the Town Clerk (Mr. F. Q. Louch), and was in the following terms: "Gentlemen,—The best years of my life have been given to rescuing your gas-works from a condition bordering on complete collapse, and placing them on a footing equal to the best of small works anywhere. The position in 1898, as compared with 1881, ere I took charge, is in short as follows: Business doubled, working expenses just the same, price of gas 29 per cent. less. Yet my salary as Manager has been kept down to merely 14 per cent. more than my predecessor had. There is no incentive to zeal and renewed effort in this treatment, which is wretched; and it has lately become quite apparent that only by forfeiting my self-respect could I continue holding my position—a position where duty done regardless of fear or favour is an impossible thing without suffering some penalty. I have suffered. For some time past a 'hounding-out' process has been in operation against me—for example, the one-sided, unjust, and cowardly attack made upon me at the last Council meeting. All this is hateful; and it therefore affords me pleasure to say that on this date three months hence, I shall quit your service. To those members of the Council who have judged my management on its merits I beg to offer the expression of my deepest gratitude." At their meeting on the 7th inst., the Gas Committee decided that there should be no separate meter-rent charged for slot-meters, but that the price charged for the gas supplied through these meters should cover the rent.

On the consideration of the minutes, Mr. Jackson moved that the Manager's resignation be accepted; and this was seconded by Mr. Hanington. Mr. Midwinter said he for one did not intend this incident to pass without expressing his regret that they were losing Mr. Couper. The gas-works had been placed on a sound footing, and investigations of a technical character had confirmed his work, while the Gas Committee had reported satisfactorily of his management. Alderman Hopson said he felt genuine regret at the occurrence, and it would be in accordance with his feelings if the Manager were asked to reconsider his decision. Mr. Lucas said the correspondence before them showed the obstinacy of the consumer—an obstinacy which ought never to have been allowed. He supported the Manager in not keeping the cheque under the circumstances. Mr. Rankin eulogized Mr. Couper for his successful management of the gas undertaking, and expressed the opinion that, as the resignation had been brought about by a quarrel in which the Manager had followed the direct instructions of the Committee, the matter should be reconsidered. He moved an amendment to this effect, and it was seconded by Alderman Hopson. Mr. Hanington said he should be quite willing to add to the motion an expression of regret, and appreciation of the Manager's services. Mr. Jackson said he had only moved the acceptance of the resignation as a matter of business, and knowing that, having been sent in, it would be adhered to. If he had been in the Manager's place, he should have sent a similar letter; and after such a letter reconsideration was impossible. He should be glad to move—"That the resignation of the Manager be accepted with regret, and that the Council desire to express their sense of the able and conscientious manner in which he has discharged the duties of his office during the seventeen years of his management." Mr. Harris said he had seen a good deal of Mr. Couper during the last seven years, and could not omit to add his appreciation of the services rendered. On many occasions he had stood up for Mr. Couper when he was unjustly and unfairly criticized. The Manager had had seventeen years of uphill work, and had discharged his duties in a most satisfactory manner. Mr. Midwinter was glad to find such an expression of opinion from the Council, and only wished that it could have come from the Gas Committee in the first place. They were doing Mr. Couper a simple act of justice in putting this on the minutes. The correspondence was so trumpery that it should make them blush to think that such a matter had been brought before them. Mr. Smith (the Chairman of the Gas Committee) claimed for the Committee a share of the credit for having brought the gas undertaking to its present condition. Mr. Jackson's resolution was then carried unanimously.

At their meeting on the 10th inst., the Gas Committee discussed the

appointment of a Manager, and recommended that it should be upon the following terms: Salary, £200 per annum, with gas for lighting purposes free; the new Manager to commence his duties on the 16th of January next, and the engagement to be determinable by three calendar months' notice on either side. Mr. Smith, in moving the adoption of this recommendation, said he personally did not think it wise to tack anything on, and not be included in the salary. Alderman Hall agreed that £200 should be the salary, and nothing be said about free gas. Mr. Elliott expressed the opinion that the terms would give rise to opportunities of bickering, and it would be difficult to draw the line between lighting, heating, and cooking gas. They would put the new Manager in the difficult position of recommending gas for cooking purposes, and not being able to use it for this purpose himself. He moved an amendment that the £200 salary should be inclusive; and this was adopted.

### THE BRADFORD CORPORATION AND OUTLYING GAS UNDERTAKINGS.

A Special Meeting of the Bradford City Council was held last Wednesday to determine whether steps should be taken to promote a Bill in Parliament in the ensuing session for several important purposes, among which is the purchase of the undertakings of certain Gas Companies who possess the right to supply gas to the inhabitants of Allerton, Thornbury, Tyersal, Heaton, and Frizinghall. In moving a resolution agreeing to the promotion of a Bill, Alderman H. B. Ratcliffe sketched the proposals contained in the measure. Regarding the gas portion, he said it provided for the purchase of the undertakings of the Clayton, Allerton, and Thornton Gas Company, the Pudsey Gas Company, and the Shipley Gas Company. The proposal was that these undertakings should be acquired at such a price as might be agreed upon, either by mutual arrangement or, in the event of that failing, by recourse to arbitration. When this had been done, the Corporation could abolish the anomaly which now existed whereby consumers in some portions of the city were paying 20 or 25 per cent. more for their gas than was paid by them in other parts. Alderman Wood seconded the motion. Mr. Peel inquired why Tong was not mentioned in the Bill in connection with the proposed purchase. Mr. Williamson asked if it was proposed to apply for powers to buy the whole of the Pudsey Gas Company's undertaking, or only the portion relating to Tyersal. The Town Clerk: Only the portion relative to Pudsey. As to Mr. Peel's question, he added that the Bill did not provide for the purchase of the Drighlington gas undertaking, because no order had yet been issued that Tong should become part of the city. Directly the extension scheme was sanctioned—and they were sure to have an extension scheme of some kind sanctioned—it would be necessary for the Council to go to Parliament for powers to deal with the other Gas Companies. The motion was adopted.

### ELECTRIC LIGHTING NOTES.

The Manchester City Council have decided, on the advice of the Electric Supply Committee, to abolish the charge for electricity meters as from March 25 next.

Even the modified scheme of electric lighting proposed by the Bury St. Edmund's Town Council does not commend itself to a section of the ratepayers. A private meeting of the latter was held last Tuesday, when it was decided to offer an emphatic protest against the proposal to borrow £16,000, which the scheme is estimated to cost.

A public inquiry was held last Thursday at Burnley into an application by the Town Council to borrow £10,000 for electric lighting purposes. It was stated that the works had been profitable from the start; yielding a surplus of £500 a year. A sum of £25,000 is already being spent in extending the works; and now £10,000 is needed for new mains.

The Stretford District Council are not yet to be turned from their intention to carry out a scheme of electric lighting of their own rather than allow the Manchester Corporation to supply current at the same price as is charged to the citizens. No doubt for the purpose of showing that they are right and the opposing ratepayers wrong, the District Council last Tuesday decided to engage Mr. R. P. Wilson to advise them upon the various schemes proposed; and his report is to be printed and distributed for the information of the ratepayers.

Complaints continue to appear of the erratic behaviour of the electric light at Exeter. A correspondent of one of the local papers says that on a recent evening the light was playing tricks in the houses of private consumers. "The following night," he continues, "it shared its vagaries between public and private customers. People at dinner eventually found themselves in darkness. And in the main streets of the city things were all awry." Similar complaining has been heard many times since the Corporation took over the supply of electricity. The newspaper's comment on this one is that the Town Council must make the supply more satisfactory, or they will lose all their customers.

Notwithstanding the action of the District Council, the Walker and Wallsend Union Gas Company are persisting in their proposal to apply to Parliament in the ensuing session for power to supply the electric light within their area of gas supply. This area embraces Wallsend, Willington Quay, Willington, Howdon, and Walker. The Company intend to erect adequate works for the purpose, and seek comprehensive powers for the distribution of the electric energy. They are asking for powers to increase their capital for the purposes of the new undertaking, and to enter into agreements with local authorities either to supply the electrical energy to them, or to sell or transfer their undertaking.

The Dublin "Freeman's Journal" last Wednesday contained the following paragraph: "All last night and this morning, the thoroughfares which depend upon the electric system for illumination were in a state of semi-darkness. One side of each of the streets in this area was without light—the usual light—and presented, in consequence, a very gloomy appearance. This is not by any means the first time this year that partial darkness has resulted from similar causes in the principal streets of Dublin." On the following day, it was explained that this partial failure was due to the fact that the old cables are pretty well worn; and that, having done full duty for a number of years past, they are now being replaced by new ones. The work will not be completed for nine months



to come; and during that time occasional decreases in the normal quantity of light may be anticipated. Care, however, has been taken that none of the streets served by the electric system shall ever be left entirely without light.

For two years the ratepayers of Colwyn Bay have been exercised over the question of electric lighting. The District Council have a Provisional Order, and they have even purchased a small quantity of electrical plant, which has since been lying idle; but the inhabitants view the expense of erecting works with some alarm. In order to arrive at a decision on the matter, a public meeting was held last Thursday; and the proceedings were of a very lively character. Mr. Bevan, a member of the Council, moved—"That this meeting is of opinion that the erection of electric lighting works at the ratepayers' expense will lead to a heavy addition to the rates for some years, and suggests that the Council should make terms with a private company to carry out the Order, or wait a few years until a reduction in the rates shall have made it possible for them to do it themselves. Meanwhile, in order to better light the main roads, additional incandescent gas-lamps should be provided where required." After a long discussion, during which some uproarious scenes occurred, a show of hands was taken, 52 voting in favour of the scheme, and 56 against. The Rev. Thomas Parry thereupon proposed that the electrical plant already purchased should be utilized for lighting the streets in the centre of the town. This was carried by a large majority.

Last Thursday, the Hampstead Vestry decided to borrow £10,490 for electric lighting purposes, on the conditions contained in a letter from the Assistant-Solicitor of the London County Council. This letter stated that, subject to the necessary consents, &c., the Council were prepared to provide this sum, in addition to the £39,980 already advanced, as further part of the loan of £51,500 applied for, for the extension of plant at the electric lighting station, to be repaid by equal annual instalments, within 42 years; interest at 3 per cent. being payable quarterly. It was asked if the Vestry would take up the loan on these terms. As the Vestry had elected to spread the repayment of the whole of the initial cost of the installation over 42 years, the Council would decline to sanction the raising of any loan to replace any of the plant and machinery to be provided with the proceeds of the present loan during the currency of the loan, and would expect the Vestry to provide for all replacements and renewals required during that period out of a sinking fund to be formed for the purpose or from the maintenance account; and they requested to be furnished with a copy of the resolution of the Vestry accepting and recording the condition on which the Council allow so long a period as 42 years for the repayment of the loan. Another communication was from a large Hampstead firm complaining of the failure of the electric light on their premises the previous Saturday, "through which they had lost sales to the amount of £10, for which they held the Vestry responsible." This matter was referred to the Committee for consideration and report.

**Llanelly Gas Workers' Dispute.**—It appears that there is no cause for fear of an immediate strike at the Llanelly Gas-Works. Mr. W. Thorne, the Secretary of the Gas Workers' Union, has sent an application for an increase of wages for the men. The stokers get 4s. 3d. a day; and the demand is for 5s. The labourers are paid 22s. a week. Mr. A. R. Cawley, the Manager, admits that stokers do get 5s. in other towns, but for far heavier work, while the labourers are better paid in Llanelly than in many other places.

**Brigg District Council and the Gas-Works.**—At a special meeting of the Brigg District Council last Wednesday, the question of the proposed purchase of the Gas Company's undertaking was considered. A report was presented by a Committee, who had consulted Mr. E. H. Stevenson on the matter. Mr. Stevenson advised that, in a place like Brigg, electric light could not be run separately as a profitable commercial undertaking in competition with gas, though it might be worked profitably in connection with gas, if the two were in the same hands. The Committee were also advised that, if the purchase were effected, the undertaking would no doubt prove remunerative to the ratepayers; and they recommended the Council to take the necessary steps towards acquiring the works. The ultimate decision would, of course, rest with the ratepayers themselves. But unless the Council moved in the matter, the Company would obtain the statutory power for which they were applying, and then the chance of acquiring the undertaking on profitable terms would have gone by. The report also intimated that the Committee believed that the cost of the undertaking would not exceed £15,000. The Chairman (Mr. J. Spring) proposed that a Bill be promoted in Parliament to authorize the Council to purchase the undertaking. This was unanimously adopted. A meeting of the ratepayers to consent to the promotion of the Bill, or otherwise, was convened for last evening.

**The Payment for the Restricted Water Supply in East London.**—The Secretary of the East London Water Company (Mr. I. A. Crookenden) has been in correspondence with Mr. C. T. Wilkinson, an owner of property, as to the charges for water, and whether it is proposed to reduce them in view to the diminished supply to consumers. Mr. Crookenden wrote that the "insufficient supply" was due to unexampled deficiency of rain-fall; but he pointed out that in the worst period of the drought the Company had never supplied less than 19 gallons per head per day for domestic purposes. After reminding Mr. Wilkinson that the East London Company were the pioneers of the constant service system, and that it was only out of sheer necessity that they husbanded the water, Mr. Crookenden added: "I regret that the Directors cannot entertain the idea of a reduction in the water-rates. In addition to the enormous expenditure to which the Company have been put in obtaining water elsewhere, the provision of vessels for the storage of water, the erection of stand-pipes, the employment of water-carts, and, of course, all the expenses of wages, rates, taxes, and so on, have had to be met. You will observe that, had the supply been in municipal hands, the water-rates would not have been reduced by reason of a diminished quantity of water supplied; and I may add that by many municipal authorities a less quantity has been delivered to consumers than by the East London Company." In connection with this correspondence, it may be stated that the various applications against the East London Water Company, set down for hearing before the Court of the Railway and Canal Commission last Thursday, have been dropped; it having been found impossible to get over the special provisions in regard to "unusual drought" contained in the Company's Acts.

## METROPOLIS WATER SUPPLY.

### Important Schemes for the Forthcoming Session.

Last Saturday the notices required by the Standing Orders of Parliament in respect of Bills to be promoted next session appeared in the customary form in the newspapers circulating in the districts affected. We shall, in due course, give our usual summary of the measures which relate to gas and water supply in various parts of the kingdom; but, in the meantime, we notice those dealing with the water supply of the Metropolis.

Taking first the notice for the Bill to be promoted by the London County Council to enable them to carry out their Welsh water scheme, it sets forth that power will be sought for the construction of a storage and service reservoir at Borcham Wood, in Hertfordshire, and of an aqueduct from a proposed reservoir on the River Yrfon, in Brecknockshire, to the above-named reservoir. Filter-beds are to be made near Edgware and Hendon; and there will be two aqueducts in connection therewith—one commencing at the southern embankment of the Borcham Wood reservoir and terminating at Edgware, and the other starting from the latter place and terminating at Hendon. There will be various road diversions in connection with the scheme. The Council seek to be empowered to enter into, and carry into effect, contracts for the supply of water in bulk or otherwise with any County Council, Urban or Rural District Council, Highway or other Local Authority, and any railway or canal company, and any corporation, body, or persons within the counties mentioned in the notice, and within such limits as may be prescribed by the intended Act; and the Act may confer all necessary and proper powers in that behalf upon all such councils, authorities, corporations, bodies, and persons as will enable them to carry into effect these contracts, and to raise or apply for the purposes thereof the necessary funds and rates. Provision may also be made for enabling any such authority, corporation, or body to carry their water-mains within or beyond their respective districts, and to break up streets, roads, and highways. The counties through which the main aqueduct will pass are Brecknock, Hereford, Gloucester, Oxford, Buckingham, and Hertford. Authority will be sought for raising the necessary money to carry out the scheme.

The Council also notify their intention of promoting a Bill to enable them to acquire the undertakings of the Metropolitan Water Companies, as well as that of the Staines Reservoirs Joint Committee. The purchase is to be effected by agreement or by compulsion; but if by the latter method, no allowance is to be made for compulsory sale. The Bill will contain various provisions relating to Local Authorities outside the Metropolis; and the Council will ask for power to supply water to them in bulk, or to sell or transfer portions of the undertakings. A Sub-Committee of the Council are to be appointed to carry into effect the provisions of the intended Act; and representatives of the Corporation of London and others not members of the Council, may form part thereof.

The scheme of the London Water Companies for connecting their works is indicated in the notice given by them. The Bill to be promoted will require them, within a period to be specified therein, to prepare and submit to the Local Government Board a statement describing the works and things which they may consider necessary to be executed for effecting junctions between the mains, reservoirs, or works of any two or more of the Companies, or for the conveyance of water to the district supplied by any Company in aid of the water for the time being available; and in the event of their not submitting such a statement within the period named, the Bill will empower and require an arbitrator to be appointed to prepare and submit one to the Board. The Board will consider this statement, and make any inquiries which they may deem necessary in reference thereto, and approve the same with such modification therein (if any) as they may think fit. The Board are to require the Companies to carry out the works specified, or any others which may be deemed necessary. The Bill will provide for the payment by the Companies, or some of them, in such proportions as they may agree, or in default of agreement as the Local Government Board may prescribe, of all costs, charges, and expenses which the Board may incur or be put to in reference to any of the matters in question. Provision will be made for the passage of water, in times of drought or emergency, from the mains of one Company to those of another. The Local Government Board are to have power to sanction a temporary augmentation in the quantity of water to be taken from the Thames by the Companies and by the Staines Reservoirs Joint Committee; and the Companies are to be at liberty to increase their pumping capacity. They are also to be authorized to raise money on debentures for the purposes of the Bill. Provision will be made for the appointment by the Companies or by the Local Government Board of the arbitrator above mentioned, whose duty will be to determine any question which may arise between any of the Companies, and whose remuneration is to be arranged in such proportions as may be settled. The Bill will sanction and confirm anything done by any one or more of the Companies before the passing of the intended Act which would have been valid and within their respective powers if that Act had been passed in the session of 1898, and the expenditure of money and the creation and issue of debenture stock by such Company or Companies in reference thereto; and it will vary or extinguish all rights and privileges which would interfere with the objects set forth, and confer other rights and privileges.

The East London Water Company have given notice of their intention to apply for authority to carry out an important series of works. They will comprise a storage reservoir to be situated in the districts of Waltham Cross, Chingford, and Enfield; another in the two last-named districts and in Edmonton; and seven conduits or pipe-lines, one of which will be that referred to in the "JOURNAL" last week (p. 1104), commencing by a junction with the existing conduit of the Company in the Camden Road, and terminating at the boundary of the parish of St. Pancras at the junction of St. Paul's Road and York Road. The Bill is to authorize the Company, for the purposes of the proposed works, to take, divert, pump, and impound waters from the River Lea, and to make and maintain, in any of the parishes and places mentioned in the notice, all such cuts, catchwaters, aqueducts, pumping apparatus, filter-beds, culverts, buildings, machinery, &c., as may be necessary or convenient; and also to empower them, by agreement or otherwise, to purchase or acquire all or any rights of taking or using water of the above-named river. An important



provision of the Bill will be one to authorize the Company to require the owner of any dwelling-house or other property supplied with water by them to provide a cistern or cisterns for its storage; and they will ask for power to "prescribe the size and nature of such cistern or cisterns, and to make regulations with reference thereto, and to provide for the imposition and recovery of penalties for any breach of such regulations," and to enable them to refuse to supply water in the absence of such. The Company also give notice of their intention to promote a Bill to enable them to draw from the Thames, by means of their present intake, or those of any of the other Thames Companies, a larger quantity of water than they are now permitted to abstract. This additional supply is only to be taken in cases of emergency, and with the sanction of the Local Government Board.

The West Middlesex Water Company have given notice that in the ensuing session they intend to introduce a Bill to extend their works. This is in furtherance of the declaration of Mr. E. Boulnois, M.P., the Chairman of the Company, at the half-yearly meeting last Tuesday, as reported elsewhere, to the effect that, in view of the increasing demand in their district, and in order that they may be in a position to convey the additional supply which will be available when the Staines reservoir works are completed, it is proposed to apply to Parliament for power to lay a 42-inch main between the Company's works at Hampton and the reservoirs at Barnes. Besides empowering the Company to lay this additional main, the Bill will authorize them, pending the completion of the Staines scheme (sanctioned by the Staines Reservoirs Acts, 1896 and 1898), and during such other period as may be defined in the intended Act, to take a further supply of water from the River Thames, in such manner and under such conditions as may be agreed upon with the Conservators. Additional capital will be required.

#### Increased Supply in the East-End—The County Council and the Corporation.

At the meeting of the Directors of the East London Water Company last Thursday, it was arranged that the supply should be extended several hours daily, commencing from to-morrow, by the abolition of the intermediate shutting off and on between the morning and afternoon services. The extended supplies will be given district by district. The dates of commencing in each district will be duly announced.

At the meeting of the Court of Common Council last Thursday, a letter was read from the Clerk to the London County Council (Mr. C. J. Stewart), forwarding a copy of the report of the Water Committee of that body on the London Water Supply, and the resolutions passed by the Council to promote in the ensuing session a Bill for the purchase of the Water Companies' undertakings, and also a Bill for the introduction of a new water supply from Wales. The Council desired to know if the Corporation still wished to be represented on the proposed Water Authority, and if they might count on their support in the prosecution of the Bills in Parliament. Mr. Wallace thought that in a matter of such great importance the Corporation ought to have an opportunity of considering their general policy as regarded the water supply of the Metropolis; and he moved that the communications be referred to the Committee of the whole Court for consideration. Mr. H. Clarke said the Court had already signified their approval of the general principle of the water supply of London being in the hands of a public body, but he trusted it would not be the London County Council. It was nevertheless desirable that the Court should carefully deliberate upon the very serious aspects of so important a matter. Mr. White thought the Corporation would be willing to abide by their old arrangement with the Council to be adequately represented upon the proposed Water Authority, whether it was the Council or a special body to be created by statute. The motion was carried.

#### WEST MIDDLESEX WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held last Tuesday at the Company's Offices, Marylebone Road—Mr. E. BOULNOIS, M.P., in the chair.

The CHIEF CLERK and SECRETARY (Mr. F. H. Wybroo) read the notice calling the meeting, and subsequently the report of the Auditors. This stated that the cash balance at the bankers amounted to £8182, less outstanding cheques £3256. A further sum of £5000 had been transferred from the dividend and interest account to the reserve fund, which now consisted of £20,000 of Metropolitan consolidated 3 per cent. stock, £26,000 of Metropolitan consolidated 2½ per cent. stock, £7250 of New South Wales 3½ per cent. inscribed stock, and £6800 of Victorian Government 4 per cent. inscribed stock, in addition to an uninvested balance of £5041. The capital was the same as reported last half year—namely, £1,641,863. The total expenditure on works had been £1,653,117, including £24,105 spent this half year; the expenditure being £11,253 in excess of the capital. The gross rental for the half year ended Michaelmas last amounted to £138,093, showing an increase of £4320 as compared with the corresponding period of the previous year. The water-rental received during the six months to Sept. 30 last, was as follows: On account of rates to Lady-day, £58,776; and to Midsummer, £58,814. The amount received for street watering for the season 1898 was £37, making a total of £117,627. The balance to the credit of the dividend and interest account was £63,010.

The CHAIRMAN, in moving the adoption of the report and accounts, and the report of the Auditors thereon, said the Company were still advancing; practically it was impossible for them to stand still. The requirements of a rapidly growing district compelled them to keep going with the times, and to enlarge their works in order that they might carry out their statutory obligations to supply the new population which was rising in the north-west part of London. In addition to this, it had always been the policy of the Board to keep the works and mains in the highest state of perfection, so that the property might not be depreciated in any way. The report referred to the exceptional and long-continued drought which had prevailed during the past half year, and stated that, notwithstanding this, the supply throughout the Company's district had been fully maintained. Taking all London throughout, it was

quite clear there had been no such thing as a water famine. While in many of the provincial towns—especially those which were under municipal government—the inhabitants had been somewhat stinted, the whole Metropolis, with the exception of one district, had had an ample and continual flow of water, notwithstanding the extraordinary demands which had been made upon the Companies by reason of the hot and dry summer. He thought that it said much for their noble river that its magnificent supply had never failed all through the summer. Though it might be true that there had been a somewhat reduced flow of water over Teddington Weir, no inconvenience had been suffered; and, as far as he was aware, no complaint had been made. He supposed that in the rivers throughout all England there was not an instance where the normal flow had not been diminished somewhat during the past summer whether water had been abstracted from them for water supply or not. The report referred to the progress of the works at Staines. As they were aware, their Company, the New River, and the Grand Junction, were joined in a Committee to carry out certain works at Staines which, when completed, would give them storage for something like 3300 million gallons of water. The works were going on most rapidly, and the weather they experienced in the summer—everything, in fact—had been favourable to the rapid development of the scheme. No one could appreciate the enormous magnitude of the work, and what it signified, unless he visited the spot and saw for himself. It would indicate somewhat how things were going on if he stated that every day for some time past about 2000 men had been employed on the works at Staines. In view of the increasing demand for water in their district, and in order that the Company might be in a position to convey the additional supply which would be available when the Staines reservoirs works were completed, the Directors proposed to apply to Parliament in the ensuing session for the necessary powers to lay a 42-inch main between the works at Hampton and the reservoirs at Barnes and Barn Elms. It was not necessary to go into the details of this Bill. They might believe that it had become essential, or the Directors would not apply to Parliament (especially just now) for powers to raise more capital and carry out further works. There would be an opportunity of explaining the Bill at what was called the Wharnclyffe meeting, which they must hold before the Bill was brought before the House of Commons. The report also stated that the London County Council had decided to introduce next session Bills for the transfer to them of the undertakings of the eight Companies, and for bringing a supply of water from Wales. It was a somewhat unusual course to apply to Parliament for legislation on a subject which was still *sub judice*. The Royal Commission on the water supply to London were still sitting, and would certainly be obliged to sit for some time longer before they could make a complete report to Parliament. The justification of the County Council was that the exigencies of East London required an immediate remedy; and the immediate remedy of the County Council depended upon the Bill which they proposed to introduce for the purchase of the eight Water Companies. With the loss of this Bill, the County Council's remedy for East London, about which such a parade had been made, disappeared also; for the power to the Council to connect and lay mains and other works necessary in order to enable them to protect any part of the Metropolis from want of water, was only a clause in the Purchase Bill, and stood to fall with that Bill. Fortunately for East London, and for the rest of the Metropolis, the Companies themselves had a full and immediate remedy should necessity arise. They were prepared, by way of precaution and insurance, to make the necessary connections, in addition to those which had already been made for the relief of East London. They were prepared to make these connections at once, and whether it was legal or not—believing that they would receive an indemnity from Parliament for any act they might commit in this direction. At all events, they believed that by so doing they would put an end to all doubt as to whether London would not in future, in all parts, get a complete supply, and in all seasons and contingencies. But the proposed Purchase Bill of the London County Council contained the same objectionable features which had characterized their previous Bills in this direction. In the first place, the County Council still demanded a special arbitration clause. He was at a loss to understand why they should be more favoured in this respect than other municipal bodies. When one party coveted the possessions of another, and desired forcibly to expropriate him, the existing law provided only one mode of procedure—in such a large undertaking as this, at all events—a mode of procedure which had always been recognized, and which had governed all cases. Provided the parties could come to no agreement, the assessment of value had to be determined by an arbitrator under the usual conditions; and he saw no reason why the arbitrator in this case should be fettered by instructions, as the County Council proposed—instructions which were one-sided, partisan, and prejudicial. He maintained that the Companies were entitled to liberal, and even to handsome treatment, for they had deserved well of the community in all respects. It seemed to be forgotten that these undertakings were originated by private enterprise for the public good. For years no profits were made, no dividends were earned; and now, after the undertakings had been administered with great care and pains, after they had been brought to a most complete state of perfection and were making a fair profit, a public body came forward, and endeavoured to buy them at the price of old iron. The second objectionable feature he observed in the Purchase Bill of the County Council was the proposal that the property should vest in the Council six months after the passing of the Bill. He did not believe that such a bare-faced proposal had ever been made before by any public body. It was justified by the County Council by the assertion that it would be accompanied with provisions assuring the shareholders against loss of income during the interval between the transfer and the payment of the purchase-money. But what the shareholders would look for was not an assurance against loss of income for a while, but against loss or diminution of the capital which they had invested. The plan of the London County Council was practically that the proposed purchaser might first seize the property, and then dictate the terms of purchase. In other words, at the end of six months the County Council were to be able to take over not only the mains, reservoirs, and all the works of the Companies, but also the staff and the books. The Directors, whom the proprietors not unnaturally expected to protect their interests, were, if the Bill should ever pass into law, to be bundled into the street in six months; and the staff, who had ever been loyal to their Boards, would come under the influence and dictation of



new masters. He believed that every device which ingenuity could suggest would be resorted to for delay, for depreciating the properties, and for urging the arbitrator to cut down the value of the undertakings; and the proprietors during this protracted arbitration would have lost the services of those to whom they would naturally look for aid and protection—the Directors. This might be the commercial morality of the London County Council; but it was not the recognized mode of fair dealing as between man and man. He did not believe for a moment that such a one-sided proposal would commend itself to the House of Commons, or, if the Bill should pass the second reading in that House, would commend itself to any Committee to whom the Bill might be referred. It had been asserted frequently that the County Council had not been met by the Water Companies in anything but an uncompromising attitude. This was not quite so, for the Companies had always expressed their willingness to take into consideration any proposal for purchase which might be put before them; but up to the present time no such proposal had been made. When they considered that not a Bill had been brought in by any Metropolitan Water Company during the last nine years for improving and extending the supply to their particular district (for the benefit, of course, of the consumers) which had not been met by the most strenuous opposition by the County Council; when they considered the arbitrary and hard conditions which had been imposed upon the Companies, conditions to which no similar undertaking (whether gas, railway, tramway, or even a provincial water undertaking) had been subjected; when they considered the language which was used about the Water Companies, and particularly about their Directors, by the Progressives and their organs in the Press—it was not very surprising that the Water Companies held that body at arm's length; and he could assure them that they would continue to hold the County Council at arm's length unless the latter could approach them in a fair, just, and honourable spirit. He trusted the proprietors would accept the assurance of the Directors that while they were in office they would continue to guard the interests of the Company.

The DEPUTY-CHAIRMAN (Mr. Jackson Hunt) seconded the motion.

The CHAIRMAN, in answer to Mr. Fowler, stated that the 42-inch main which they intended asking Parliament next session for powers to lay would have to be provided for out of capital, which would be mentioned in the Bill.

The resolution was carried unanimously; and afterwards a dividend was declared at the rate of 10 per cent. per annum on the consolidated stock for the half year to Sept. 30 last, less income-tax.

Mr. NICHOLAY afterwards proposed a vote of thanks to the Chairman and Directors for their diligent attention to the business of the Company, and for their able and satisfactory management of affairs. He felt sure he was only expressing the feeling entertained by all the shareholders when he said that they were exceedingly indebted to the Directors for their strenuous exertions to maintain the interests of the proprietors against the attacks of the London County Council.

Mr. FOWLER seconded the motion, which was carried unanimously.

The CHAIRMAN, in acknowledging the vote, assured them that the Directors had at all times the interests of the proprietors thoroughly at heart. For the past ten years—or nearly so—a great deal of vigilance and care had been necessary to protect the property; and the same vigilance and care would be at their service in the future.

The proceedings then terminated.

#### SALE OF NEW RIVER COMPANY'S SHARES.

In view of the present position of the London Water Question, unusual interest attached to the sale of shares and stock of the New River Company, conducted by Mr. E. H. Bousfield, of Messrs. Edwin Fox and Bousfield, at the Mart, Tokenhouse Yard, last Wednesday. There were offered for competition several fractions of a King's share, £4000 of 3 per cent. debenture stock, and 30 new shares of £100 each. In submitting the various fractions of a King's share, Mr. Bousfield commented on the exceptional advantages possessed by New River freeholds. The proportion of dividend in respect of every 104th part of a King's share which he was about to put up was stated in the particulars to be at Midsummer last at the rate of £27 6s. 3d. per annum; but it was not fair to take this sum simply as the basis for capitalization, as there were elements in connection with the property which were not comprehended in that return. The income of the New River Company had greatly advanced in the last 25 years—rising from £284,203 in 1871 to £588,595 in 1897. The future revenue had, he said, all the elements of expansion which the revenue had had in the past. They might anticipate that within the next 25 years the present income would be doubled again. It might be said that long before another 25 years had elapsed the Water Companies would be taken over by the London County Council. When, however, he was a boy, this was in the air, where he believed it would be for a very long time yet. In spite of the County Council introducing a Bill, as they were now proposing to do, for the purchase of the undertakings of the Water Companies, his own impression was that when the time came, as probably it would, for taking over these properties, they would not be handed to the London County Council—a body composed of highly-respectable individuals, but one who had set before themselves political aims not conducive to the satisfactory management of such enterprises as the Water Companies of London—but a Water Trust would be established, who would buy them at a fair price under the Lands Clauses Act. The value of the property which he had now to dispose of would then be very greatly increased. There was, he further remarked, one very satisfactory feature in the County Council's proposed action this time—they clearly recognized the expediency of buying. There was no longer any threat such as had previously been held over the Companies of endeavouring to import a dual system of water supply into London. Coming to the properties he had to sell, he stated that one of the New River Company's estates—perhaps the most important, but still only one of them—was that at Clerkenwell, of 50 acres, situate within a mile of the Bank of England. Within 20 years the whole of this area would be in the Company's hands available for development. He then offered lot 1, a 104th part of a King's share. The first bid was £930, which advanced by offers of £10 each to £1000, at which figure the property was sold. The next similar lot realized the same price; but the other

11 lots produced £950 and £960 each. Eight 112th parts of a King's share (the proportion of dividend to each last Midsummer being at the rate of £24 17s. 10d. per annum) were then offered. The bidding opened at £750; but the first four lots were disposed of at £860 each, the others fetching £845 and £850 each. Fifteen 120th parts of a King's share were next submitted; the proportion of dividend to each at Midsummer last being £23 13s. 5d. The first bid was £750; but for each lot £790 was realized except the last, for which £795 was obtained. For the five 80th parts of a King's share, on each of which the proportion of dividend last Midsummer was at the rate of £34 13s. 8d. per annum, £1185 each was secured; the first bid being £1100. A 64th part of a King's share was afterwards offered, and fetched £1480; the proportion of dividend in respect of this lot at Midsummer last being at the rate of £43 7s. per annum. For the 3 per cent. "C" debenture stock, prices were given varying from £107 to £109 per cent., as against an average at the last sale of the stock of £118 17s. 6d. per cent. The 30 new £100 shares, the dividend in respect of which at Midsummer last was at the rate of £13 5s. per annum, realized £445 each for the first 25 lots; the other lots being purchased at £440 each.

#### PORTSMOUTH WATER COMPANY.

##### Half-Yearly Report.

At the half-yearly general meeting of this Company on Thursday, the Directors will report a balance of £23,261 available for distribution. Out of this they recommend that the full statutory dividends should be paid and that a sum of £822 should be carried to the arrears of dividend fund, which, with the sum already standing to the credit of the fund, will enable a similar distribution to be made in respect of these arrears as on previous occasions. This, after the usual deductions for void houses, &c., will leave a balance of about £7426 to be carried forward. During the six months ending Sept. 30, 2742 yards of additional service mains were laid in new roads; making a total of about 46 miles of trunk mains and 123 miles of service mains. The number of additional services connected with the mains during the half year was 469; making the total number of premises now under constant supply by the Company in all their districts 38,414. The quantity of water pumped from Havant and Bedhampton during the six months was 1,249,976,000 gallons, or an average daily supply for all purposes of 6,868,000 gallons; being a decrease of 579,000 gallons daily as compared with the corresponding period of last year. The quantity supplied for domestic use is equivalent to an average of 27 gallons daily per head of the population exclusive of all supplies by meter. The number of fire hydrants now fixed in the Company's districts is 3036. The Engineers (Messrs. J. Quick and Son) report that the Company's engines, boilers, reservoirs, and works are in good order. The recent unusually prolonged drought caused much anxiety and distress throughout the country; but the Directors were able to continue the usual constant service at high pressure, which has now existed for eighteen years, without any such restrictions as have had to be applied in other large towns.

#### BRIDLINGTON WATER-WORKS PURCHASE AWARD.

The Bridlington Town Council last Tuesday held a special meeting to receive the Arbitrators' award in respect to the purchase of the water-works. Before the Solicitor (Mr. F. J. Brigham) introduced the award, it was agreed that it be referred to the Water Committee without comment, in order that members should have an opportunity of considering it before expressing a hasty opinion. The Arbitrators (Mr. G. F. Deacon for the Council, and Mr. Thomas Newbigging for the Company) awarded that the price to be paid by the Council should be £66,260, in addition to the costs incidental to applying for and obtaining the Bridlington Water Act of 1896, and the value of the Company's stock-in-trade as from March 12, 1899. The reserve fund, amounting to £794 2s. 11d., with interest to March 12, 1899, will become the property of the town. The award provides that two officials of the Company—the Secretary and Manager—shall, in the event of leaving or being discharged from service within five years from the date of purchase, receive an annuity for life of one-half their present salary, or if after the expiration of five years, an annuity of two-thirds of their present salary. It is ordained that the purchase shall be completed by the Council by March 12, 1899; and failing the completion of the purchase at that date, interest shall be paid at the rate of 5 per cent. on the purchase-money until the actual payment, which must take place not later than June 12, 1899. The award was referred to the Committee as arranged.

**The Whitchurch Gas-Works Purchase Scheme.**—A meeting convened by the District Council was held at Whitchurch last Wednesday, for the purpose of ascertaining the views of the ratepayers regarding the proposal to purchase the gas-works for £37,000. Several members of the Council recommended the purchase upon commercial grounds; but the scheme was opposed by a number of ratepayers, who contended that electric lighting works could be erected at less cost. Upon a vote, the scheme was rejected by a large majority.

**The General Gas Company of France.**—The report of this Company for the twelve months ending June 30 shows that the result of the working in that period was a sum of 2,976,960 frs. (£119,078), as compared with 2,793,058 frs. (£111,722) in the preceding year. Adding the balance brought forward (486,245 frs.), there was a total of 3,463,205 frs. (£138,528). Deducting the general expenses, the amount required to pay the interest on the bonds, the Directors' fees, and other charges, there was left a disposable balance of 1,146,045 frs. (£45,842). The Directors recommended that 300,000 frs. should be distributed among the shareholders, at the rate of 7 frs. 50 c. per share; that 500,000 frs. should be added to the provident fund; and that the balance of 346,045 frs. should be carried forward. At the recent meeting of the Company this was agreed to. The dividend declared was 32 frs. 50 c. per share—the same as last year; and the reserve fund was brought up to 1,352,235 frs. (£54,089).



## METROPOLITAN WATER SUPPLY COMMISSION.

Thirty-fourth Day—Monday, Nov. 14.

(Viscount LLANDAFF, Chairman, Major-General A. DE COURCY SCOTT, R.E., Mr. A. DE BOCK PORTER, C.B., and Mr. R. LEWIS.)

The Commission sat at the Guildhall, Westminster.

The following are the Counsel engaged: Mr. POPE, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., for the New River and the Southwark and Vauxhall Companies; Mr. LITTLER, Q.C., and Mr. LEWIS COWARD for the Kent Water Company; Mr. PEMBER, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. RICKARDS for the Chelsea Water Company; Lord R. CREIL for the Hertfordshire County Council; Sir JOSEPH LEESE, Q.C., M.P., for the Kent County Council and Kent Local Authorities; Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN, Q.C., for the London County Council; Sir R. NICHOLSON for the Middlesex County Council; and Mr. GABRIEL P. GOLDNEY (Remembrancer) for the Corporation of the City of London.

Mr. W. B. Bryan, examined by the CHAIRMAN, said he had been for sixteen years Chief Engineer to the East London Water Company, who were now supplying a population of 1,300,000. The daily quantity of water delivered last summer, on the average was: June, 42,563,000 gallons; July, 44,959,000 gallons; September, 33,149,000 gallons; and October, 34,202,000 gallons. In August, up to the 22nd, when the intermittent supply was commenced, the average was 43,170,000 gallons daily; the average for the whole month being 40,656,000 gallons. In September the supply was about 25 gallons per head per day, 7 gallons of which were for trade purposes.

The CHAIRMAN: I have received a letter from a Mr. Glover, of 111, Green Street, Upton Park, who tells me that on many days the water never reached his cistern, which placed him in a worse position than those who got it from the mains?

Witness: If he had a tap for drinking purposes at the usual height, he would have had the same supply as others in the district. A difficulty does arise with very high cisterns. When the water is turned on it naturally has to fill all the lower cisterns first; the consequence being that only when the lower cisterns are full does the water reach the higher ones. A house solely furnished with a high cistern would get water from the draw-off taps on lower or ground cisterns.

Have there been cases in which you attribute the fact that the water has not reached individual consumers to the turning on of numerous taps for an unnecessary length of time?—There have been an enormous number of cases in which the water has not reached the consumers owing to this cause. The hours of supply by the Company during the drought varied; but time-tables were posted in different parts of the district notifying when the supply would be turned on and off. The water was turned on twice daily, and lasted for two hours. One street would have it for two hours starting at 6 a.m.; the next commencing at five minutes later; and so on.

A man who was in the 6 to 8 o'clock district, would either have to get up at 6 in the morning to open his tap, or leave it running to fill any vessels he might have for storing water?—Unless he had a proper cistern that would be so.

Does this not account for the taps being left open?—To some extent it might. The Company are still giving four hours' supply daily throughout the district.

Major-General SCOTT said he had roughly worked out the total quantity of water supplied by the Company during the four months as follows: July, 1,393,729,000 gallons; August, 1,260,336,000 gallons; September, 994,470,000 gallons; and October, 1,060,262,000 gallons—a grand total of 4,708,799,000 gallons.

Witness handed in a table showing that in 1898 there were pumped into the Company's mains from the Lea: In July, 9,479,000 gallons; in August, 6,354,000 gallons; in September, 1,032,000 gallons; and in October, 4,693,000 gallons. The corresponding figures for 1897 were: July, 34,611,000 gallons; August, 34,803,000 gallons; and September, 32,202,000 gallons. This included what was drawn from storage. It might be that the volume coming from the Lea was somewhat smaller than the figures given; the balance being made up out of storage. The difference in the figures (say) for August was enormous, and indicated that the volume of the Lea was lower than it ever was before. The supplies the Company drew from the Thames in the last four months were: July, 9.80 million gallons; August, 9.50 million gallons; September, 9.72 million gallons; and October, about 9.80 million gallons—much larger quantities than in 1897. The corresponding figures of the daily supply drawn from wells was: July, 7.17 million gallons; August, 9.55 million gallons; September, 9.44 million gallons; and October, about 9 million gallons. These quantities were considerably more than double as much as was pumped from wells in 1897. As regarded the Thames, they pumped as much as they could get from it—a little over 10 million gallons. During the four months mentioned in 1898, the Company did not pump their wells to the extent of the full yield, as they did not work the pumps quicker than was safe.

The CHAIRMAN: Now, practically, from these two sources—the Thames and the wells—could you have got more water for your district than you did during the four months?

Witness: Not from our Thames main. It was carrying as much as it would be safe to pass through it. We could have got a little more from our wells, but not without some risk of working the deep-well pumps at too great a speed.

In answer to further questions, witness said the reservoirs of the Company were pretty well exhausted in July, when some 12½ million gallons daily were taken from them. The supplies from the New River Company averaged daily 1,013,000 gallons in July, 5,346,000 gallons in August, 6,129,000 gallons in September, and 6,093,000 gallons in October. Nothing was obtained from the Southwark and Vauxhall Company in July and August; the first water from them being received on Sept. 19. In September, the daily average quantity from the Company was 2,029,006 gallons; and during October, 4,801,000 gallons. The supply had never reached 6 million gallons daily; and it was not increasing. The Southwark and Vauxhall water entered the East London area at a short distance east of the Tower, and was allocated into a district as though the area were an integral part of the Southwark and Vauxhall

Company. It was very difficult indeed to so arrange as to take in a large quantity of water. It was weeks before the East London Company could take as much as the Southwark and Vauxhall Company could afford them. The amount supplied daily by the Southwark and Vauxhall Company had been greater than 5 or 6 million gallons; but owing to one or two bursts, a day's supply had been lost—thus reducing the average to 4,800,000 gallons. Witness wished it to be distinctly understood by the Commission that there was no truth whatever in the suggestion that the East London Company's mains were of less strength than those of any other Company. The same founders made them; they were laid in the same way—perhaps by the same contractors; the iron was equally good; and there was no reason whatever for assuming that they were not equal to those of any other Company. In fact, experience proved that they were quite as good as those in any part of England. The Kent Company's supply was only received in September and October last; and the largest amount was 206,000 gallons. This quantity would decrease rather than increase, because the pressure on the East London side was higher than it was in September.

Major-General SCOTT said he had roughly worked out the total of the contributions to the East London Company from all outside sources. They were: July, 31,403,000 gallons; August, 165,726,000 gallons; September, 250,920,000 gallons; and October, 343,790,000 gallons—a grand total of 791,839,000 gallons. There were two small mains from the Kent Company, of 4 inches diameter. It was quite practicable for the Kent Company to give more water by laying a new main through the tunnel, and on the south side. The drought commenced about sixteen months ago. The flow of the Lea began to fall off in June of last year; and since then it had been very small indeed. Even in January of this year it was only 48 million gallons a day; in February, only 26 million gallons; in March, nearly 32 million gallons; April, 19 million gallons; May, 23 million gallons; June, 19 million gallons; July, 12 million gallons; August, 6 million gallons; September, 2 million gallons; and October, he thought, nearly 5 million gallons. The total flow of the River Lea in July was 13.9 million gallons daily, which included what the New River Company allowed to flow down for the benefit of the East London Company. The latter Company took roughly 9.5 million gallons of this quantity. During the four months of drought the navigation had what it wanted. Also the Company pumped water from the Thames to the lower reaches; but he could not tell how much, because it was impossible to gauge it. They pumped up as much as kept the navigation to its proper head level; but none was pumped into the upper reaches from which the East London Company took their supply. This pumping operation had been done twice before recently—once for about five weeks in 1896. There were no records to show that there had been any other drought like the last in intensity and duration.

Mr. DE BOCK PORTER: Has the discharge from the wells in the neighbourhood of the Lea been reduced in the same proportion?

Witness: That I can scarcely answer. We have found no diminution whatever in their yield at the present moment over the yield at the commencement of the drought.

The CHAIRMAN: Not only no diminution, but you have been getting an increased quantity from your wells?

Witness: We have.

Do you see any connection between the increased supply you have got from your wells and the diminished flow of the Lea?—None; the reason being that the Company's wells are situated at the lower end of the valley, and we take what water is flowing underground and is running to waste.

Further examined: The lack of storage cisterns in the Company's district aggravated the hardship of the drought very much. It might be in one or two isolated cases the water did not rise high enough to fill the cisterns. Witness believed there was a clause in one of the Company's Acts which said that cisterns were to be fixed; but it did not specify their size or character. The consequence had been that, to comply with this clause, in some cases cisterns about as big as a hat had been put in. In many instances—especially in some portions of the Essex district—a builder would put in one cistern. He would then apply for the water to be laid on; and a day later he would remove the cistern and take it into the next house. One cistern would thus do duty for a whole row of houses.

Some discussion then took place as to the power of the Company with regard to cisterns; Mr. Balfour Browne asserting they had power to refuse a supply unless the cisterns were proper, and witness and other Counsel stating that the power was very doubtful, and, if it existed, difficult to enforce. Eventually, the matter being before the Railway Commissioners, the subject was left.

Mr. DE BOCK PORTER: Have you formed any idea of the time when you will be able to resume a proper supply of water?

Witness: No, I have not. It depends upon the flow of the river. The flow of the Lea is very minute at the present time; but we have increased the amount of water in store considerably during the last month. I think it wise to husband this store, in case of severe frosts coming; but our position is very much better than it was a month ago.

You see no immediate prospect of running a proper supply?—No; but I think that when rain comes, the ground is so saturated now that we shall have an increased flow.

Examination continued: He had followed the available volume this year in estimating the supply from the Lea next year at 10 million gallons in July, 6 million gallons in August, 1 million gallons in September, and 4 million gallons in October. The quantity estimated for as coming from the storage reservoir was nothing in July, 3 million gallons in August, 7 million gallons in September, and 2 million gallons in October. Adding these two sets of figures together, gave an amount very much short of what the Company usually drew from the Lea. He counted on 12 million gallons each from wells and from the Thames. They were only entitled to draw 10 million gallons daily from the Thames; but 2 million gallons would come from the springs at Hanworth. The Company's mains and pumps were sufficient to pump 10 million gallons daily from the Thames; but to get the extra 2 millions, it would be necessary to cut the main in two, and then, by arrangement with the Grand Junction Company, to pump the water from Hanworth into the Campden Hill reservoirs, and the Grand Junction Company would pump it into the East London reservoir in Finsbury Park. With regard to the wells, he thought more than 12 million gallons would be obtained from them, because the engines at every well would be doubled



next year, so that whenever one set of pumps had to be overhauled the other set would be available. Then he counted on 6 million gallons daily from the New River Company, with the assistance of the Grand Junction and West Middlesex Companies, through the Oxford Street connection; and a further similar quantity from the Southwark and Vauxhall Company. He estimated the storage at the beginning of July next at 1200 million gallons.

Mr. DE BOCK PORTER: What prospect is there of your being able to fill your reservoirs this year?

Witness: If we have no rain, we shall not be able; if we have a moderate amount of rain, we shall.

But you want all your increased supplies, do you not, for your customers?—Yes; but we could do that by purchase from the other Companies until our reservoirs are full.

The CHAIRMAN: If you are to avoid another failure to supply next year, you must be able to fill your reservoirs by the end of July?

Witness: Yes; or have 700 million gallons in store.

Major-General SCOTT gave the following as the total of the estimated supplies of the Company from all sources in 1899; the totals being based on figures furnished by witness: July, 1426 million gallons; August, 1395 million gallons; September, 1320 million gallons; and October, 1302 million gallons—altogether 5443 million gallons. This quantity, less the amount supplied in similar months this year from the resources of the Company, left a deficiency of 1,526,042,000 gallons, which, divided over the four months, gave an average deficiency of 12,406,830 gallons daily.

Witness (continuing) said that was more than they expected to obtain from the New River and Southwark and Vauxhall Companies; but this only meant that in the 123 days they would deplete their reservoirs by 50 million gallons more, unless more water was obtained from the Kent and New River Companies.

Mr. DE BOCK PORTER: You are withholding water from your consumers now in order that you may fill the reservoirs for next year?

Witness: To some extent. We are doing it for their benefit, as trustees.

Still the consumer continues to pay for his full quota of water?—Yes; I suppose he does.

The CHAIRMAN: There is no doubt he does. He pays for the full constant supply; and you are condemning him for months to an intermittent supply.

Mr. PEMBER: He is not entitled to a constant supply if there is drought.

The CHAIRMAN: It strikes me as a *casus omissus* in the Act, that there should not be a stoppage of the rates as well as of the supplies.

Witness, further examined, said in estimating the water that would be needed next year, he reckoned on an increase of population supplied of 25,000, which, at 30 gallons a head daily, meant an increased consumption of 750,000 gallons. With regard to inter-communication, the Companies had the means enabling them to get over 6 million gallons daily from the New River Company, and between 5 and 6 million gallons from the Southwark and Vauxhall Company. The connection with the New River Company would convey a large volume beyond the 6 million gallons—a volume dependent on what the Company, with the help of the West Middlesex and Grand Junction Companies, could supply. The inter-communication with the New River was the River Lea. If the two Companies could supply the New River Company with a considerable quantity, the New River could release from the East London, in the Lea, the same amount in addition to what that Company had to spare at Hertford. The Grand Junction and West Middlesex Companies might be able to supply a further 2 millions.

The CHAIRMAN: Therefore the existing communications bring you all that you want for next year?

Witness: They do.

Then you do not want the extra main from the Nunhead reservoir to the Tower Subway?—So far as we are concerned, the 6 million gallons daily that they can pass us through will be ample for our purpose, according to my estimate.

You do not want any inter-communication at all?—I am quite content with this.

Mr. DE BOCK PORTER: Will the inter-connection with the Southwark and Vauxhall Company give all that they can spare?

Witness: No; I think not. They will be able to spare more than the 6 million gallons.

Major-General SCOTT: How many years will it be before you can throw overboard these connections with other Companies for the purpose of supplementing your own supply?

Witness: It will take, I should think, two years at least to make the 1000 million gallons storage.

But then you have to get more storage than that if you take your 30 million gallons from the Lea?—The 1000 million gallons extra storage would in 98 or 99 per cent. of droughts give us the 30 millions; but in an extraordinary drought like this, it would not. That is the reason I am advising my Directors to go to Parliament again for further storage. If another drought like the present occurred next year, or in any year till 1904, with the help of the other Companies and through already existing connections, the Company would be able to give a constant supply, even though the population in, say, four years had increased by some 100,000, involving a further consumption of 3 million gallons daily.

Mr. DE BOCK PORTER: Then you are not likely to be independent of the other Companies for some years to come?

Witness: I hope in two years we shall be independent of them.

By Major-General SCOTT: If the season two years hence were very abnormal, like the present, the Southwark and Vauxhall and New River Companies' connections might have to be again used; and he thought it would be well to lay the main from Nunhead to the Thames Subway, in view of a possible increase of supply from the Southwark and Vauxhall Company. The main could be laid in about six months.

The CHAIRMAN: In the interests of your Company, you think Sir Henry Knight's suggestions would be sufficient?

Witness: I do.

Do you know whether typhoid has increased in your district lately?—I cannot say.

By Mr. PEMBER: One flood in the Lea, of (say) 14 million gallons daily, though the first would have to be let pass, would go far towards filling the 1000 million gallons of storage. With the new reservoirs which would be before Parliament next session, the Company were making considerable

provision to take in flood water themselves. The proposed scheme of this year was intended to give something like 4000 or 5000 million gallons storage. He had no doubt whatever in anything like ordinary seasons the Lea would, by its flood waters, provide the amount of storage which the reservoirs would hold.

Cross-examined by Mr. BALFOUR BROWNE: With the present means of inter-communication, he believed the East London Company could tide over a drought as serious as that of this year.

Mr. BALFOUR BROWNE: In two years, if all goes well with your present works, do you think you could do without the assistance which is put down in your table both from the New River and Southwark and Vauxhall Companies?

Witness: In normal seasons, we could.

And if the scheme which you are going to submit to Parliament this year is sanctioned, even in abnormal seasons you would be able to do without it?—When finished, certainly.

Witness was subjected to a further cross-examination, with a view to showing that the pumping that was going on in the Lea Valley was intercepting water which would otherwise go to increase the flow of the Lea. He however maintained that the water pumped was water which would otherwise have flowed into the tidal portion of the Thames, and that, therefore, it could not affect the flow of the Lea.

The CHAIRMAN: You say it is an accidental coincidence that the more you pump from your wells, the less water there has been in the Lea?

Witness: That has been due to the minute rainfall. For the twelve months ending September we have only had an average of 12½ inches, instead of 25 inches.

Further cross-examined by Mr. BALFOUR BROWNE: The 6 million gallons the East London Company were receiving from the New River Company cost altogether about £178 per day, or £5414 per month. If, instead of the two 4-inch pipes now passing through the Thames Subway, there was a 24-inch main, and about 2 miles of main to the south of the river were laid, the quantity that could be passed from the Kent Company would be about 6 million gallons daily—supposing the Company had it to give. The East London Company were supplying the previous week a little over 35 million gallons a day as nearly as he could tell; and they were still receiving aid from the New River, Southwark and Vauxhall, and Kent Companies.

#### Thirty-fifth Day.—Tuesday, Nov. 14.

All the Commissioners were present, except Mr. Cripps and Mr. Mellor.

Mr. Bryan said with reference to the question of typhoid, about which the Chairman put a question the previous day, he had examined the Registrar-General's returns for the past six weeks, and found that in the eastern districts supplied by the East London Company, for the six weeks ending Nov. 5, the number of deaths from typhoid were 1 per 39,000 people living; in the central districts not supplied by the East London Company, 1 per 33,000 people living; and in the northern districts, also not supplied by the East London Company, 1 per 31,000 living. The eastern districts, therefore, compared very favourably with the other two.

Cross-examined by Lord R. CECIL: The Company had several more wells in course of construction; and at some of the existing wells the tunnels were being extended. The quantity to be reserved for navigation was about 5,400,000 gallons daily. In July, the quantity flowing down the Lea was 3·4 million gallons; but what went down the Lea as far as Hertfordshire was concerned, was 13·9 million gallons. The quantity left to go down the Lea in August was ½ million gallons; and in September, about 1 million gallons. In no case did the Lea Conservancy enforce their statutory rights under the Act of 1855 in regard to this matter.

In reply to Mr. PEMBER, witness went again into the question dealt with the previous day regarding the water the Company pumped from wells. It was a difficult and complicated question; and to elucidate it, he produced a rough diagram showing the geology of the district. The London clay, he said, cropped out at Hoddesdon, which was about 90 feet above mean tide in the Thames. Any water getting into the permeable strata at Hoddesdon—that place being 90 feet above the Thames—whether he pumped or not, would, by gravitation, find its own level. The water pumped at the lower reaches of the Lea could not affect the river at Hoddesdon, because the reaches being below Hoddesdon the water would go down, and it was now finding its way into the Thames.

The CHAIRMAN remarked that, though the effect might be slow, yet the pumping must deplete what would flow into the chalk and sand.

Witness said it did deplete the basin somewhat; but the basin being so much lower than the river at this point, the water would not benefit the Lea, but the Thames.

As you pump, it must to that extent deplete it, though the effect may not be observed for some time?—That is so to some extent.

I understand your point is that whatever you are taking you are not robbing the Lea, because the Lea has irremediably lost it, if you did not take it?—That is so.

Mr. PEMBER: It is a substitution of one outlet for another.

The CHAIRMAN: Suppose you did not pump at all, then the whole of this sand and chalk would get saturated with water, which would solely escape into the Thames?

Witness: Yes.

Being saturated, it would take in no more water above Hoddesdon?—If it were fully saturated, it would take in no more.

Any more rain water that fell, instead of being absorbed, would go into the Lea?—Yes. Practically, however, the friction of the water in the chalk is so enormous that I do not think the quantity abstracted by the Company would make a difference of 1000 gallons a day.

Mr. M. W. Hervey, for the past ten years Engineer to the West Middlesex Water Company, examined by the CHAIRMAN, said the water the Company had pumped this year through their works at Hammersmith was: June, 23,124,933 gallons; July, 23,917,011 gallons; August, 22,870,405 gallons; September, 23,504,445 gallons; and October, 21,372,666 gallons. This was sufficient to supply all the wants of their district. The sole source of the Company was the Thames, from which they were authorized to draw 2½ million gallons daily. In the months



mentioned, they had therefore to spare daily: In June, 1,375,067 gallons; July, 582,989 gallons; August, 1,629,595 gallons; September, 995,555 gallons; and in October, 3,127,324 gallons. The first set of figures were considerably in excess of the corresponding ones for 1887. The pumping capacity of the Company was ample. They had finished four additional filters this year; bringing up their filter area to 19 acres, which could easily treat from 33 to 35 million gallons daily. The pumping power was also ample. The Company could pump into their district about 33 million gallons a day; but there would be little spare power then, so that this would hardly be safe. Moreover, the quantity would be restricted by the mains. He should think 5 million gallons a day would be the maximum quantity they could at present supply to an outside Company. In the summer months, it would be much smaller—about 1½ million gallons. The total storage of the Company was 397,500,000 gallons. A supply of 1½ million gallons daily during the four months would total 183 million gallons; and supposing the spare water of the Company to amount to 139,708,764 gallons, they would have to draw the balance of 43,291,236 gallons from store, which would leave 354,208,764 gallons. This, less water used for sand washing, &c., at Barnes during the four months (56,705,000 gallons), would reduce the storage to 297,503,764 gallons, which at an average consumption of 22 million gallons a day, equalled 13½ days' supply. His Company, however, were going to Parliament next session for power to take 5 million gallons of water a day more, pending the completion of the Staines scheme. He considered this quantity absolutely necessary to meet their wants. It would give the Company a margin to fill up the storage reservoirs quickly.

Sir G. BRUCE: If it is thought desirable that all the Companies should in some way be coupled up, do you think scheme No. 2 is a good one?

Witness: I think it is the best that could be devised.

Major-General SCOTT: And you approve of coupling up?

Witness: Yes.

Do you think it is worth while to spend half a million to do it?—I think this sum might be modified.

Is it worth while, considering the benefits which might be derived from it?—It is a very large expense, no doubt.

Are you distinctly in favour of it?—As an assurance, yes; but for possible failure, as it has not occurred in the past, I do not see any necessity for it occurring in the future.

By the CHAIRMAN: He thought his Company could spare the 1½ million gallons a day next year, but certainly not after that. Practically his Company's power of contributing 1½ million gallons a day to this inter-communication stock, except for next year, depended on them getting their forthcoming Bill.

By Sir J. DORINGTON: He thought the main passing water from the Grand Junction, West Middlesex, and New River Companies would also be available to return water to (say) the West Middlesex Company in case of necessity.

The CHAIRMAN: If scheme No. 3 establishes a means of communication all round the circle, the supply of each Company could travel that way, and meet any want that arose?

Witness: I think it would be sufficient to meet any case; but not to the extent No. 2 would, because we depend on the amount of water each individual Company has to spare at the time. Scheme No. 2 I think does not, because you would be able to pump the water direct from Hampton to Battersea; and there you would have the means of distributing 15 million gallons a day to whoever required it.

Mr. Richard Hack, Chief Engineer to the Chelsea Water Company, said that his Company had power to take from the Thames 22 million gallons daily at West Molesey. The Company pumped on an average every day during 1898 12,283,789 gallons. The daily average for June was 12,358,000 gallons; July, 13,225,000 gallons; August, 12,530,000 gallons; and September, 12,673,000 gallons. On the annual average, therefore, they had pumping powers for about an extra 10 million gallons. They had sufficient plant and mains to deliver the whole 22 million gallons to the filtering area at Surbiton; and in twelve months' time they could put up sufficient filtering plant to deal with this quantity. At present, they could filter 5 million gallons more than their daily requirements. The only contribution, therefore, they could make to the inter-communication scheme would be about 5 million gallons a day. On the average of the four months mentioned, they could have afforded 2 million gallons—perhaps 3 millions. The pressure of the Chelsea water at the point of connection was superior in the day, and inferior in the night, to that of the Southwark and Vauxhall Company; so that the supply would have to be given when the pressure of the latter Company had been reduced. The period of supply, therefore, would be limited to about half the 24 hours; and practically all the Chelsea Company could contribute would be 3 million gallons a day. His Company did not want the inter-communication scheme for themselves; but they thought it was desirable in case of a breakdown of mains.

Mr. Ernest Collins, Distributing Engineer to the New River Company, was then re-called for the purpose of formally handing in a statement of scheme No. 2, which the Chairman had already dealt with at length. The Chelsea Company were left out of the scheme except as a receiving Company; witness understanding from Mr. Hack that the greatest quantity they could give in time of drought was 2 million gallons a day. If they had water to spare, a connection so as to take it from them could easily be made.

Mr. PEMBER said all the Directors of the Companies approved of the scheme.

Sir J. DORINGTON: How is this scheme superior to scheme No. 3?

Witness: I do not think that scheme was put forward as a definite one. Sir Henry Knight said there were certain connections which were sufficient for certain purposes, and they have answered; but they were not made for inter-communication. For instance, we laid a main along Oxford Street to connect the Grand Junction Company with the New River head; but we do not look upon it as permanent. Though it may answer for a short time, it is a connection that we do not like. Scheme No. 3 was part of scheme No. 2.

Mr. W. Morris, Chief Engineer to the Kent Water Company, said his Company approved generally of scheme No. 2. With existing plant, the Kent Water Company could contribute 2 million gallons daily to an inter-

communication scheme. During the summer just passed, the Company had pumped their wells nearly to their utmost capacity, having had an accident at one, the loss from which they had had to make good at different stations. In June, the daily quantity pumped was 17,003,000 gallons; July, 17,907,000 gallons; August, 18,686,000 gallons; September, 18,791,000 gallons; and October, 16,523,000 gallons. These figures included the quantity passed through the Blackwall Tunnel. He had a slight objection to scheme No. 2, inasmuch as it did not provide for giving the Kent Company more than 2 million gallons a day in case of unforeseen emergency. Witness handed in a rainfall table for the last 86 years in the Kent Company's district, from which it appeared that the lowest average of ten years was 23·4 inches in 1855-64. None were below 17 inches, until this last year, when the rainfall fell to 12·77 inches.

By Mr. BALFOUR BROWNE: The maximum capacity of the pumps for one day was 25 million gallons, and the maximum quantity pumped was 21 million gallons; so that they had a margin of about 4 million gallons for safety.

Mr. Joseph Francis, Engineer to the New River Company, examined by the CHAIRMAN, said he was in charge of the wells of the Company in the northern part of the system. The average quantity of water pumped this year would probably be about 2 million gallons daily above the highest year in the past. None of the wells were situated very near the Lea. To a small extent, the water oozed from the chalk into the Lea. The wells were fed by whatever water was contained in the chalk formation, which to a very small extent in some places supplied water to the Lea. The Lea this year had been lower than he had ever known it before. There had been a deficiency in the higher sources. There was no connection between the pumping from the wells and the deficiency; the effect of the pumping being purely local. The water fell on the high chalk, and sank into the ground; and as it passed towards the wells and the Thames, it naturally fell below the level of the outflow of the springs that formed the sources of the Lea. There was no evidence whatever to show that the pumping had any effect upon the yield of the Lea. All the springs in the open chalk had yielded as well this year as any other, with the qualification that in a dry season, or a series of dry seasons, the pumping level was slightly lower than in a wet year; but this had no effect on the water obtained. The Chadwell spring failed this year; but this did not really affect the Company's resources, because it was not counted on in a dry season. It would yield some 3 million gallons daily in wet years.

The CHAIRMAN: Do you consider that, even if the drought of this summer is repeated, you will be able to go on furnishing 6 million gallons a day to other Companies?

Witness: I do not see why we should not. But we must, of course, provide for our own consumers first.

Major-General SCOTT: At what daily rate is your supply increasing year by year?

Witness: About a million gallons a day. I think that is a very full estimate.

By Lord R. CECIL: The Chadwell spring had now fallen lower than ever before. For years, the Company had been increasing their pumping from wells; so that now they were pumping more than in 1892, and still more than before that date.

Mr. CLAUDE BAGGALLAY: Do you find when you are pumping from one well that it seriously affects any other?

Witness: No, certainly not.

Sir Alexander Binnie was then placed in the box, in response to a suggestion that the London County Council might like to call evidence on the particular subject being inquired into—viz., inter-communication. Examined by the CHAIRMAN, he said he considered scheme No. 2 under existing circumstances unnecessary.

The CHAIRMAN: Then you are in favour of scheme No. 3?

Witness: Practically it would come to that.

You think it is not worth while to establish inter-communication so as to guard against accident or breakdown on the part of other Companies?—Hardly so. It very much depends on what is going to happen in the future. I regard the spending of half a million in this particular way as money very much wasted, if the Companies are to be purchased.

Why so? Would not a purchaser at once couple up all these concerns, so as to practically make them one?—In a different way. Suppose the County Council were to purchase the whole of the Companies to-morrow, and they were all in one hand, the water would come in in the future not from the Thames Valley, but from northwards.

But there would still be 185 million gallons coming in from the Thames?—Yes.

By northwards, do you mean from Wales?—Yes, the Elstree reservoir; and I should not like to see it complicated by this central communication. I agree that No. 1 scheme is a good one; and, putting aside for the moment the drought of this year, something of the kind will have to be done for the future. I do not think it would be conducive to the general interest to make all the communications with Battersea, which might never be used at all.

Supposing the Companies unite, they would be used constantly?—With deference, I think scheme No. 1 would be more workable than No. 2 in case of amalgamation. I think the difficulty of getting over next year, and probably the year after, is met by what has already been done.

Major-General SCOTT: After that?

Witness: After the next two or three years—well, we must suspend our judgment until we learn what the Companies are going to do in Parliament. We hear that the East London and West Middlesex Companies are going to Parliament. I am looking at the matter from the limited point of view of how we are to deal with the case of the East London Company next year or the year after.

Do you think that in two years the East London Company will be independent of all these connections?—I think not.

The CHAIRMAN: Supposing all the Companies were bought next year, the East London Company will want more water?

Witness: Probably. We know the Thames Companies have power to draw 150½ million gallons a day, and they draw as a maximum 136 million gallons; so there are 14 million gallons available from the Thames. We know there are 6 million gallons from the New River. That is 20 millions from these two sources to meet the possible bad case of next year.



Mr. DE BOCK PORTER: What has already been done would allow this water to be distributed?

*Witness:* With the addition of the mains spoken of by Sir Henry Knight. This would increase the 6 million gallons to 10 millions through the Tower Subway. This would make the scheme adequate for the East London Company; and all the Engineers have told us that they do not anticipate difficulty in their own districts. If we are going into the question of inter-communication of pipes generally, the whole system ought to be worked out in a different way—not from the centre outwards, but from outwards to the centre.

The CHAIRMAN: You, in fact, differ from almost all these eight Engineers, who prefer scheme No. 2 to No. 1?

*Witness:* I do. I am looking at it from the point of view of amalgamation in one hand.

If the County Council were the purchaser of the eight Companies next year, would you recommend scheme No. 1?—Yes. The immediate necessities of the case would be met by laying the main which would allow the Nunhead reservoir to give increased pressure to the Tower Subway.

You would meet only the possible, and indeed, probable, failure of the East London Company next year, and nothing else?—Yes, for the present; but in a few years I should adopt scheme No. 1.

*Witness:* in answer to further questions, said he could hardly state that he represented the views of the County Council, because they had not had time to see the evidence of the last few days. But, as a matter of fact, he believed the views he had expressed were generally those of the Council. The Council, he thought, would feel very much aggrieved if an expenditure of half a million were put upon the Companies at this stage, after hearing the evidence the Chairman had had.

The CHAIRMAN: I cannot help saying that the adoption of scheme No. 2, though it will increase the debenture debt, will diminish the selling value of the Companies.

Mr. BALFOUR BROWNE: I am not at all sure of that.

The CHAIRMAN: There is a dead outlay of capital, with no possible recoupment.

Mr. BALFOUR BROWNE: Oh, yes there is, because if the East London Company were bought to-day, it would be bought as a defaulting Company; but after this scheme, it would be bought as a Company that has the water and could supply it.

*Witness* (continuing) said, as regarded the East London Company, he thought that what had been done by the Companies in the last month or two was practically sufficient to meet the crisis not only for the present, but for next year also; and Mr. Bryan agreed with him. He believed any large scheme of coupling up would be prejudicial to a possible purchaser. He was thinking rather of the way the hands of a purchaser would be tied by having a concern with pipes like these, which would not be used. Connections might be formed on the lines of No. 1, where the connections would be less expensive and more likely to be used. He went on to point out that it was intended by the New River Company to lay a pipe which was to be of much larger size than was required to bring their share of the water under the Staines scheme. This pipe crossed the East London mains at Sunbury; it passed close to one of the Grand Junction mains at Hounslow; it crossed the West Middlesex mains near Kilburn; and so on—there being other connections of an advantageous kind to the whole of the Companies.

The CHAIRMAN: It seems to me that your criticism depends on this—that you are looking forward to a supply from Wales, and you would mould your whole inter-communication system so as to benefit and enable you to inter-communicate that?

*Witness:* That is one thing; and I am looking also to the possibility of all the Companies being worked from one centre by one common authority.

By Mr. LITTLE: He proposed to utilize the 10 million gallons from the Southwark and Vauxhall Company, by passing it on to Battersea, Nunhead, and Brixton, and so through the Tower Subway to the East London district; but this could not be done under scheme No. 1.

This concluded the evidence on the question of inter-communication.

Mr. BALFOUR BROWNE then suggested that perhaps the Chairman would like to hear him in criticism of the scheme favoured by the Companies.

The CHAIRMAN, after consulting with his colleagues, said they did not desire to hear Counsel. The proceedings were then adjourned till to-day; it being understood that the Committee would meet yesterday to consider their report on the subject.

### THE DERWENT WATER SCHEME OF THE LEICESTER CORPORATION.

The report of the Water Committee of the Leicester Corporation on the new water scheme for the borough has been published. It is a voluminous document, and will be submitted to a special meeting of the Town Council to-day. At the outset it shows that the experts consulted (Mr. J. B. Everard, Mr. R. E. Middleton, and Mr. G. F. Deacon) do not adopt quite the same view that the late Mr. Thomas Hawksley did as to the quantity of water available for the borough under the works now in operation. The yield from the rainfall in the gathering-grounds of Thornton, Bradgate, and Swithland is not regarded as so large as previously believed—a greater percentage being allowed for evaporation and other contingencies. Hence the necessity for looking out at once for further supplies, which will be needed, at the latest, in ten or twelve years' time. It is next shown that there are no other sources available in the county likely to yield water of the quality required, and which would be commensurate with the expense incurred. Consequently it is proposed to utilize the waters of the Upper Derwent, impound them in three reservoirs, the first of which would be constructed near to Ashopton, and convey them to Leicester by conduits and pipes—a distance of about 70 miles. It is recognized that Derby and Derbyshire have a claim upon the waters; and provision is made in the Bill either for the supply of Derby and other places *en route*, upon terms to be arranged, or for a joint scheme with the Derby Corporation—what is known as the Birmingham clause also being adopted. The financial part of the report is of considerable importance. The construction of the first reservoir and the other works necessary to carry the water *viâ* Ambergate to Leicester is

estimated to cost in round figures one-and-a-half millions. The other reservoirs, of course, would only be made as the necessities of the borough demanded. It is suggested that the profits now made by the Water Department should be funded from this year; and if this be done, by the time the new works were constructed, it is anticipated there would be a sum in hand equal in round figures to £178,000. By that time, also, the rateable value of the town would have increased, and likewise the revenue from the department; so that, with the help of the funded profits, the call upon the rates will be comparatively small, and diminishing with the growth of the demand for water for domestic and manufacturing purposes. Suggestions for the appropriation of some of the water of Blackbrook by arrangement with the Corporation of Loughborough, are shown to be inadequate and costly, considering the volume that would be available; and finally the report deals with the quality of the Derwent water, and demonstrates that the fears locally urged that it might produce goitre or "Derbyshire neck" are groundless. The undertaking is the largest that the Leicester Corporation have ever had to consider, involving a total outlay of several millions, spread over fifty years. The Water Committee have officially approached the Derby Town Council with proposals for a joint scheme, but so far without success.

The conclusions and recommendations of the Water Committee are as follows: After giving the whole matter their most anxious consideration, the Committee have arrived at the decided conviction that it is for the best interests of Leicester that the Derwent and Ashop Valley scheme should be adopted, and every effort made to secure the necessary parliamentary powers. The Committee are deeply impressed with the necessity of at once taking steps to submit a Bill for the necessary powers to Parliament in the next session; and they have therefore authorized the Town Clerk to insert the necessary parliamentary notices. The Committee recommend the Council to approve the above scheme, and to authorize them to take all necessary proceedings for the promotion of a Bill in Parliament, and to do all acts consequent thereon, including the entering into provisional agreements for the purchase of land and easements and as to any other matters, and for the employment of such professional and other assistance as may be necessary or desirable, and to affix the common seal of the borough to all documents.

### NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Notices of Parliamentary Bills are coming out at present. The only one relating to gas supply which I have yet seen is by the Dundee Gas Commissioners, which, by the way, is a name I thought had been lost since the Town Council took over the entire management of the gas undertaking; but I must have been mistaken. The purpose of the Bill is to empower the Commissioners to discontinue and remove portions of their existing gas-works, and to erect and maintain new gasholders, purifying apparatus, and other gas-works and gas apparatus, on the lands belonging to the Commissioners, on which the existing gas-works and gas apparatus of the Commissioners stand; being those lands lying within the Parish of Dundee. Power is also asked to borrow money for the purpose, on the security of the existing works of the Commissioners, and of the rates and charges which they are authorized to levy. The Commissioners also wish to have conferred upon them the powers of the Electric Lighting and other Acts. The Bill is an *omnibus* one; and it further asks for an extension of the burgh boundaries.

Among the notices of Parliamentary Bills which are appearing, is one relating to an extraordinary measure for the utilization of water power in Scotland for the generation of electricity. People who have been to Switzerland have come back fired with the idea that, as in that country, the mountains might be made to pay for their keep, so to speak, by making the water which flows down their sides do useful work. A company, or syndicate, has been formed, the *personnel* of which is not yet disclosed, with this object in view in Scotland. The proposal is to impound the water in Loch Erich and other streams and lochs in Perth and Inverness shires, and to convey it, by aqueducts and tunnels, a distance of 20 miles, to Loch Leven, above Ballachulish, where a fall of upwards of 1100 feet can be obtained. The anticipation is that about 38,000-horse power will be derived. The scheme has only one chance of passing—that is, if its promoters are persons of great influence, such as were those who promoted the Foyers Syndicate. On the other hand, there are various reasons why it should fail. Without going into them all, it may be said that the heaviest obstacle will be found in the fact that the scheme requires the diversion of the water of Loch Erich, and of one stream, from the River Tay to the west coast; and this involves the payment of compensation to everyone who possesses a right to fish in the Tay from its source to the sea, and in all its tributaries and feeding lochs. An enormous capital would thus be required. One of the reasons which are given for the proposed scheme, is that sea carriage will be secured to the works. That would be very important, if it were the case; but in this instance it is one of the weaknesses of the business, as only vessels of 14 feet draught could be employed. The probabilities are that, whatever may become of the proposal in Parliament, the works will never be started. It doubtless is the case that there is much valuable power running to waste; but a less ambitious scheme would serve to show whether it could be profitably employed, and how to do it.

The failure of the electric light in Edinburgh, to which I referred last week, led to the issue, last Saturday, of the following appeal to consumers, on behalf of the Electric Light Committee: "Sir or Madam,—We respectfully and earnestly appeal to you, in the present unfortunate crisis in the electric lighting undertaking of Edinburgh, hitherto so successful. Relying on promises of plant delivery, which were not fulfilled, new consumers were connected up in large numbers during summer and autumn; and we are now unable to deliver current at the standard pressure during the hours of heaviest load, from 4 to 7 p.m. The consumers can help us in this difficulty by arranging to light only two-thirds of the lamps usually required during the above hours. If this is done, more light will be got from the remaining lamps than if they were all on, as the full pressure can be maintained. If the switches do not suit, the necessary lamps can be unshipped. As soon as we can get the plant in sufficient order, due intimation will be given. We trust to your complying with this



request, assuring you that every effort is being made to put the plant in a more satisfactory condition, and with the least possible delay." This is not quite dignified; but necessity required that something should be done. Such an incident was certain to be the occasion of complaint, and letters to the newspapers were bound to be in evidence. On this matter, it is singular that these "voices of the people" should not have been able to get their grievances aired in the Edinburgh Press, but had to betake themselves to Glasgow. The letters give, as one of the reasons for the failure of the light, an alleged defect in the works, which has never been suspected, and which I do not altogether accept. One writer says: "The deficiency in regard to light is attributed to delay in delivery of plant, &c., necessary to meet the increased demand for current. In a measure, this is perhaps correct. At the same time, it would be interesting to know the meaning of the extempore iron chimney with forced draught arrangement which within the last few days has made its appearance at the east entrance to the Corporation lighting station." Then another correspondent says: "'Lamplighter' is quite right in drawing attention to the iron chimney. The fact is that the Corporation have more boilers and engines and dynamos in their building at Dewar Place than they can get to work, for the simple reason that a great blunder was perpetrated in the first instance in making their chimney-stalk quite inadequate to the requirements of their engine and boiler room space. In addition to this, the flues are all too small; the result being that there is no draught for the boiler-fires, and, as is usual in such cases, it is found that the lighting of more boilers reduces the quantity of steam produced instead of increasing it—hence the additional iron chimney. The delay in the delivery of any plant ordered—barring the said iron chimney—has therefore nothing to do with the failure of the electric lighting; and it is rather ungenerous to send round such a circular blaming the contractors for non-delivery of plant. This Club (the Conservative) has been in semi-darkness for some weeks now; the voltage having fallen on several occasions as low as 190, instead of 230."

On Monday night the Royal Scottish Society of Arts held their annual general meeting, in Edinburgh. The President (Mr. Andrew, Beaton Bell) delivered an opening address, the greater part of which was devoted to subjects relating to gas lighting. This course was adopted chiefly because the two leading papers before the Society last winter were on gas supply subjects. Mr. Bell narrated a short history of gas manufacture, from the days of William Murdoch, and went on to comment upon the fact that, alongside of a large demand for electricity for lighting purposes, the consumption of gas was not receding, but was advancing by leaps and bounds. All this is known to everyone who is conversant with gas matters. But it is not so well known by the general public; and the more widely circulated the information is the better.

The work of telescoping a gasholder for the Broughty Ferry Gas Commission having been completed by the Contractors (the Barrowfield Iron-Works, Limited), the ceremony of turning on the gas was performed by Provost Gray, of the burgh, last Wednesday. At a luncheon which was held afterwards, Mr. Christie, the Convener of the Works Committee, speaking of illuminants, pointed out that the invention of the incandescent gas-burner was a most formidable opponent to the electric light. Gas, he said, was, so far as the lighting of the burgh was concerned, cheaper than electricity. An estimate for the electric lighting of Brook Street had been obtained, and it amounted to £320; whereas they could light the whole burgh with gas for £265. Of course, with electricity there would be a greater illumination; but the difference in cost fully warranted an adherence to gas. It was necessary that they should increase the storage capacity at the gas-works. In 1870, when the burgh acquired the undertaking, the sale of gas was 8½ million cubic feet; in 1880, it was 17 millions; in 1890, 25 millions; and now 37 millions. In 1894, immediately before the erection of the holder which had just been telescoped, the storage accommodation at the works was 94,000 cubic feet; after that, it was 150,000 cubic feet; and it was now 220,000 cubic feet. The maximum winter day's make in 1884 was 140,700 cubic feet; and for this winter it might be taken at 216,000 cubic feet. These figures showed that the productive capacity of the works had had to be attended to in recent years. The cost of telescoping the holder would be about £1700. If they had adopted another scheme which was considered, the cost would have been at least £9000. They had therefore effected a saving in capital expenditure of £7300, the interest upon which, at 3 per cent., and sinking fund at 2½ per cent., meant an annual saving of £420. Besides this, the ground which would have been required by the larger scheme had been left untouched, and would be available for further extensions. It is evident from all this that the gas-works at Broughty Ferry are well engineered by Mr. A. Waddell.

The Turfiff Gaslight Company held their annual meeting on Monday. A dividend at the rate of 5 per cent. was paid, and the charge for gas was continued at 7s. 6d. per 1000 cubic feet. This price is surely higher than it need be. It was reported that the works are in a satisfactory condition, and that the leakage is 2 per cent. less than it was in the preceding year.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Nov. 19.

**Sulphate of Ammonia.**—The market has been quiet all through the week; and the closing quotations are £10 to £10 1s. 3d. per ton, delivered f.o.b. at the ports. Makers, having availed themselves of the recent advance to dispose of their current production, have been in no hurry in regard to further sales; so that, although there has been smaller demand, prices have been fairly well maintained. Speculative buying seems to have stopped; and the bulk of the week's business has been done by consumers. In the forward position, makers have been firm; and their quotations remain £10 5s. per ton, ordinary terms, f.o.b. Leith, January-June delivery; and for London, Beekton terms, £10 per ton, delivery over the same period. Within the past few days, there has again appeared speculative offering abroad at a discount on spot prices, delivery over near months; but buyers have not responded very freely.

**Nitrate of Soda** is unchanged; the quotations for ordinary being 7s. 6d. per cwt., and for fine quality 7s. 7½d. on spot.

LONDON, Nov. 19.

**Tar Products.**—The high prices being paid for tar is causing much comment, especially having regard to the fact that the leading products have so largely decreased in value. Speculative purchases are doubtless

made in the hope that some improvement will soon come to the trade. Benzols are quoted weaker, although a provincial sale is reported at a price above the quotation made herewith. There is no change in the value of pitch, although business is brisk, owing to shipments and the improved value of fuel.

Average values may be taken at: Tar, 14s. 6d. to 20s. Pitch, east coast, 25s.; west coast, 22s. Benzols, 90's, 8½d.; 50's, 8½d. Toluol, 1s. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 1½d. Crude, 30 per cent., naphtha, 3½d. Creosote, 3d. Heavy oils, 45s. Carbolic acid, 60's, 1s. 11d. Creosote salts, 30s. Anthracene, nominal, "A," 4d.; "B," 3d.

**Sulphate of Ammonia** continues to show a firm market; and prices in all positions may be taken at £10 2s. 6d. per ton, less 3½ per cent.

## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—The position continues strong in the coal trade here; and now that there is no immediate prospect of the wages question being raised, the outlook is somewhat more settled. The better qualities of round coal are moving off rather more readily; but the demand is still not up to the average for the time of the year, and collieries working five days per week are turning out sufficient to meet present requirements. Prices, however, are firm at the full list rates. Common round coals are in much the same active request as reported of late, so far as inland requirements are concerned; and though there is no scarcity of supplies, prices are exceedingly firm at from 7s. 9d. per ton at the pit for medium, up to 8s. 6d. for the best qualities of steam coal. For engine fuel, there is also a continued brisk demand, with a good deal of inquiry for forward contracts; and the tendency of prices continues in a hardening direction—from 8d. to 10d. per ton over last year's contracts being obtained in many cases for the better qualities of slack. At the pit, common sorts average 3s. 6d. per ton; good medium, 4s. to 4s. 6d., and best qualities, 5s. to 5s. 6d. The shipping trade is moderate; but vessels are scarce, and with higher freights business is restricted. Prices are perhaps a shade easier; 9s. to 9s. 3d. per ton representing average figures for good ordinary steam coal delivered at the Mersey ports.

**Northern Coal Trade.**—There has been an increased demand for both steam and gas coals in the last few days; and with fuller work at most collieries, prices are decidedly firmer. Best Northumbrian steam coals are quoted at 9s. 6d. per ton f.o.b.; second-class steam, 8s. 9d.; and steam smalls, about 5s. 6d. Gas coals are now at about the period of the fullest demand; so that the chief collieries have little of their output to sell. For occasional cargoes, the quotation is from 9s. to 9s. 4d. per ton f.o.b. Gas coke sells rather more freely for household use; and the price is maintained. The output is now very heavy; and stocks are increasing at some of the inland works.

**Scotch Coal Trade.**—Reports to hand show that the demand is improving everywhere except in Fife, where the Baltic season has closed somewhat disappointingly. In the West, freights having fallen slightly, more coal has been got away. This has relieved railway waggons, which were standing full awaiting shipment, and has enabled work to proceed at the collieries. Splint is reported to be fully contracted for till the end of the year. The prices quoted are: Main, 8s. per ton f.o.b. Glasgow; ell, 8s. 6d. to 8s. 9d.; and splint, 8s. 9d. to 9s. The shipments during the week amounted to 165,694 tons—an increase of 11,188 tons over the preceding week, but a decrease of 4347 tons upon the corresponding week of last year. For the year to date, the total shipments have been 8,518,272 tons—an increase on the same period last year of 1,426,711 tons.

**Accident to a Reservoir.**—Last Wednesday evening, a recently completed reservoir belonging to the Tendring Hundred Water Company at Dovercourt, collapsed, some of the bottom plates giving way. About 200,000 gallons of water were wasted, and flooded the adjacent land; but no further damage is reported.

**Issue of Additional Metropolitan Water Stock.**—As will be seen by an announcement which appears elsewhere, the East London Water Company are inviting tenders for £150,000 of 3 per cent. debenture stock, created under their Act of 1897. We learn that the Lambeth Water Company are also offering for tender £100,000 of stock of similar nominal value. Both stocks will be redeemable after 25 years on six months' notice.

**Market Harborough Gas-Works Purchase Question.**—A discussion of some length took place last Tuesday at the meeting of the Market Harborough District Council on a report of the General Committee, which set forth the steps taken in the negotiations with the Gas Company for the purchase of their undertaking. At the request of the Committee, Mr. Corbet Woodall had fully considered the whole matter, and had submitted his views thereon. The profits of the Company for each of the past two years were above £1600; and, taking this into consideration and the probable cost of arbitration, the Committee recommended the Council to offer £38,000 for the works, plant, &c.—the date of the transfer to be settled by a Joint Committee. The report was adopted.

**Sales of Shares.**—At the Mart, Tokenhouse Yard, E.C., last Tuesday, Mr. Alfred Richards sold some £100 shares in the New River Company at £435 to £439 each. On the same occasion, some fully paid £10 shares in the Lea Bridge Gas Company fetched £26 per share; some £5 shares in the Romford Gas Company, £10 each; and 5 per cent. preference stock of the Enfield Gas Company, £132 per £100 of stock. The biddings were less keen than at recent sales conducted by Mr. Richards. On Thursday, Messrs. Day and Sons disposed of some stocks and shares in the Maidstone Gas and Water Companies. Twenty £100 lots of consolidated stock of the Gas Company were offered. The first lot realized £253, seven fetched £252, and the remainder £251 per lot. One lot of £50 stock of the Company was sold for £125 10s.; but 35 similar lots changed hands at £125. A single lot of £24 stock realized £62. Some £100 lots of 3 per cent. debenture stock were disposed of at less than par value; the prices ranging from £97 to £93. Thirty £10 preference shares (5 per cent.) in the Maidstone Water Company fetched from £13 to £13 10s. per share; six £10 4 per cent. preference shares, £11 each; ten £10 original (10 per cent.) shares, £25 per share; ten £10 ordinary (10 per cent.) shares, £22 10s. per share; and some 7 per cent. ordinary shares, £16 to £16 10s. apiece.



**The Ramsgate Corporation and the Minster Gas-Works.**—The Directors of the Minster Gas Company, after consulting the shareholders, have decided to accept the final offer of the Ramsgate Corporation to purchase the Company's undertaking for £2500.

**The Shelf (Yorks.) District Council and the Water-Works.**—The Shelf Water Company, at a special general meeting recently held, decided to sell their undertaking to the District Council for £2750, plus the cost of transfer. The paid-up capital is £1500 on 3000 shares; so that the price offered represents about 83½ per cent. thereon.

**A Victim of Acetylene.**—A tinman in the town of Papenburg, in the fen district of Prussia, has recently been killed on the spot by an explosion which resulted when he proceeded to examine an acetylene service with a naked light. He is reported to have made the generating apparatus furnishing the gas which exploded, though he was without any technical knowledge of acetylene.

**The Newhaven and Seaford Local Authorities and the Water-Works.**—At a recent special meeting of the Newhaven Urban District Council, it was unanimously resolved to unite with the Seaford Urban District Council for the purpose of obtaining powers to enable them to obtain, by compulsion or otherwise, the control of the undertaking and property of the Newhaven and Seaford Water Company.

**A Water Scheme for Fletching.**—A scheme of water supply is to be carried out for the village of Fletching, near Uckfield. A well from 12 to 15 feet deep is to be sunk near Fletching Mill, fitted with a pump capable of raising 3500 gallons per hour into a reservoir about 1100 yards distant; 4-inch pipes being used for the purpose of conveying the water. Four or more stand-pipes will be placed at intervals through the village, from which water may be obtained. The reservoir will have a capacity of 50,000 gallons, and will be 45 feet by 22 ft. 8 in. It will have brick sides and a concreted base. The reservoir and the ground on which it will be built, as well as the stand-pipes, Mr. Maryon-Wilson proposes to present to the Parish Council on behalf of the village. The cost of the scheme will be about £500.

**Rotherham Gas Stokers' Dispute Ended.**—Last Friday week the gas stokers who have been out on strike at Rotherham held a meeting to consider the report of a deputation who had sought an interview with the Sub-Committee of the Corporation Gas Committee on the previous day. The terms offered to the stokers were 5s. 7½d. per shift for the horizontal retorts, and 5s. per shift for the inclined retorts. Later in the day certain of the men waited upon the Engineer at the works, and offered their services upon the stipulated terms. Some of these men will be reinstated as soon as arrangements can be made; and the others will no doubt later on find employment in their old occupation. One condition of the arrangement is that the men must sign an agreement; and they have consented to do so.

**Gas-Works Extensions at Chesterfield.**—About two-and-a-half years have elapsed since the gas and water works of Chesterfield were taken over by the present Board from the old Company. Shortly after becoming possessed of the concern, the Board decided to reduce the price

of gas—a step which quickly led to an enormously increased demand. The producing capacity of the plant was about 350,000 cubic feet per day; and it soon became apparent that the demand would, in a short period, exceed the supply. The Board therefore decided, some months ago, to put down new plant adequate to meet the growing needs of the district for some years to come. A large skeleton building, erected by the old Company some time before the concern was transferred, has accordingly been altered to accommodate an installation of inclined retorts, with a maximum producing capacity of 750,000 cubic feet of gas per day. The construction of the retort-settings has just been completed; and it is intended, when all the new retorts are in operation, to dispense with the old plant.

**Fatal Gas Explosion in Paris.**—A terrible explosion, which killed two persons and wounded seven others, occurred at about half-past five o'clock on Sunday evening last at the Restaurant Champeaux, in the Place de la Bourse, Paris. It took place in the cellar, and such was its violence that all the plate-glass windows of the establishment were shattered, the flooring of the restaurant was destroyed, and the iron door of the cellar was blown into the street, where it killed an old woman who supplied the establishment with newspapers. She had been chatting on the foot pavement in front of the restaurant with the knife-cleaner, who was mortally wounded, and who died while being carried to the hospital. The seven persons injured comprise one cellarman, four of the cooks, and two of their friends. The explosion is reported to have been caused by the cellarman, who had entered the cellar with a lighted candle. Being questioned as to how the accident occurred, he could only say that all he knew was that after entering the cellar he suddenly found himself back in the hall with a broken leg and burns all over his body. The Prefect of Police, the Police Commissary of the district, and numerous other officials were soon on the spot, and commenced an inquiry.

**Chard Water Supply.**—The Local Government Board have refused to sanction the proposal of the Chard Town Council, to which reference was made in the "JOURNAL" for the 4th ult. (p. 772), to borrow £2500 for purposes of water supply. In communicating their decision to the Corporation, the Board say they gathered from their Inspector that the two springs from which the supply is obtained are liable to serious contamination from their surroundings, and that one of them is actually polluted by the soakings from a stable. It also appears to have been admitted by the Town Council that a proper supply of water is wanted for the whole of the borough. Under these circumstances, the Board say they are not prepared to assent to the borrowing of money for the purpose of defraying the cost of any works in connection with the water supply from the present sources; and they request the Council to take the matter into their immediate consideration with a view to the preparation and submission, without further delay, of a comprehensive scheme for providing the entire borough with an adequate supply of wholesome water from a fresh source. The decision has given satisfaction to the residents in the higher parts of the town, who opposed the application for the loan on the ground that provision should be made for a water supply to serve the whole borough, and not leave the higher parts without water.

## GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1153.

| Issue.    | Share. | When ex. Dividend. | Dividend or Bonus. | NAME.                      | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue.    | Share. | When ex. Dividend. | Dividend or Bonus. | NAME.                                   | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|-----------|--------|--------------------|--------------------|----------------------------|-----------------|---------------------|------------------------|-----------|--------|--------------------|--------------------|-----------------------------------------|-----------------|---------------------|------------------------|
| £         |        |                    | p. c.              | GAS COMPANIES.             | £ s. d.         |                     |                        | £         |        |                    | p. c.              | GAS COMPANIES.                          | £ s. d.         |                     |                        |
| 590,000   | 10     | Oct. 13            | 10½                | Alliance & Dublin 10 p.c.  | 20½-21½         | ..                  | 4 17 8                 | 75,000    | 5      | June 29            | 6                  | Malta & Medn., Ltd.                     | 43-54           | ..                  | 5 14 3                 |
| 100,000   | 10     | "                  | 7½                 | Do. 7 p.c.                 | 16-17           | ..                  | 4 8 3                  | 541,920   | 20     | Nov. 11            | 5                  | Monte Video, Ltd.                       | 13-14           | ..                  | 7 2 10                 |
| 900,000   | 100    | July 1             | 5                  | Australian 5 p.c. Db.      | 105-107         | ..                  | 4 13 6                 | 617,946   | Stk.   | Aug. 31            | 9½                 | Newt'le & Gatesh'd Con.                 | 230-240         | ..                  | 4 1 3                  |
| 200,000   | 5      | Nov. 11            | 6                  | Bombay, Ltd.               | 6½-6¾           | ..                  | 4 11 1                 | 252,325   | Stk.   | Jan. 3             | 3½                 | Do. 3½ p.c. Db. Stk.                    | 113-117         | ..                  | 2 19 10                |
| 40,000    | 5      | "                  | 6                  | Do. New, £4 paid.          | 4½-4¾           | ..                  | 5 1 1                  | 150,000   | 5      | May 26             | 8                  | Oriental, Ltd.                          | 7½-7¾           | ..                  | 5 3 3                  |
| 880,000   | Stk.   | Aug. 12            | 12                 | Brentford Consolidated     | 275-280         | ..                  | 4 5 9                  | 135,000   | 5      | "                  | 8                  | Do. New, £4 10s. pd.                    | 6½-7            | ..                  | 5 2 11                 |
| 240,000   | "      | "                  | 9                  | Do. New                    | 210-215         | ..                  | 4 3 9                  | 15,000    | 5      | "                  | 8                  | Do. do. 1879, £1 pd.                    | 15-17           | ..                  | 4 11 5                 |
| 50,000    | "      | "                  | 5                  | Do. 5 p.c. Prf.            | 140-145         | ..                  | 3 9 0                  | 60,000    | 5      | Sept. 29           | 7                  | Ottoman, Ltd.                           | 6-6½            | ..                  | 6 6 2                  |
| 159,375   | "      | June 10            | 4                  | Do. 4 p.c. Db. Stk.        | 130-135         | ..                  | 2 19 3                 | 500,000   | 100    | June 1             | 6                  | People's Gas & 2nd M. of Chicago J. Bd. | 103-108         | ..                  | 5 11 1                 |
| 220,000   | Stk.   | Sept. 15           | 11½                | Brighton & Hove, Orig.     | 263-268         | ..                  | 4 5 10                 | 848,070   | 10     | Oct. 13            | 6                  | River Plate Ord.                        | 41-93           | ..                  | 6 3 1                  |
| 226,820   | "      | "                  | 8½                 | Do. A. Ord. Stk.           | 190-195         | ..                  | 4 7 2                  | 250,000   | Stk.   | June 29            | 4                  | Do. 4 p.c. Db. Stk.                     | 99-101          | ..                  | 3 19 3                 |
| 933,500   | Stk.   | Aug. 31            | 5                  | Bristol, 5 p.c. max.       | 125-130         | ..                  | 3 16 11                | 250,000   | 10     | Sept. 29           | 10                 | San Paulo, Ltd.                         | 143-151         | ..                  | 6 9 0                  |
| 420,000   | 20     | Sept. 29           | 10                 | British                    | 49-50           | ..                  | 4 0 0                  | 135,000   | Stk.   | Sept. 15           | 10                 | Sheffield A. . . .                      | 242-245         | ..                  | 4 1 8                  |
| 50,000    | 10     | Aug. 12            | 11½                | Bromley, Ord. 10 p.c.      | 25-27           | ..                  | 4 5 2                  | 209,053   | "      | "                  | 10                 | Do. B. . . . .                          | 242-245         | ..                  | 4 1 8                  |
| 75,000    | 10     | "                  | 8½                 | Do. 7 p.c.                 | 20-22           | ..                  | 3 17 3                 | 447,427   | "      | "                  | 10                 | Do. C. . . . .                          | 242-245         | ..                  | 4 1 8                  |
| 500,000   | 10     | Oct. 13            | 6                  | Buenos Ayres (New) Ltd     | 9½-10           | ..                  | 6 0 0                  | 5,600,000 | Stk.   | Aug. 12            | 5½                 | South Metrop., 4 p.c. Ord.              | 138-142         | ..                  | 3 15 1                 |
| 98,122    | Stk.   | June 29            | 4                  | Do. 4 p.c. Db. Stk.        | 98-100          | ..                  | 4 0 0                  | 1,460,000 | Stk.   | July 14            | 3                  | Do. 3 p.c. Db. Stk.                     | 102-105         | ..                  | 2 17 2                 |
| 150,000   | 20     | July 14            | 8½                 | Cagliari, Ltd.             | 29-30           | ..                  | 5 10 0                 | 60,000    | Stk.   | Aug. 31            | 12                 | Tottenham and J. A.                     | 280-290         | ..                  | 4 2 9                  |
| 100,000   | 10     | Sept. 23           | 7                  | Cape Town & Dis., Ltd.     | 14-15           | ..                  | 4 13 4                 | 60,000    | "      | "                  | 9                  | Edmonton J. B.                          | 200-210         | ..                  | 4 5 9                  |
| 50,000    | 50     | Nov. 2             | 6                  | Do. 6 p.c. 1st Mort.       | 57-59           | ..                  | 5 1 8                  | 182,380   | 10     | June 10            | 7                  | Tuscan, Ltd.                            | 103-113         | ..                  | 6 1 9                  |
| 550,000   | Stk.   | Oct. 13            | 13½                | Commercial Old Stock.      | 310-320         | ..                  | 4 4 5                  | 149,900   | 10     | July 1             | 5                  | Do. 5 p.c. Dbs. Red.                    | 160-163         | ..                  | 4 17 1                 |
| 200,750   | "      | "                  | 10½                | Do. New do.                | 247-252         | ..                  | 4 3 4                  |           |        |                    |                    |                                         |                 |                     |                        |
| 200,750   | "      | June 10            | 4½                 | Do. 4½ p.c. Db. do.        | 148-153         | ..                  | 2 18 10                |           |        |                    |                    |                                         |                 |                     |                        |
| 800,000   | Stk.   | June 10            | 10½                | Continental Union, Ltd.    | 265-270         | ..                  | 2 15 3                 |           |        |                    |                    |                                         |                 |                     |                        |
| 200,000   | "      | "                  | 7½                 | Do. 7 p.c. Prf.            | 190-195         | ..                  | 3 11 10                |           |        |                    |                    |                                         |                 |                     |                        |
| 51,600    | Stk.   | Aug. 31            | 14                 | Croydon A 10 p.c.          | 305-310         | ..                  | 4 10 4                 |           |        |                    |                    |                                         |                 |                     |                        |
| 168,400   | "      | "                  | 11                 | Do. B 7 p.c.               | 255-265         | ..                  | 4 3 0                  | 746,164   | Stk.   | June 29            | 10½                | WATER COMPANIES.                        |                 |                     |                        |
| 555,000   | Stk.   | Aug. 12            | 5½                 | Crystal Palace Ord. 5 p.c. | 125-130         | ..                  | 4 0 9                  | 150,000   | "      | "                  | 5                  | Chelsea, Ord.                           | 313-318         | ..                  | 3 6 0                  |
| 60,000    | "      | "                  | 5                  | Do. 5 p.c. Prf.            | 140-145         | ..                  | 3 9 0                  | 160,000   | "      | "                  | 4½                 | Do. 5 p.c. Prf.                         | 170-175         | ..                  | 2 17 2                 |
| 486,090   | 10     | July 28            | 11                 | European, Ltd.             | 23-24           | ..                  | 4 11 8                 | 175,785   | "      | Sept. 29           | 4½                 | Do. 4½ p.c. Prf. Stk., 1875             | 148-152         | ..                  | 2 19 3                 |
| 354,060   | 10     | "                  | 11                 | Do. £7 10s. paid.          | 17-18           | ..                  | 4 11 9                 | 1,720,560 | Stk.   | Oct. 13            | 7                  | Do. 4½ p.c. Db. Stk.                    | 155-160         | ..                  | 2 16 3                 |
| 5,922,230 | Stk.   | Aug. 12            | 12½                | Gaslight & Coke, A. Ord    | 296-291         | ..                  | 4 4 0                  | 654,740   | "      | June 29            | 4½                 | East London, Ord.                       | 212-217         | ..                  | 3 4 6                  |
| 100,000   | "      | "                  | 4                  | Do. B, 4 p.c. max.         | 120-125         | ..                  | 3 4 0                  | 390,000   | "      | "                  | 3                  | Do. 4½ p.c. Db. Stk.                    | 157-160         | ..                  | 2 17 2                 |
| 665,000   | "      | "                  | 10                 | Do. C, D, E, 10 p.c. Prf.  | 308-313         | ..                  | 3 3 11                 | 700,000   | 50     | June 29            | 7½                 | Do. 3 p.c. Db. Stk.                     | 103-105         | ..                  | 2 16 3                 |
| 30,000    | "      | "                  | 5                  | Do. F, 5 p.c. Prf.         | 152-157         | ..                  | 3 3 8                  | 310,000   | Stk.   | Sept. 29           | 4                  | G'd Junc't'n, 10 p.c. max.              | 115-118         | ..                  | 3 3 7                  |
| 60,000    | "      | "                  | 7½                 | Do. G, 7½ p.c. do.         | 223-238         | ..                  | 3 3 0                  | 708,000   | Stk.   | Aug. 12            | 14                 | Do. 4 p.c. Db. Stk.                     | 138-143         | ..                  | 2 15 11                |
| 1,900,000 | "      | "                  | 7                  | Do. H, 7 p.c. max.         | 195-200         | ..                  | 3 10 0                 | 160,000   | "      | "                  | 7                  | Kent                                    | 365-370         | ..                  | 3 15 8                 |
| 463,000   | "      | "                  | 10                 | Do. J, 10 p.c. Prf.        | 308-313         | ..                  | 3 3 11                 | 1,043,800 | 100    | June 29            | 10½                | Do. New, 7 p.c. max.                    | 212-217         | ..                  | 3 4 6                  |
| 476,000   | "      | "                  | 6                  | Do. K, 6 p.c. Prf.         | 185-190         | ..                  | 3 3 2                  | 406,200   | 103    | "                  | 7½                 | Lambeth, 10 p.c. max.                   | 300-355         | ..                  | 3 8 10                 |
| 1,061,150 | "      | June 10            | 4                  | Do. 4 p.c. Db. Stk.        | 131-133         | ..                  | 3 0 2                  | 350,000   | Stk.   | Sept. 29           | 4                  | Do. 7½ p.c. max.                        | 228-233         | ..                  | 3 4 4                  |
| 294,850   | "      | "                  | 4½                 | Do. 4½ p.c. do.            | 148-153         | ..                  | 2 18 10                | 500,000   | 100    | Aug. 12            | 12½                | Do. 4 p.c. Db. Stk.                     | 138-143         | ..                  | 2 15 11                |
| 958,000   | "      | "                  | 6                  | Do. 6 p.c. do.             | 195-200         | ..                  | 3 0 0                  | 1,000,000 | Stk.   | July 28            | 4                  | New River, New Shares                   | 420-440         | ..                  | 3 0 2                  |
| 70,000    | 10     | Nov. 11            | 8                  | Hongkong & China, Ltd.     | 13-14           | ..                  | 5 14 4                 | 902,300   | Stk.   | June 29            | 6                  | Do. 4 p.c. Db. Stk.                     | 138-143         | ..                  | 2 15 11                |
| 3,900,000 | Stk.   | "                  | 10                 | Imperial Continental       | 217-222         | ..                  | 4 10 1                 | 126,500   | 100    | "                  | 6                  | Southw'k & V'xhall, Ord.                | 160-165         | ..                  | 3 12 9                 |
| 576,400   | 100    | Aug. 2             | 4                  | Do. 4 p.c. Dbs. Red.       | 98-101          | ..                  | 3 19 3                 | 469,200   | Stk.   | "                  | 5                  | Do. do. 7½ p.c. max.                    | 170-173         | ..                  | 2 17 10                |
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| 680,000   | 100    | Oct. 1             | 5                  | Met. of Mel. J 5 p.c. Db.  | 110-112         | ..                  | 4 9 3                  | 1,155,066 | Stk.   | June 10            | 10                 | Do. 4 p.c. A Db. Stk.                   | 295-300         | ..                  | 3 6 8                  |
| 250,000   | 100    | "                  | 4½                 | bourne J 4½ p.c. Db.       | 105-107         | ..                  | 4 4 1                  | 200,000   | "      | Sept. 15           | 3                  | West Middlesex                          | 162-165         | ..                  | 2 14 7                 |
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1 Next dividend will be at this rate.



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## EDITORIAL NOTES.

## The Interpretation of the Workmen's Compensation and Other Acts.

It is to be expected that many attempts will be made to induce the Courts to stretch the operation of the Workmen's Compensation Act with the object of making it include injuries to which it does not explicitly apply. It is one of the standing complaints of the political party which has not the credit of passing the Bill, that it leaves out a large number of hard cases in which compensation is richly deserved. Obviously, this is a very cheap and easy kind of criticism; but it is also extremely futile. Neither is it fairly to be alleged as a defect of the Act that a good many people now outside it will continually trouble the Law Courts with demands for admission into the protected ranks. The Act is large enough, in all conscience, though for good and sufficient reasons it was not drawn to include all workmen and every kind of industrial injury. Take merely the case of trade injuries, such as the damage to health traceable to working at a "noxious" process. This is an order of injuries which the framers of the measure deliberately excluded; yet Judge Addison, at the Southwark County Court, was asked last week to adjudicate upon a claim for compensation for "painter's colic." The answer of the employer was that this class of injury is not an "accident" coming within the meaning of the Act. The defence prevailed; the Court holding that the meaning of the word "accident" in the Act of Parliament is the ordinary, and not the broad or philosophic one. This is a kind of legal judgment which is greatly to be applauded, on general grounds. Apart altogether from the question of interpreting a word in a particular statute, it is a point of public policy of the greatest importance that the simple, every-day language in which it has become customary to draft our Acts of Parliament should receive common-sense, plain interpretation in the Courts. Ancient legal phraseology was a terrible bugbear. There used to be a humorous skit upon it, in the form of a deed of gift of an orange, which ran into many folios. It is unnecessary to go into this subject at length, on the text of Judge Addison's admirable judgment. It is a consideration, however, that needs to be borne constantly in mind by those who have to do with the drafting and interpretation of legal documents of all kinds, from Acts of Parliament down to the patent specification of an amateur. So-called legal fictions, laboured diction, and all the hair-splitting refinements of scholastic philosophy which have lingered so long in our Law Courts, are out of date. Let an Act, or any private instrument, be only couched in plain, ordinary language, and then the Courts will deal with it in a few minutes.

The foregoing observations are thoroughly borne out by the character of the proceedings in the case of *Suckling v. The Gaslight and Coke Company*, which we report at length in our "Legal Intelligence" to-day. This is the first action of its kind brought by a gas worker against his employers since the Workmen's Compensation Act came into operation; and the circumstance of its being brought under the Employers' Liability Act, 1880, instead of under the latest Act, exemplifies much that has been said concerning the concurrent operation of these statutes. The plaintiff, a sufferer originally from gas poisoning contracted while assisting to empty a foul purifier at Beckton, alleged that his injury was due to the existence of defects in the works chargeable to the negligence of the Engineer of the station (Mr. Thomas Goulden). This plea comes in under the Act of 1880, which expressly makes the master liable to pay compensation when the injury is caused by the personal negligence or wilful act of some person for whose act or default the employer is responsible. A workman who thinks he has a case of this character against his employer, will always be advised by his Union or by his attorney to proceed under the Act of 1880, because in the event of his gaining the day a sympathetic Jury will be able to award him more money than would be given under the Act of 1897. On the other hand, it is obvious that the risks of such a proceeding are greater. In the case in point, the opening address of the plaintiff's Counsel, Mr. Ruegg, contains several piquant revelations of the peculiar conditions under which work at Beckton is carried on. It looks very much as if the purifier gangs asserted their right to work or not, pretty much as they pleased. The plaintiff, by his



own admission, could not say that there was any precedent for the supposition, by Mr. Goulden or by anybody else, that there was anything unusual about the work he was expected to do. The purifier hands are paid by the piece, and have to take the rough with the smooth. It was alleged that this particular purifier was in an exceptionally bad condition when, at 3 o'clock on a very hot August day, the gang to which Suckling belonged had orders to get into it. Naturally, all his mates swore to the dreadful state of the purifier; but still it did not appear how Mr. Goulden was responsible for the condition of the lime, or the heat of the weather, or the bodily state of every member of the purifier gang.

The case for the defendants was chiefly made up of medical testimony, and the evidence of Mr. Goulden and his assistants. The former went to show that the plaintiff's injury, such as it was, had not arisen only from the state of the purifier. Mr. Goulden's evidence, corroborated by that of Mr. J. N. Reeson and of the foreman, Mr. Berry, put a complexion upon the whole affair differing entirely from the plaintiff's assertions. The gang did not want to start a fresh job at 3 o'clock on a very hot afternoon. The discharging of a foul lime purifier is not pleasant work; and the plaintiff had probably already had quite enough of it for that one day, his health not being particularly good. Mr. Goulden had to deal, not for the first time, with a set of men who shirked their work. He acted upon his judgment of what was necessary to be done. An unpleasant feature of the case was the use that was attempted to be made of Mr. Goulden's kindness to the sufferer and his family; but when it came to the bolstering-up of the claim by the "independent" testimony of the local Secretary of the Gas Workers' Union, the scheme was effectually "blown." The Counsel for the Company reminded the Jury that there was no necessity for them to allow their judgment to be warped by sympathy for the working man, because the plaintiff could have had his compensation under the Act of 1897 without being under the obligation to convict his employers of culpable negligence. It was not the suffering workman, but really the Gas Workers' Union, who "went for" Mr. Goulden and the Company. In the event, the Jury found for the defendants, which is a result of the utmost value for them and for all gas manufacturers. If the case had been decided otherwise, it is doubtful how the work of gas making could have been carried on at all.

#### The Parliamentary Notices.

IN another column we give the Parliamentary Notices for the ensuing session relating to gas and water supply. The number of Bills promised is large; and some of them are of great importance. Many considerable Provincial Gas Companies are coming to Parliament next year for additional powers; and the incorporation of new Gas Companies keeps pace fairly with the municipalization of established undertakings. The most generally interesting application is that of The Gaslight and Coke Company, who are in want of more money, additional land, and some minor facilities. Unless all the warnings of the past two or three years mean nothing, there will be a great fight over this Bill. The Bristol Gas Company are preparing a Bill for various purposes; as also are the Cambridge University and Town Gas Company. Westward and eastward, the gas undertakings grow and prosper. A conflict of Bills is promised for Ilford. A general gas supply scheme for Mid-Kent is in contemplation. Altogether, next session promises to be a bustling one for the able gentlemen whose business it is to settle the conditions under which statutory gas supply is to be carried on in the United Kingdom. It is, of course, impossible to discuss the nature of parliamentary projects upon the notices; but one of the most ambitious of these statutory formulæ relates to Hastings and St. Leonards. Several London Suburban Gas Companies require additional powers. A respectable amount of Scotch business is in hand; but there is not a single application for a Gas Bill from Ireland.

#### The Manchester Institution Meeting.

A VERY successful year's work was completed on Saturday by the Manchester District Institution of Gas Engineers, under the presidency of Mr. W. S. Haddock, of Warrington. Recognizing the ever-increasing difficulty experienced by all the District Associations in inducing members to submit formal papers at the ordinary meetings, the Manchester

Committee tried the experiment of arranging for two of the members to "introduce" subjects for discussion; and the experience of Saturday is likely to be repeated, with equal success, if only the members selected will undertake to prepare something worth listening to, as Mr. Shadbolt and Mr. Brearley did on the present occasion. The former gentleman has previously distinguished himself by his contributions to the proceedings of this and kindred Associations; and on Saturday his running comment on a series of tabulated statements with which he had furnished the members, was of a character eminently calculated to raise a useful discussion, besides furnishing comparative figures of purification results that will doubtless be appreciated outside the Institution itself. Mr. Brearley made his first appearance as an author of a well and lightly written paper, dealing exhaustively with some of the items of a Gas Company's accounts that need very careful consideration before determining whether they should be carried to capital or revenue, and in what proportion they ought to be divided should part of the sum be chargeable to both accounts.

The latter paper, and the series of tables with which it is accompanied, call attention once more to the continued rapid municipalization of the gas undertakings in the district covered by the Institution. At the present time a good half of the works represented by the members belong to the Local Authorities; and those still under Company control cannot account for more than a tithe of the capital invested. By far the largest of the latter class is that of the Ashton-under-Lyne Gas Company—if exception be made of the Liverpool United Gas Company, one of the Works Managers of which still nominally belongs to the Institution, though it is years since he attended any of the meetings. Mr. Brearley was able to invest the usually dry subject of figures with fresh interest; and he may well look forward with pleasure to a full discussion of his conclusions at the next meeting of the members in February. His data will afford many chances of an effective comparison of Corporation as contrasted with Company control of the gas supply of large and small districts.

It remains to notice that the members occupied their morning with a visit to the Bradford Corporation Chemical Works at Frizinghall, where they were received by Mr. Charles Wood, the Gas Engineer, and Mr. John Wyld, the Manager of the Chemical Department, and were able to appreciate the advantages of treating the residuals as an integral part of the economy of gas manufacture rather than disposing of them to an outside buyer. After lunch, a vote of condolence was passed with the widow and children of the late Mr. Robert Hunter; and Mr. S. S. Mellor, as Hon. Secretary, made a verbal report about the fund being raised by the Committee (among the members only) for the relief of the family, and already amounting to considerably over £100. This and the fund being acknowledged from week to week in the "JOURNAL" will be a welcome addition to Mrs. Hunter's slender resources. The action of the Council of The Gas Institute in the matter of the standardizing of meter-unions engaged brief attention before the meeting closed. During the afternoon, Mr. Shadbolt was elected President for 1899; and a very popular leader he promises to become.

#### Mr. G. S. Raworth on Municipal "Avarice."

It is not often that the conduct of British Municipalities in respect of gas supply is intelligently criticized by a stranger to the industry; which is to be regretted. The dealings of local authorities with gas consumers furnish such valuable information respecting the working of Municipalism, as contrasted with the theory that they ought to be much more regarded than they are outside the technical Press. In the course of a Presidential Address recently delivered to the Northern Society of Electrical Engineers, Mr. G. S. Raworth broke new ground in this direction; thus giving welcome evidence that the peculiar notions of gas-works administration cherished by certain English towns are attracting notice from outsiders. Mr. Raworth was considering the various influences that affect the progress of the electrical industries; and among them he discovered the "Avarice of Municipalities," as illustrated on the largest scale in connection with gas supply. The same thing might be expected to operate upon electricity supply, only that this business is too young to furnish reliable evidence of the influence of policy as distinct from personalities.

Falling back for an argument on the Board of Trade Returns of Authorized Gas Undertakings, Mr. Raworth



picks out the example of Manchester—"a city which manages its gas-works nearly as well as they can be managed by a Corporation." Testing the performance of the Manchester Gas Department by that of the South Metropolitan Gas Company of London, or of the Sheffield United Gas Company, Mr. Raworth finds the Corporation sadly wanting. Nor does Birmingham come off better at the hands of this scathing critic, who appears to think it is a piece of impudence for a Corporation comparing so poorly with the Sheffield Company as regards gas supply to aspire to command the local electric lighting. Wigan and Plymouth, and Stoke-upon-Trent and the British Gaslight Company (Potteries), are also pressed in to show that Municipalities take the whole of their apparent gas profits out of the pockets of the consumers—"that is to say, of their ratepayers." This is surely great daring on Mr. Raworth's part. The "Electrical Review" censures him, not for exposing the thing, but for calling it "avarice." The term is condemned as objectionable, and as likely to "stir up feelings of animosity in the breasts of town councillors, and make even the plain places rough in the paths of companies approaching them for concessions." For this not very lofty consideration, Mr. Raworth is blamed as having "committed a grave error of judgment." Our contemporary is distressing itself in vain. Mr. Raworth or anybody else may abuse profit-hunting by Municipalities as heartily as he pleases; he will effect nothing, change nothing, and offend nobody. The Municipalities will act upon their interpretation of the law, and grab the profits until Parliament intervenes to restrict their rapacity.

Upon another point the criticism of Mr. Raworth by the "Electrical Review" fails. Our contemporary ventures upon the declaration that, "in the natural order of things, Companies and Municipalities must ever be at war. Companies exist and operate for the benefit of individuals, Municipalities for the benefit of the body politic." What a confusion of economical ideas, and disregard of the practice as compared with the theory of Municipalism does this passage betray! Has the suspicion never entered the mind of our contemporary that perhaps in some respects the Municipality, as an organization, may have interests not identical with those of the community which it represents? Apart from the gross consideration of the possibility of official corruption, is it a tenable proposition that the Local Authority can always and to any extent be trusted to act in the best interests of the body politic? If so, what is the good of the Local Government Board, not to mention the Treasury and the Board of Trade? And the "individuals" for whose benefit Companies are alleged to exist and operate, does this mean only the proprietors? If it were a case of selling eggs, would not the consumer go where he could get the greatest number for a shilling, regardless of the status of the vendors? Why not judge the trade in gas or electricity by exactly the same standard? This is precisely what Mr. Raworth does; and the "JOURNAL" has done it before him. Perhaps "avarice" is not absolutely the correct word to use for the profit-grasping habit of certain Municipalities; but it will serve as well as another. Called by any other name, the practice remains still unsavoury.

#### **Falmouth Ratepayers Reject the Proposed Gas and Water Works Purchase.**

MUNICIPALIZATION has no charm and water gas no terrors for the majority of the ratepayers of Falmouth. For the second time, they have rejected the Corporation's scheme for the purchase of the gas and water works; and the latest vote is so decisive that, in all probability, nothing more will be heard of the matter. In regard to the gas-works, this will almost certainly be the case. The Corporation have been tempted to twice put the question to the test because of the existence of a clause in the Falmouth Gas Act giving them the option of purchase within a certain period of the passing of the Act. This term expires next year; and as the ratepayers have put their veto upon the proposal to take advantage of the clause, there is an end to that part of the scheme. As to the water-works, the result will in all probability be much the same, though it will be reached in a different way. A great deal has been said against the water supply, chiefly, we imagine, with the idea of convincing Parliament that the price to be paid for the undertaking ought to be a low one. There is a party in Falmouth which professes to be convinced of the absolute necessity of the water-works being under public control, in order that

measures, which they say are necessary, may be taken to ensure the purity of the water. It is admitted, however, that the Corporation cannot acquire the works and carry them on without adding very considerably to the burdens of the ratepayers. In these circumstances, the demand for the municipalization of the water-works, and of the gas-works, is likely to die down. Unfortunately for Falmouth, the agitation has raised questions both as to the quality of the water supply and the supposed poisonous nature of the gas, which may seriously affect its reputation as a health resort. So far as the gas supply is concerned, much has been said and written which is perfectly ridiculous; and the same may, no doubt, be said of the allegation respecting the water. But these ridiculous things, though obviously not credited in Falmouth, are believed by people who have no means of getting at the truth; and if the town should prove to have fallen into ill odour, the indiscreet friends of Municipalization will be alone to blame.

#### **A Variant of *Allen v. Flood*.**

AN instructive illustration of the law as laid down in the leading case of *Allen v. Flood* has just come to hand from Ireland. It originated similarly in a Trade Union proceeding, and is recorded in the Irish law reports under the name *Leathem v. Craig and Others*. The plaintiff sued the defendants, who were Trade Union officials, for having induced some employees of his to break their contracts of service to his detriment. A Belfast Jury awarded the employer £200 damages for this wrong; but judgment was held over until the decision of the House of Lords in *Allen v. Flood* was known. The Court held that the proceeding of the defendants was covered by this decision, and entered judgment for them accordingly. The plaintiff appealed, with success. The Irish Queen's Bench Divisional Court has now distinguished between this case and *Allen v. Flood*, on the highly important point that in the former there was a specific contract of service which was broken, whereas the House of Lords held that no contract whatever existed in the case of the Thames-side shipbuilders, who were employed by the hour. The main point in *Allen v. Flood* was that the question of motive does not arise in connection with the performance of a legal act. In the Irish case, the circumstances were totally different. The plaintiff's men were working under a contract of service, which was illegally broken by the defendants' provocation and inducements. The "moral" for employers is obvious. It is believed to be a delusion of professional Trade Unionists that if several hundreds, or thousands, of workmen broke their contracts of service at once, in the high and holy cause of a "strike to order," the law would be paralyzed before such a revolt, and would hesitate to multiply penalties. Workmen would be very ill advised if they were to trust to any such fond belief.

#### **Further Complaints Concerning the Smoke Nuisance.**

THE appeal of Sir W. B. Richmond for help towards the suppression of the smoke nuisance in London, has evoked a good deal of more or less pointed comment. In the first place, it has transpired that the London County Council are not so utterly oblivious of their duty in this respect as was suspected, on general principles, by "The Times." By a notable coincidence, the same week that brought Sir W. B. Richmond's complaint, witnessed the conviction of a Lambeth firm for continued smoke nuisance, at the instance of the London County Council, after the Vestry had neglected to take proceedings. The defendants called as witnesses on their behalf the Medical Officer of Health and the Vestry's Smoke Inspector. Still they were fined. This action delivers the County Council from utter condemnation; but inasmuch as "one swallow does not make a summer," a single penalty exacted from a manufacturing firm who were probably no worse than their neighbours, does not prove that the law is being satisfactorily enforced. Meanwhile, expression has been given to the general understanding that factory chimneys, even those of electric light works, are not the sole, or even the chief, cause of the smoke in the atmosphere of London and other English towns. Another "Richmond" has entered the newspaper field, with the object of reminding the public that "firesides" are just as culpable in this regard as factories. By way of showing what is being done by the London Gas Companies to convert householders to the use of gas for heating and cooking, Mr. E. W. T. Richmond informs the readers of "The Times," on the authority of Mr. G. F. L. Foulger,







because the Welsh project was rejected upon its merits, but because the impression had been given that the object of the Council was to bring water from Wales "in competition with, and for the purpose of depreciating the value of, the existing methods of supply."

Water is now flowing more freely in the East London district; the welcome change commencing the middle of last week. The Special Correspondent of "The Times," whose articles respecting the East London water supply have been marked by extraordinary acuteness and completeness of information, very aptly says, in regard to immediate provision, "the public should notice that it is possible to make East London safe, that the Companies are anxious to do it, and that the County Council are opposing them." The reason for this opposition is that which we stated last week, as expressed by the Council's legal representative before the Royal Commission. "The Times" Correspondent, in referring to the "surprising frankness" of the acknowledgment made on that occasion, says that those who have followed the proceedings of the Council "have long been convinced the Progressive policy has been to force a breakdown upon the Companies; but such a cynical avowal was not expected." The inter-communication scheme was to be frustrated, so that the East London Company's undertaking might be purchased at a reduced rate. We observe that the Hackney Vestry, always eager to attack the Water Companies, are seeking, in their own small way, to forward the policy of depreciation. They have issued a notice, specified as "By Order," advising the inhabitants "as a precautionary measure, to boil all water to be used for drinking purposes." Alarm is naturally created by such a notification, and a suspicion of typhoid is excited. Official and scientific reports of the highest character are thus set at naught, and people are worried into the exercise of wholly unnecessary precautions. The Hackney "Notice" is an absolute libel, only unfortunately not actionable. Perhaps it is an act of revenge for the failure of the Vestry to find any foothold for carrying on their threat to sue the East London Company before the Railway and Canal Commission for damages on account of the four hours' supply.

The Lee (popularly called the Lea) Conservancy Board, as at present constituted, apparently fails to satisfy the authority at Spring Gardens. The several objects sought in the General Powers Bill to be promoted by the County Council in the coming session include the dissolution of the present Conservancy Board and the constitution and incorporation of a new Board. Failing to accomplish so much, power is to be sought to reconstruct the existing Board; and a variety of changes are proposed, of which it is difficult at present to see the meaning, though we obtain a sufficient clue by the proposal to alter or amend certain Acts of Parliament relative to the New River and East London Water Companies. The effect may be little or much; but we may infer that the design is in some way to strengthen the position of the Council against the Water Companies. As at present constituted, the Lea Conservancy Board has five representatives from the landowners, one from the bargeowners, one from the Local Authorities, two from the New River Company, two from the East London Company, one from the Corporation of the City of London, and one from the London County Council. By the Bill of which notice has been given, the representation will be extended, so as to include the Corporation of West Ham and the County Councils of Middlesex, Essex, Bedford, and Herts. No doubt the intention is to swamp the Water Companies, and enlarge the authority of the London County Council. But more will be known when the Bill appears.

**The Water Supply of German Towns.**—We have just received from Herr W. H. Lindley, the President, and Dr. H. Bunte, the General Secretary of the German Association of Gas and Water Engineers, a copy of the first volume of a work by Herr E. Grahn on the water supply of towns in the German Empire and adjacent countries. ["Die Städtische Wasserversorgung im Deutschen Reiche, sowie in Einigen Nachbarländern," von E. Grahn. Erster Band. 547 pp. R. Oldenbourg, Munich and Leipzig.] The preparation of this valuable work of reference, under the auspices of the Association, has already been mentioned in the "JOURNAL" for July 26 (*ante*, p. 202). The present volume deals with Prussia, and gives details of the water supplies of 1244 towns in that country. We hope to refer to this important and careful compilation at greater length in some subsequent issue.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1244.)

THE Stock Exchange has had a smooth and peaceful week free from agitation of any kind. But still there is not the degree of activity in business which one would almost have a right to expect. The fact is that, when once the machinery of speculative operation has been stopped, it takes some time to get it into full swing again. Despite the comparative quiet, the markets all round have been firm; and prices in every department show a nice rise, with a healthy tendency to improve further. The condition of the Money Market has aided the upward movement, unaffected by the rise in Berlin; and everything at present points to a continuance of the 4 per cent. rate to the end of the year, if nothing startling and disconcerting should occur. Business in the Gas Market has again ruled very quiet; and the tendency was inclined to be dull, though changes in quotation were few. In Gaslights, the "A" which had been hanging fire for some time gave way, and fell point by point until at the close it showed a loss of 4. This was largely due to the fact that next Tuesday at the Mart the Directors will offer for sale the large amount of £187,500 of stock. It must be borne in mind, however, that this stock will be on the new 4 per cent. basis, and is therefore the equivalent of £75,000 "A" stock on the present 10 per cent. standard. South Metropolitan was very little touched, and was rather inclined to droop for lack of support. In Commercial, a parcel of new and debenture stock marked at "special" low prices had a chilly appearance; but no business was done. The quotations will be "ex new" to-morrow. Next to nothing was done in the Suburban and Provincial group; and quotations did not move. At the Mart on Wednesday, £15,000 Brentford new stock was sold by the Directors; but the price realized was not very good. Among the Continentals, Imperial was the only one to show any animation; and it scored a fair improvement. European and Union were quiet, and unchanged. None of the remoter undertakings offered any feature calling for remark. The Water Companies were quite brisk, compared with the listlessness they had been showing for some time past; and the tendency was favourable enough to advance two or three quotations.

The daily operations were: All Gas stocks were very quiet on Monday, except Imperial Continental. Commercial debenture fell 1. Tuesday's business was a little more brisk; but quotations did not move. Wednesday was a quiet day, and inclined to droop. Gaslight "A" fell 1. In Water, Southwark ordinary rose 2; and East London  $4\frac{1}{2}$  per cent. debenture,  $1\frac{1}{2}$ . Thursday brought no more activity into the market; and things remained listless. Gaslight "A" fell 2; but Imperial rose 1. In Water, Lambeth  $7\frac{1}{2}$  per cent. advanced 2. Friday was a little more lively. Imperial rose 2; but Gaslight "A" fell 1. Saturday produced no further change.

### ELECTRIC LIGHTING MEMORANDA.

Electrical Projects in Parliament—A South Lancashire Power Scheme—  
Mr. Raworth on the Electrical Industries.

THE parliamentary notices give promise of much activity in the two chief divisions of electrical engineering and industry—lighting and traction. The Board of Trade will be busy, mainly with local authorities' applications for Lighting Orders. It would be rash to hazard a guess as to the number of these destined to be carried out. It may at least be said with truth that there is no necessary practical connection between the proceedings of obtaining an Order and lighting a town, or there would not be 145 Provisional Orders in a state of suspense—that is to say, in the condition of being "hung up" indefinitely. Many projects of electric tramway and light railway working are on foot; and additions are threatened to the low-level electric railways of London. A typical example of the last-mentioned kind of electrical enterprise is put forward under the auspices of the Great Northern Railway Company, who wish to run a feeder line from Wood Green to the Strand. This is of a piece with the policy of the London and South-Western Railway Company in getting access from Waterloo to the City, with the improvement of not contributing to the congestion of the main line terminus, and the terminal section of the line. As Sir J. Wolff Barry showed the other day, something will have to be done to enable the great London passenger railways to grapple with their rapidly growing responsibilities; and these low-level electric relief lines may provide what is wanted, if only they can be worked at a reasonable cost.

Another big central electric power generating and distributing scheme is to be submitted to Parliament; the chosen field of operations being South Lancashire and Cheshire. The idea is to locate the central power station in the vicinity of St. Helens (where coal will be procurable at the door), whence current would be distributed to Liverpool, Widnes, Warrington, Wigan, and other populous manufacturing centres. The favoured places are to be connected by electric mains laid along the roads, so that any manufacturer or resident in their neighbourhood will be able to obtain all the electricity he may need for power, or



lighting, or chemical purposes. This supply is to be priced at 1d. or 1½d. a unit. The capital of the Company is to be a round million; and they would want every penny of it to carry out the ambitious programme which the promoters have carefully unfolded through the complaisance of the Liverpool newspapers. The Company may consist, to begin with, as these reports claim, of "an influential group of manufacturers and capitalists;" but we think the smaller capitalists of the locality chosen for the scene of these operations will be well advised to have the whole scheme worked out to their satisfaction in detail before putting any money into it. The language of the preliminary advertisements is altogether too vague. Thus it is averred that "undertakings for the distribution of power, although comparatively novel in this country, are in common use on the Continent and in America"—where, and with what commercial results? The statement which follows—that "in consequence the foreign manufacturer has an advantage over his English rival, who is in practice compelled to produce his power for himself by means of isolated steam or other generating plant"—is clap-trap. The terms in which this project are recommended to the public do not command confidence.

When Mr. G. B. Raworth delivers an address upon matters electrical, he always manages to entertain and impress his audience. His latest performance in this line, for the benefit immediately of the Northern Society of Electrical Engineers, contains more information and suggestion in any half-dozen lines picked out at random than all the windy platitudes that recently reverberated by the hour in Great George Street. The first striking truth brought out by Mr. Raworth, was that the total amount of capital actively employed in electric lighting, by companies and corporations together, is £14,142,000. A handsome sum this, representing a great deal of honest work of brain and hand, and much devoted service. But in the years 1882 and 1883, when "the light of the future" was being "boomed," the total amount of money subscribed was £14,743,000. If the electricians of the period had only taken care of the money subscribed for them by the public in those two years, not a penny more would have been needed to carry out all the electric lighting work that has been done since. As a matter of fact and of history, most of this money vanished into the *ewigkeit*, without leaving a trace of its passage. Cash now laid out upon electric lighting mostly goes straight into the banking accounts of manufacturers of apparatus. Of every £100 so spent, the makers of plant get £37, and the cable makers get £34. The former stand before the world as representing electrical industry. "They make all the noise and hold all the meetings," said Mr. Raworth; but the cable men pocket all the profit there is in the business, without saying anything about it. Another suggestive remark was that, although 14 millions seems a good deal of money to have been sunk in electric lighting, it is a trifle compared with the investment in gas. Why, said Mr. Raworth, "we spend as much every year upon making the gas as the total subscribed capital of the electrical industry—14½ millions." There is plenty of space here for electricity to fill.

Mr. Raworth was equally candid on other points of electrical enterprise. He could not claim a large measure of success for the application of electricity to the propulsion of river or lake launches. There is something being done in this way; but there is "no money in it." Similarly with electric cabs. He wished he could say that these vehicles were going to be a great success. They seemed to answer very well as carriages; but how the accumulators were working, Mr. Raworth could not tell. He highly approves of the idea of generating and supplying electricity in bulk, while refraining from expressing an opinion on the feasibility of particular schemes. He hoped that electric traction and electric distribution of power, now being exploited by private enterprise, are not to be killed by municipal obstruction. With regard to foreign competition in the supply of plant, Mr. Raworth, as a British manufacturing engineer, is not afraid of it. The Americans, who are actually supplying a good deal of electrical machinery to this country, are not doing so at English prices; they are only filling orders that could not have been carried out here in the time. A piquant part of the address, referring to "the avarice of municipalities," is reserved for notice elsewhere, as it is a gas subject.

## MECHANICAL TRAMWAY TRACTION.

### THIRD ARTICLE.

THE application of electricity to the driving of tramcars by the method of surface contact belongs to the category of those electric traction arrangements which alone have proved practically successful. This is the whole class of electric traction systems in which the motor car draws its driving power from a fixed line conductor continuous with the rails. Mr. J. Allen Baker does not arrange his matter in the most natural and systematic way, or he would have divided electric traction into the two chief orders of "battery" and "line" systems. The "line" conductor is common to his divisions of traction by surface contact, by overhead wire with trolley, and by underground conduit.

These three classifications refer originally to the manner in which the electric power is to be delivered to the motor on the car, although obviously from these differences of connection

spring many important divergencies of tramway construction. Fundamentally, all line systems of electric traction are alike as regards their main requirements. The most informing way of approaching the study of the subject is to start with a simple electric railway—like that, say, on Ryde Pier; and begin with an appreciation of the indispensable elements of the system. These are the motive power station, the line, and the driven car. When the elements of the system are grasped, it is comparatively easy to understand the nature of the minor modifications necessary to adapt the principle to various applications; street tramways being of the number. To begin, as Mr. Baker does, by describing "surface contact" electric tramways, before making it clear what the contact in question is to effect, is an exact electrical equivalent of "putting the cart before the horse." Actually, the concluding paragraph of his report, which lays stress upon the fact that "whether the current is carried by the overhead wire or the underground conductor in the conduit, the general installation (including power house, rolling stock, with motors and controllers, and the feeder cables) are the same," should have preceded all that he has to say concerning line systems. We shrewdly suspect Mr. Baker of not possessing a true engineering insight into the principles of his subject, because of his omitting all reference to the working data of electric railways, which are in the same category with tramways. A tramway differs from a railway only in having its working surface forming part of the common road; whereas in a railway the surface of the metals is the only road. With a railway, everything can be made subservient to the working of the line; with a tramway, the working must itself be subservient to the general use of the roadway by the public. Great as the consequential results of this difference are, they do not affect the fundamental problems of electric traction. We have in electricity a power which will drive railway carriages or tramcars. It can be very conveniently applied to the former class of traction by means of a line conductor, from which the travelling motor takes off the necessary power by sliding contact as it goes along. Any amount of power likely to be needed for this purpose can be generated at stations, and conveyed along the line. So far, there is no difficulty. There is no question here of "trolley" or any other device for making connection between the motor car and the conductor. There being no other interest to regard except the working requirements of the line and the traffic, we here find electric traction in the fairest possible field, where it can have everything it wants to do its work withal.

Why, then, are not all railways worked by electric power? Simply because, up to the present, it has not been established that the travelling electric motor can supplant the steam locomotive to advantage. A steam locomotive can take along an express train at a normal speed of 60 miles an hour, or it can haul goods trains running into hundreds of tons of dead-weight at a reasonable rate of speed for the size of the country and the needs of the traffic. It can do these things with an expenditure of (say) 200-horse power on the crank of the driving axle. Obviously, to do the same work an electric motor must exert at least the same power; but, actually, owing to the mechanical differences between the steam-engine with its long leverage on the crank, and the electric motor with a much smaller leverage, the latter must be supplied with considerably more power than suffices for the steam-engine. It follows that all this power, whatever its amount, must be taken off from the line conductor by means of the electric contact. No great learning in electric science is necessary to enable one to appreciate what this means, both for the conductor and for the contact-pieces. Electrical energy corresponding to perhaps 300-horse power has to be transmitted through a temporary connection of necessarily small area, making at best but imperfect contact between the operating metallic surfaces. We cannot state here conclusively how all these considerations work out. If we could, it would be because the matter is a part of common knowledge, which is so far from being the case that the Metropolitan Railway Company are spending a large sum of money, under the direction of the first engineering ability of the day, in order to find out the truth of it.

Short of this last application of electricity to traction, however, the Liverpool Electric Railway and the lines in London exist to show that light railways can be worked in this way. No evidence has yet been offered, from these examples, to prove that electric traction is of high efficiency, regarded from the standpoint of mechanical science. The electric traction has its advantages, and it may even be imperative of selection on their account; but it is very wasteful of power. Mr. Baker has not judged it necessary to inform his readers what fraction of the power generated and sent into the line conductors in Liverpool, South London, and at Waterloo is accounted for in the haulage. We fancy that if this ratio were known, there would be an end of the talk about the "economy" of electric traction. At the same time, one must distinguish between mechanical economy and commercial cheapness. The latter may exist in the absence of the former; and in the particular case in point, coal may be cheaper than horseflesh for tramway working. Perhaps it is. The next thing to be considered is how the power of coal, through the intermediary of electricity, can best be used for the super-session of horse haulage.

Passing on from the considerations of how much power we want for the purpose, and what it costs to provide, the most pressing special advantages and drawbacks of electric tramway



traction are very soon stated—although not so easily adjudicated upon. Not to treat the question as one of comparison, but on the merits, it appears that electric traction is cheap, swift, cleanly, able to deal with heavy traffic, and both safe and comfortable in use. The most salient drawback is that an electric tramcar is not self-contained, but depends for its power of locomotion upon the line conductor. Everything connected with the general question of the improvement of tramway working starts from one of these considerations. The moment they are valued, the comparison between possible systems starts afresh.

Granting all that can be claimed for electric traction in itself—its speed, cleanliness, silence, and large capacity for work—how is it to be applied to tramcars, which are at best statutory trespassers on the Queen's highway? The naked parallel conductor of the electric railway is out of the question. It has been proposed to get over the difficulty by converting the continuous conductor into an interrupted one, having contact-pieces sticking up in the line of tramway, from which the car can derive motive power as it passes over them; while no other vehicle or wayfarer would be able to effect the same kind of connection. This is Mr. Baker's "surface contact" system. His report very briefly describes several experimental tramways worked in this way, in Paris, Monaco, and Washington. The Birmingham Corporation Committee recognized as the special recommendations of such a system the absence of overhead wires, of open slots in the surface of the street, of tubes, and of deep excavations—all the necessary work being contained within the thickness occupied by the concrete foundations of an ordinary paved street. Mud and water, to a depth obscuring the contact-plates, do not affect the working. The return current is conveyed by the rails, which would therefore have to be relaid and bonded as for every other electrical system. Mr. Baker does not mention the work of Westinghouse in this kind. The fact of so able a mechanic as George Westinghouse having chosen this field of enterprise to work in, shows its attractiveness; while the circumstance of his having laboured in vain goes far to prove its hopelessness.

Yet it seems that Mr. Baker has no more been allowed to say the last word about the surface-contact system of electric tramway working, than about the gas-tram. According to the "Electrician," there is a closed-conduit system of tramway working, the invention of Mr. Christopher Anderson, now being tried upon a short length of experimental line at Leeds. In this arrangement, the surface contact-pieces are not fixed, but are capable of being pushed up 4 inches from the road surface level, at which they ordinarily rest. When raised, the pieces are electrically alive; when dropped, they are inert. It is obviously of the first importance that there should be no mistake about the operation of these members of the system; and this is the point that time and experience can alone dispose of. Another arrangement of the same kind is being tried at Willesden—known as the Thompson-Walker system, which has been warmly advocated by Professor Silvanus Thompson (one of the inventors), and was described in a British Association paper. Mr. Baker does not appear to know anything about this experiment, which our electrical contemporaries do not think very highly of up to the present. Further trial in the actual roadway is needed to establish the reliability of this or any other surface-contact system, under the rough and arduous conditions of London street traffic. No mere makeshifts are worth an instant's consideration in this connection.

This reflection brings us to the question of the "trolley-wire" system of electric traction. This is, emphatically, the test question of the hour for the tramway and electrical engineering interests. It should be understood, to begin with, that the trolley and the overhead wire are merely a device for enabling an electric motor tramcar to obtain its power as it goes along. This is elementary information; but from the tone of much that is published by the technical Press respecting this subject, and of more that is reported as proceeding from local authorities, it seems that some misapprehension exists as to the nature and scope of the so-called trolley-wire system. Our electrical contemporaries, for example, often appear to be anxious to ram the trolley-wire system down the throats of the British public, regardless of the protests of those who object that the streets of English towns are worthy of better treatment. Over and over again the public are told that what is good enough for 30,000 miles of American thoroughfares, ought to be good enough for London; but this is not the way to put it. We doubt if our electrical friends themselves admit the force of the argument. They advocate the system because it is the cheapest; but it is Mr. Baker's greatest merit that he has shown how little regard need be had to this plea. London, at any rate, does not want the cheapest system, but the best. The electricians, almost to a man, have kept out of sight the consideration upon which Mr. Baker lays most stress—that the trolley-wire system is but a cheaper way of carrying the current, and conveying it to the car, as compared with the underground conduit system. Everything else is the same for both systems—generating stations, cars, motors, rails, bonding, electrolysis risks, and the rest of it. Nobody questions the unsightliness of the overhead wires, nor denies that they obstruct the thoroughfares. In the case of curves, they are troublesome; at busy crossings, they are a terror. Can anyone who knows Tramway London imagine the Elephant and Castle delivered over to this system? Such is, in brief, the controlling factor of the situation. When London is equipped with a system of mechanical tramways, no makeshift device will

serve the turn. The population per mile of tramway in London is (according to Mr. Baker) 31,786. A long way after comes Paris, with 21,739 people per mile; followed by Glasgow, 20,064; and so on, down to Chicago and Philadelphia, with little over 4000 per mile. To talk of cheap tramway construction as though it were a consideration affecting London as it might affect "Bridgeport, Conn.," is nonsense. Whatever system of electric tramway working is tried in London, the existing tracks will have to be relaid; and after this necessity is realized, the question of whether the conducting wire should be carried overhead or placed in a trough between the metals loses its importance. When, further, the small saving of the former system is weighed against its unsightliness, danger, the nuisance of sparking, and the obstruction of the thoroughfare, it "kicks the beam." As Mr. Benn, the Chairman of the Tramways Committee of the London County Council, has aptly observed, people in London think trams are an eyesore at best; and if it were to become understood that the trolley wire must go with the tram, there would be the greatest possible opposition to the further extension of the lines in districts where additional transit facilities are really needed. If the price of deliverance from the trolley wire is a matter of a little money, or even of a good deal of money, London will sooner pay than suffer.

## SECOND EDITION OF BUTTERFIELD ON "GAS MANUFACTURE."\*

It seems only the other day that we had the pleasure of introducing to "JOURNAL" readers the first important effort in the technology of gas manufacture of a young master of the chemical side of the subject, Mr. W. J. A. Butterfield, who was then in charge of the Beckton laboratories. Our files remind us, however, that this happened within a month of three years ago. On reperusing our *critique* of the first edition of Butterfield's "Gas Manufacture," it appears that a generally appreciative judgment of the work was qualified in certain regards; and the hope was expressed that what we considered to be defects would be made good in a future edition. Now that in fulness of time a second edition, revised and added to by the author, has been published, it becomes our duty to inquire how far the excellent promise of the first has been fulfilled.

Painful experience of the ways of publishers has taught book buyers to make sure, when a so-called new edition of a well-known work of reference is offered for sale, that it is really freshened up. We shall never recommend readers of the "JOURNAL" to look twice at a mere publisher's "new edition." On the other hand, when it has been given to a capable author to produce a good handbook of any art or industry which is inspired with life and the power of development, it becomes his bounden duty to keep his work up to date. Fresh and new as Butterfield was three years ago, a good deal has happened in the gas industry since then. Students and followers of a manufacture so very much alive as that of illuminating gas want to buy text-books that tell what gas making actually is, not what it was even three years back.

Mr. Butterfield's first book was not quite authoritative on the mechanical side of the industry, which was not to be wondered at, seeing that the author is a chemist. We had to criticize his treatment, as a chemist, of certain points of gas manufacturing practice which, though mechanical in character, require to be judged by their results. It is with the results of manufacturing processes that the chemist has to do. He is, or should be, the professional critic of the engineer and mechanician. It is worse than useless for an engineer to construct plant which, however excellent from the mechanical point of view, does not yield the right kind of results in gas or residuals. Mr. Butterfield is still too diffident, or remiss, in grappling with such chemical problems as the influence of the dimensions and shape of retorts on the character of the gas produced, and the cause of stopped ascension-pipes. In these respects, the author has not always corrected himself; but the paragraphs relating to the inclined retort system of carbonizing have been extended and almost wholly rewritten. Even so, Mr. Butterfield has not succeeded in reconciling all opinions concerning carbonizing methods. The paragraph on "Carbonization-Products" is improved.

Mr. Butterfield has added another head to his systematic classification of the raw materials of gas manufacture, in order to make a place for those new comers, the carbides, "which interact with water to yield gaseous hydrocarbons." His discussion of the impurities of crude coal gas has been recast in order to lay stress on the pernicious effect of carbonic acid upon illuminating power. He makes the observation that "generally speaking, the removal of carbonic acid is less costly than enrichment to compensate for its retention in the gas." As the French say, "that depends." It is not always a question of simple cost, but of expediency and convenience as well. The account of washing and scrubbing has been modernized; and a new paragraph treats of "traces of ammonia in washed gas." It is unnecessary to say anything to commend Mr. Butterfield's masterly

\* "Gas Manufacture (The Chemistry of)," &c. Second Edition, Revised, with a New Chapter on Acetylene. Numerous Illustrations. By W. J. Atkinson Butterfield, M.A., Consulting Chemist, Formerly Chemist at the Gas-Works, Beckton. London: Charles Griffin and Co., Ltd.; 1898.



handling of all questions of testing: A new paragraph deals prudently with the toxic action of water gas. Those who want information concerning oil gas and spirit enrichment processes, will find it here. The author's treatment of acetylene is adequate; and his observations upon its use for lighting, judicious. Lastly, an appendix contains the London Gas Referees' instructions for the summer of the present year. Altogether, therefore, we are able to recommend the new edition of "Gas Manufacture" as well deserving a place in every gas engineering library, however limited.

### PERSONAL.

On Monday last week, the officers of the Portsea Island Gas Company invited to a complimentary dinner their colleague Mr. HARRY BARBER, who, after 21 years' service, is leaving the Company (as already mentioned in the "JOURNAL") to take the appointment of Secretary of the Sheppy Gas Company. A handsome testimonial, which took the form of a silver tea and coffee service, was subscribed for by the Directors and officers of the Company, and was presented by the Secretary, Mr. C. Jenkins, who bore testimony to Mr. Barber's great abilities, and to the efficient manner in which he had always carried out the duties of his office.

### OBITUARY.

Mr. JOSEPH WHITWORTH, who for many years has been Secretary of the Honley Gas Company, died last Sunday week, at the age of 77.

We regret to record the death, on the 20th inst., of Mr. ROBERT DALE, who had been for a quarter of a century connected with the Durham Gas Company, and for the past seventeen or eighteen years had held the position of Secretary. He had been in very bad health for some little time; and during the summer the Directors sent him to Grange-over-Sands. He returned rather better, but was not long able to attend to his duties. He was a member of the North of England Gas Managers' Association, but was very little known. Mr. Dale was only forty years of age, and unmarried.

### NOTES.

#### Preservative Paints.

Some instructive tests of preservative paints are reported in American technical journals as having been carried out for the Norfolk and Western Railway, under the supervision of Mr. G. R. Henderson. There were 162 test-pieces in all, of different materials; but they all had two coats of paint on one side in nine different combinations of lead and zinc. Thus treated, the samples were hung for a year on the south side of a workshop, just under the eaves. With tin, the best results were obtained with a first coat of white lead and a second coat of white zinc. It was the same with galvanized iron. With sheet iron, the mixture of one-third white zinc and two-thirds white lead, for both coats, gave the best results. Poplar and white pine wood did well with a second coat of zinc upon a priming of lead, or zinc, or of both mixed. Yellow pine seemed difficult to treat properly with any blend of paints; but a lead priming answered best. As a general result, it appeared that lead priming and zinc coating is good for tin, galvanized iron, poplar, and white pine. Sheet iron showed up best with both coats of mixed paints. Black iron, as might be supposed, took the paint better than either tinned or galvanized plate. The suggestion that lead and zinc paints can be mixed with advantage for structural ironwork is novel, and cannot be accepted without some fuller experience.

#### The Strength of the Ironmongers' Trade.

A suggestive "census" has just been taken by the "Ironmonger" to ascertain the six articles most frequently asked for by ironmongers' customers. It is stated that the number of responses to the inquiry has been sufficiently large to enable an opinion to be formed as to what articles are chiefly in demand, throughout the United Kingdom, of this class of shopkeepers. The inquiry is obviously one that might be extended with advantage to other dealers in "sundries," and would help to establish the truth as to what the public chiefly needs. In the case of the ironmongers, the commodities that figure in the greatest number of entries are as follows, in the proper order: Nails, screws, tacks, locks, paraffin oil, lamp glasses. The attention of readers of the "JOURNAL" may be directed to the two last items of the list. All over the kingdom, the mineral oil lamp and the chimneys which it is continually requiring, provide the ironmonger with a great proportion of his trade. Our contemporary does not notice the fact that in London the commerce of the oil lamp is so important that a distinct description of shop is devoted to it. Where the oil shop does not exist, the ironmonger takes the trade. It appears that 68 leading articles altogether were listed as furnishing the bulk of the ironmonger's over-the-counter trade, whereof oil and lamp-glasses came fifth and sixth respectively. Nearly all the returns mentioned these

commodities; some giving them the first and second places. A long way after came lamp wicks, lamps, and incandescent gas-burner mantles. There is evidently plenty of lost ground for the prepayment gas-meter to overtake. No other gas-burner besides the incandescent is in the running.

#### Gas and Water Mains and Electrolysis.

At the convention of the American Society of Municipal Improvements, recently held in the city of Washington, Mr. L. W. Rundlett, City Engineer of St. Paul, presented a report from a Committee appointed last year to investigate the subject of protective coatings for cast-iron and steel riveted gas and water mains. There was little fresh matter in the report. The experience of the past year in St. Paul with cast-iron pipe coated with coal tar, and steel pipe with the Sabin baked covering, showed that the former exhibited slight tubercles, while the coating of the steel main was intact. Mr. Rundlett laid stress upon the importance of careful inspection, to see that the pipes are thoroughly cleaned and properly coated; remarking that rigid specifications not backed up by equally rigid inspection are unfair to contractors and of little protection to cities. At the same meeting, a report of a Committee on Electrolysis was brought up by Mr. Harold P. Brown, who, apparently in despair of getting the mischief prevented in any other way, suggested that gas and water service pipes might be made of wood covered with spiral wrought-iron bands, and heavily asphalted. It was also proposed that, where the danger of electrolysis is greatest, two or more consecutive lengths of wooden gas and water mains should be interposed, in order to break the electric conductivity of the distributing systems. Lead caulking of existing mains in danger areas should also be carefully painted over with asphalt or petroleum wax. Other speakers confirmed the statements made as to the gravity of the evil and the difficulty of preventing it. At Milwaukee, the water-mains are actually connected to the dynamos of the power stations by means of heavy conductors.

#### Stray Electric Currents in New York.

At a recent meeting of the American Institute of Electrical Engineers, in New York, Mr. A. A. Knudson read a paper on the results of an electrical survey of the Manhattan Island, conducted with the object of discovering and measuring wandering electric currents. This locality has elevated railways and trolley-wire electric tramways. About a year ago, the trolley line had a terminus on the east side of the island, immediately fronting an elevated railway station. At this point, there was a difference in potential of 2 volts, rising at times to 10 volts, between the tram-rails and the nearest gas-main. After the removal of this terminal, Mr. Knudson had an opportunity for observing the effects of the passage of electricity from the tram-rails to the gas-pipes and structure of the elevated railway. Here the damage appears to have been confined to the rails. When new, the bottom of the rail was 4 inches wide; but when taken up, the width of the end rail was only 2½ inches, and the lower edges were all worn away to extreme thinness for many feet. Moreover, the rail ties had been eaten through in the middle. Tests at another point showed that a trolley line using rails and water-mains for its return service, can spread its influence for a mile or more in any direction—affecting even independent metallic structures. Thus the superstructure of the New York end of the Brooklyn Bridge was found to be as much as 3 volts positive to the rails of the adjoining cable tramway. The existence of these stray currents, naturally led to a consideration of their effect on the bridge, particularly on the anchorages. No evidence of damage in this respect was discovered.

#### Coke Filters for Feed-Water.

It is a commonplace of industrial experience to state that, while great developments and valuable improvements are continually in progress in some machines and processes, there are many apparently simple requirements which never seem to approach any nearer to complete fulfilment. Stopped ascension-pipes, and naphthalene deposits are illustrations of these incurable complaints in the department of gas manufacture. Mechanical engineering knows several such; prominent among them being the difficulty of removing grease from boiler feed-water. This is admittedly one of the most important of all the technical subjects that engage the attention and exercise the judgment of the mechanical engineer. Marine engineers have long been familiar with this difficulty; but now that large steam-power plants for electric lighting and traction purposes are becoming increasingly common in towns, the question of economizing the feed-water by returning the condensed water to the boilers, is assuming more general interest. The most obvious means of getting the grease out of the condensed water is by filtration; and this is effected by the use of straw, sponges, cloths, and sand. It is suggested, however, that gas coke makes the best filtering medium, and possesses the additional recommendation of costing nothing for the purpose, because it can be burnt to advantage under the boilers when too foul for further use in the filter. Every other filtering medium requires either cleaning, which is a filthy job, or carting away, which costs money. Even coke, however, will not arrest more than 90 per cent. of the grease in the water; and the remainder is still too much to go into the boilers. Further experiment, to deter-



mine the best conditions of duty of coke for this purpose—the proper size of the pieces, and so forth—would be highly valued.

“Etherion” Exploded.

Sir William Crookes handles somewhat severely the claims of Mr. Charles F. Brush to have discovered a new atmospheric gas, which he has called “etherion.” The discoverer has not pretended that his find possesses any chemical affinities, and admits that he only stumbled upon it by observing that in the course of some high vacuum experiments something came off which exhibited a remarkable power of conducting heat. Sir W. Crookes was moved by this statement to look up his notes of old researches upon similar lines; and he now publishes in the “Chemical News” the evidence which tends, in his opinion, to show that Mr. Brush’s etherion is nothing more than aqueous vapour. It is hardly necessary to remark that Sir W. Crookes has been working at vacuum experiments for upwards of a quarter of a century; and so long ago as 1873, he noticed that the presence of a little aqueous vapour played peculiar pranks with some of the results. In short, the anomalous action of aqueous vapour has been obtruding itself upon the notice of the inventor of the radiometer since this early period; and although much of his research into this matter has never been published, he finds in it ample ground for the suspicion that the new American atmospheric gas will turn out to be nothing more mysterious than water vapour. It is admitted that only an abstract of Mr. Brush’s paper has yet been published; and Sir W. Crookes politely affects incredulity that so serious a matter as the existence of a new element should be proposed to be inferred from the scanty evidence yet offered. As it is, one of the strongest pieces of evidence offered by Mr. Brush—the occlusion of his new gas by broken glass—strikes his critic as one reason for regarding it as nothing but water. With regard to the conduction of heat, the rarefied aqueous vapour, somewhat misleadingly called “water gas” by Sir W. Crookes is a better conductor of heat than air or hydrogen at like pressures.

COMMUNICATED ARTICLE.

SLOT COOKERS AND ALL ABOUT THEM.

By E. W. T. RICHMOND.

THIRD ARTICLE.

“Toward London, back again,  
To look into this business thoroughly.”  
“Henry VI.,” Part II., Act ii., Sc. i.

1897. Our first public reference this year is again by Colonel Makins, who, in common with Mr. George Livesey in 1895, now places his remarks respecting gas-stoves and automatic meters right in the forefront of his half-yearly February address to the Chartered Company’s shareholders. Well may he do so, seeing that in 1896 the consumption had increased over 1894—the year before the introduction of the automatic system—1874 million cubic feet. This increase was equal to the whole make of Bradford (1669 millions), Nottingham (1673 millions), Edinburgh (1554 millions), or Brighton and Hull (1800 millions)—a result due almost entirely to the 33,500 additional ordinary stoves (or 39·8 per cent. 1896 increase over 1895) and the 75,000 automatic supplies, 66,300 of which had cookers. The amount consumed by automatic cookers alone is referred to later in this article. He said the average automatic consumption was 19,000 to 20,000 cubic feet, which was more than they dared to expect. When these figures are considered along with those given the following week by Mr. Livesey to his shareholders, it becomes increasingly evident that no Gas Department can afford to wait longer before carefully considering the London free cooker system. Mr. Livesey describes the increase of 1896 over 1895 in money value at £43,000, and he divides this increase into three parts—one, and the largest, to automatic supplies with cookers; and the other two to “gas-stoves and new consumers.” So that, taking the gas-stoves to ordinary consumers and the cookers supplied to automatic meters, the writer ventures to credit gas-stoves with an increase for this one year of over £20,000 to the South Metropolitan Company alone.

CHARTERED COMPANY’S CONSUMPTION INCREASES 1874 MILLION CUBIC FEET.

LONDON AVERAGE PREPAYMENT CONSUMPTION, 19,000 TO 20,000 CUBIC FEET.

SOUTH METROPOLITAN RECEIVES £20,000 EXTRA STOVE REVENUES.

“I should be glad to hear such news as this once every hour.”  
“Henry VIII.,” Act iii., Sc. 2.

Mr. J. Young, of Hanley, in his characteristic “commercial” address from the chair of the Midland Association in the same month as the last two speeches referred to were delivered, again refers to the automatic supply, and admits with a refreshing candour that in Hanley the supply of meters only, without fittings and cookers, has not increased much after the first spurt of 1000 was supplied, as in two years he has only added another 500. He says “they may have been too cautious;” and, in view of the success attending the supply of stoves and fittings elsewhere, he is

seriously considering the desirability of increasing his automatic “inducements.”

The Eastern Counties Association has frequently, and during its last meetings invariably, had some useful reference made to the automatic system; and Mr. J. T. Jolliffe in his Peterborough address (April, 1897), packed as it was with facts and figures, reserved a first-class compartment for prepayment meters. In five years, through their agency, he has nearly doubled his consumers, bringing them from one consumer to twenty inhabitants to one in ten. He supplies four brackets with governor burners (more, if desired, at the consumer’s cost) and a good-sized cooking-stove at 1s. per quarter; and as regards capital, the meter only is placed to this account—the 7d. extra per 1000 cubic feet is credited to a suspense account which liquidates the cost of the remainder of the installation.

|                                      | Cubic Feet. | Revenue. |
|--------------------------------------|-------------|----------|
| Ipswich average lighting consumption | 12,700      | £2 2 6   |
| “ “ “ cooker consumption             | 7,300       | 1 4 3    |
| Total automatic consumption          | 20,000      | £3 6 9   |

The Great Eastern Railway conveys us direct to our next meeting, that of the Commercial Gas Company, where the Chairman, Mr. J. Blacket Gill, congratulates the shareholders and the Engineer (Mr. H. E. Jones) on a record increase for their Company of 7 per cent. for the year ending 1896. And here again it is automatic supplies and gas-stoves to ordinary consumers which account chiefly for the increase. Mr. Jones, in responding to the usual vote of thanks, gives an interesting glimpse of East London in the years that have fled, and shows why the Company’s consumption does not increase faster. This Company fixes slot cookers free separately, and where fixed along with fittings a nominal charge of 1d. per quarter only is made.

The public interest in the system is also manifested by the remarks of the Chancellor of the Exchequer (Sir Michael Hicks Beach). In the Budget speech during the following month (May), he stated that for the year ending March 31, 1897, more than three times the usual number of bronze coins had been minted—largely due to the increasing use of penny-in-the-slot mechanisms. Taking it that at this time there were 300,000 automatic meters in use in the United Kingdom—a number well within the mark—averaging (say 11,500 cubic feet per annum at 25 feet for 1d., or 3s. 4d. per 1000 cubic feet, this would represent 140,000,000 pennies dropped into the slot; and allowing for those used over again, we still have here a tangible effect on the coinage of the country through a simple departure in the system of collecting gas-rentals. The Chartered Company alone collect over 1,000,000 pennies a week—equal to about £215,000 per annum; and in Manchester 43,000 have been collected in one day.

This historical sketch now brings us to another Presidential Address this year—Mr. C. S. Ellery’s at Bath, in June—in which distinctly favourable views both of the present and future of the system are expressed. Mr. Ellery belongs to the enterprising band who early recognized the desirability of supplying slot cookers; and, though charging a rental, he has supplied a moderate proportion of his meters with cookers.

Simultaneously, the fascination of the automatic meter spreads itself over the Paris meeting of the Société Technique de l’Industrie du Gaz en France. Descriptions of four various automatic meters and allied contrivances were read by their respective inventors. The only one that calls for special notice is M. de Billy’s, consisting of two separate meters in one case—one for day, the other for night consumption, at, of course, differential prices.

Within three months of the Paris meeting appears a most exhaustive report on automatic meters throughout Europe, compiled by Herr F. Reichard, of Carlsruhe. The writer remembers visiting this gentleman twelve years ago, and found him most enterprising, and free from Continental prejudices. As might be expected, in his own town light and cookers are supplied at 1s. per quarter. The refusal of the German Standards Authorities to recognize the slot meters has prevented much progress being made up to date in Germany; but now this is withdrawn, a great future is before them.

In France, an installation with a cooker, two lights, and meter, averaging about £4 10s., including service, is the usual practice. In Italy, Rome and Genoa have upwards of 1000 meters in use. In Switzerland, Geneva alone has successfully introduced the system.

In Denmark, Copenhagen had at this date 250 meters. There is little doubt, however, that Mr. F. D. Marshall, who boasts at present a day consumption of nearly 80 per cent., will make the system, both in Copenhagen and the other ten Continental towns under his brilliant and resourceful management, an unqualified success. Unfortunately, an account of the method whereby Mr. Marshall obtained his unique and remarkable day

How  
MR. J. T. JOLLIFFE  
FINANCES.

MR. H. E. JONES,  
M.INST.C.E.,  
COMMERCIAL GAS  
COMPANY.

SIR MICHAEL HICKS  
BEACH AND THE  
COINAGE.

MR. C. S. ELLERY,  
BATH.

CONTINENTAL  
PROGRESS AND  
OPINIONS.

HERR F. REICHARD,  
CARLSRUHE.

FRANCE, ITALY, AND  
SWITZERLAND.

MR. F. D. MARSHALL,  
COPENHAGEN.



consumption does not come within the scope of this article; but it may be stated that, chiefly through this consumption, he has in seventeen years reduced the price of gas in Copenhagen and the other towns lighted by his Company, from about 7s. 6d. to 3s. 3d. per 1000 cubic feet, besides paying 9 per cent. on an additional capital of close upon £500,000.

**HOLLAND AND BELGIUM.** In Belgium, Antwerp, with more than 3600 prepayment meters, and Brussels, with 1100, are fair beginnings. Three other towns average more than 200 each. In Holland, Utrecht, Rotterdam, Tilburg, Hoorns, and Arnhem have upwards of 10,000 meters between them, and are fixing over 150 a week.

Herr W. von Oechelhaeuser, of Dessau, considers "the delay in pushing the meters in Germany is a good thing, as they will profit by recent English improvements!" The custom of having two coin boxes to each meter finds favour in the Fatherland, one being removed full while a second is replaced empty—a system open to various objections, but worth passing notice.

**MR. THOS. WILSON, COATBRIDGE.** Returning to our own shores, we are again favoured by a paper on "Prepayment Meters," read at the annual meeting of the North British Association by Mr. Thos. Wilson, of Coatbridge. Neither in the paper nor in the discussion which followed do we find any mention of cookers being supplied. But this feature will not long escape the attention of our Scottish friends when they realize, as Mr. Hubert Pooley, of Dunfermline, among others, has done, that cookers are a necessary adjunct to make the installation really pay. Mr. Wilson's plan of "returning the difference" after a reduction, instead of changing the wheels or otherwise adjusting the meters, seems popular—gratifying a general weakness for discounts; and he has increased his consumers 22 per cent. by prepayment means.

Mr. T. D. Hall, of Montrose, recommends shilling-in-the-slot

HOUSES SUPPLIED WITH SLOT COOKERS BY THE  
TONBRIDGE GAS COMPANY.

NUMBER OF SLOT COOKERS FIXED BY THE COMPANY, 260.



BETTER-CLASS HOUSES, ASHBURNHAM ROAD, TONBRIDGE.

|                                                          |     |
|----------------------------------------------------------|-----|
| Rentals per week                                         | 9s. |
| Number of cubic feet of gas for 1d.                      | 23  |
| Extra charge per 1000 cubic feet to prepayment consumers | 9d. |



CHEAPER-CLASS HOUSES, BOTANY, TONBRIDGE.

|                  |                |
|------------------|----------------|
| Rentals per week | 3s. to 3s. 6d. |
|------------------|----------------|

[Tonbridge average automatic consumption, 13,000 cubic feet = 8000 feet, "cooker;" 5000 feet, "lighting."]

HOUSES FITTED WITH SLOT COOKERS BY THE IPSWICH GAS  
COMPANY.

NUMBER OF SLOT COOKERS FIXED BY THE COMPANY, 454.



BETTER-CLASS HOUSES, WESTERFIELD ROAD, IPSWICH.

|                                                          |      |
|----------------------------------------------------------|------|
| Rentals average per week                                 | 10s. |
| Number of cubic feet of gas for 1d.                      | 24   |
| Extra charge per 1000 cubic feet to prepayment consumers | 7d.  |



CHEAPER-CLASS HOUSES, GREAT GIPPING STREET, IPSWICH.

|                          |     |
|--------------------------|-----|
| Rentals average per week | 2s. |
|--------------------------|-----|

meters; and Mr. A. Yuill, of Alloa, after three years' experience, heartily approves of the system, as also does Mr. A. Wilson, of Perth, with 800 prepayment meters in use. Mr. David Vass complains of having only 3000 to 4000 cubic feet consumption per annum through these meters in Portobello. If he had cookers fixed he would soon cease to complain, and rejoice in at least a trebled consumption. At any rate, this is evidently the

COAL CONSUMPTION  
CHECKED.

view of the National Association of Colliery Managers, who met in May, 1897, at Wrexham, and whose President complains that "the coal strikes are causing the public to use gas-stoves," and that they are "encouraged to do this by gas companies supplying and fixing free of cost gas-stoves in their respective districts." Rather an alarmist view, considering that water and oil gas are as yet but trifling adjuncts to the gas obtained from our coal supplies. Still, the pronouncement "marks time," and shows how gas cooking and heating are laying firm and favourable hold of the public mind. A thousand pities not to strike while the iron is hot, and weld, by means of the automatic attachment, this great mass of new consumers into a united community of gas-stove users.

No two Gas Engineers have done more to bring about this desirable result than Mr. George and Mr. Frank Livesey; and we find this duly appreciated by the London Press. The "Daily News" published an interview about this time (August, 1897), with Mr. George Livesey, who added to his prepayment paragraphs advice as to the use of incandescent burners. This was followed shortly by the enterprising "Daily Mail," who received from Mr. Frank Livesey most interesting facts and figures, from which I select the following bearing on the subject: "Prior to the introduction of the coin meter (with cooker), Sunday was an



HOUSES FITTED WITH SLOT COOKERS BY THE WALLASEY GAS DEPARTMENT.

NUMBER OF SLOT COOKERS FIXED BY THE DEPARTMENT, 200.



BETTER-CLASS HOUSES, WINDSOR STREET, NEW BRIGHTON.

Rentals average per week . . . . . 9s.  
Number of cubic feet of gas for 1d. . . . . 23  
Extra charge per 1000 cubic feet to prepayment consumers . . 7½d.



CHEAPER-CLASS HOUSES, HOPE STREET, WALLASEY.

Rentals average per week . . . . . 6s. 2d.

extremely slack day for gas, but the demand between twelve and two o'clock, when thousands of dinners are being cooked on and in the gas-stoves, is enormous. . . . The effect has been an equalizing of the summer and winter consumption. Formerly there was a great disparity; but the consumption of gas for cooking in the summer months has worked a marked change." Again: "Not more than a dozen of our coin meter consumers have been lost!"—a striking testimony to the popularity of the system. Mr. Livesey stated that as much as 10 tons of coppers had been removed in one collection, and it was estimated that at one time £10,000 worth of coppers was locked up in their slot consumers' meters. Mr. Frank Livesey writes me, in the course of an appreciative letter, under date Oct. 29, 1898: "If I were asked to add to your articles, I should say, when you have a considerable number of these consumers, see that there is a good pressure in the mains, for if you give them the gas they will burn it. I now put on a special cooking pressure daily between 11 a.m. and 2 p.m."

The remarkable hold obtained by the South Metropolitan Company on its district may be gathered from Mr. G. Livesey's bi-annual address. He stated that at this time they had secured two-thirds (63,000) of their possible consumers, and were gaining on the other third (37,000) at the rate of 200 a week. To find a parallel to their present consumption increase of 10 per cent., it is necessary to go back twenty-five years.

THE SOUTH METROPOLITAN COMPANY GETS 63,000 NEW CONSUMERS.

THE GASLIGHT AND COKE COMPANY GETS 65,000 NEW COOKER CONSUMERS.

The Gaslight and Coke Company share in this prosperity, as is evinced by the Governor's remarks at the August half-yearly meeting, in the course of which he speaks of their 65,000 automatic cookers consuming in 1897 508 million cubic feet of gas—an amount as large as the whole make of Derby or South Shields, or the three

towns of Lancaster, Ramsgate, and Stafford combined. The total automatic lighting and cooking consumption is referred to at the commencement of this article.

The fast passing months bring us again into October, and the date of the North of England Gas Managers' Association meeting, under the presidency of Mr. J. Holliday, to whose experience with prepayment meters and grillers previous reference has been made. In his address, Mr. Holliday expresses every confidence in the future of the slot system, but is "dubious" as to its increasing at the rapid rate which ruled at the commencement of the system; and he is, I know, not satisfied with the amount of the automatic consumption. The writer is arrested by this and similar statements made by gas engineers where a cooker is not supplied. It would appear that the addition of slot cookers increases the demand for slot meters wherever adopted. As mentioned in the second article, Mr. Holliday writes me (Oct. 18, 1898): "The Scarborough Gas Company have agreed to supply a slot cooker free;" so that their demand for slot installations may be expected to boom again.

HOUSES FITTED WITH SLOT COOKERS BY THE HEREFORD GAS DEPARTMENT.

NUMBER OF SLOT COOKERS FIXED BY GAS DEPARTMENT, 366.



BETTER-CLASS HOUSES, CHANDOS STREET, HEREFORD.

Rentals per annum . . . . . £18  
Number of cubic feet of gas for 1d. . . . . 20  
Extra charge per 1000 cubic feet to prepayment consumers . . 14d.



CHEAPER-CLASS HOUSES, BRYNGWYN TERRACE, HEREFORD.

Rentals per annum . . . . . £7 10s.



While in the neighbourhood of Scarborough, reference should be made to the success attending the introduction of automatic installations with cookers in Hull. I cannot find any public references from Mr. Dougall, but it should, I think, be known that his automatic consumption, with cookers, ranges from 19,500 to 22,000 cubic feet per annum. These excellent results are doubtless attributable to the British Gaslight Company's liberality in supplying 35 cubic feet of gas for 1d., and the cooker to help out the day and summer consumption.

This record of the public references to prepayment meters in 1897 would be by no means complete without recording the outspoken testimony of the Commercial Gas Company's respected and resourceful Engineer, Mr. H. E. Jones, to the advantages of attaching a cooker to the automatic installation. The Company had a record increase of 11 per cent.—1 per cent. better than the South Metropolitan; and, in response to a vote of thanks moved by the Chairman (Mr. J. B. Gill) and seconded by Mr. George Livesey, Mr. Jones said "the 11 per cent. increase could not continue, but there was room for a steady growth by supplying gas to working men's dwellings. They were not only helping the working man, but the working woman too, as when the latter persuaded her husband to put in a small gas-stove, the consumption went up more than 50 per cent." Mr. Frank Livesey gives the South Metropolitan Gas Company's cooker increase at 70 per cent.; and Mr. G. F. L. Foulger, The Gaslight and Coke Company's, at 100 per cent. The foregoing testimony from so cautious a "parliamentary hand" as Mr. Jones is most valuable. Had he desired to quote, he might have added—

"Mistress, I beseech you,  
Confirm his welcome with some special favour.

Once more, new servant, welcome."

"Two Gentlemen of Verona," Act II, Sc. 1.

With such an admitted increase, free cookers must surely soon become throughout the country a recognized part of every installation. Let us hope slot consumers may speedily be told that cookers—

"Shall ere long be free,

Be free, and fare thou well."

"Tempest," Act v., Sc. 1.

(Will be concluded next week.)

**Society of Engineers.**—At the meeting of this Society next Monday, Mr. George Thudichum, F.C.S., will read a paper on "Bacterial Treatment of Sewage."

**Railway Carriage Lighting by the Pintsch System.**—For some time past there have been general complaints with regard to the lighting of the trains on the South Australian Railways, and various attempts have been made to introduce some better system of illumination than the oil-lamps which afflicted passengers by the long-distance trains running out of Adelaide. Electricity was tried; but it proved too costly. At length it was decided to adopt Pintsch's gas system, which, as readers are aware, has proved highly successful in this particular department of public lighting. Plant was accordingly erected in the station yard at Adelaide; and several carriages were fitted up with the new light. With the object of testing its effect, a trial trip was made on the 7th ult.; the party consisting of the Railways Commissioner (Mr. A. G. Pendleton), and a number of the principal officials and members of Parliament, accompanied by Mr. T. R. Saxton, the Engineer of the Pintsch Company, who has been in the colony since May superintending the erection of the plant. The trip, in which several ladies took part, was in every way successful; the party being unanimous in praise of the new light. The cylinders in which the gas is stored are 20 inches in diameter and 8 feet long. They are constructed of light steel plates tinned inside and out, and the seams are brazed. Each cylinder is fitted with a shut-off valve, so that they may be taken down without loss of gas if necessary when the carriage is in the shops for repairs. A sufficient quantity of gas is stored in these cylinders to supply the lamps for 24 hours' continuous burning with the lamps full on. Each carriage and lamp is provided with a bye-pass, so that the gas may be turned down to a very small flame when it is not required. The lamps in sleeping compartments are provided with silk shades. The pressure in the cylinders at starting is 100 lbs. per square inch; but this is reduced by means of a patent regulator to a pressure of 0.5 inch at the burners. The quantity of gas in the cylinders is shown on gauges fitted on either side of the carriage. Each burner consumes from  $\frac{3}{4}$  to 1 cubic foot of gas per hour according to the class of lamp, and gives a light equal to from 8 to 9 candles per burner. Each double-burner lamp furnishes a light equal to 16 candles. It is expected that by the end of the year Pintsch gas will be in use in all the broad-gauge carriages and joint-stock cars running on the line between Adelaide and Melbourne.

## TECHNICAL RECORD.

### MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

#### Quarterly Meeting in Bradford.

The One-Hundred-and-Sixteenth Quarterly Meeting of the Members of this Institution was held on Saturday, under the presidency of Mr. W. S. Haddock, the Engineer and Manager of the Warrington Corporation Gas-Works. There was a fair attendance of members, and the items of business on the agenda were carried through with commendable punctuality. Directly on the arrival of the Manchester contingent at the Victoria Station, Bradford, conveyances started to take the party to

#### THE BRADFORD CORPORATION CHEMICAL WORKS.

The Frizinghall Chemical Works were established 30 years since by Messrs. Illingworth and Co., who at that time had the contract for the tar and ammoniacal liquor from the Bradford Gas Company's works. The works were sold in 1878 to Messrs. Spence and Stewart, from whom they were purchased by the Corporation in 1884; and since that date the plant has been almost entirely replaced by modern apparatus.

At present, sulphuric acid, sulphate and muriate of ammonia, sulphate of soda, copperas, and hydrochloric acid are produced for sale; while copper sulphocyanide, prussian blue, and oxide for gas purification have been prepared in quantity from time to time, when it has been found profitable to do so.

The furnace, containing 24 ovens, is capable of burning about 35 tons of spent oxide per week. The sulphuretted hydrogen in the waste gases from the saturator is also burnt in the ovens. The Glover absorbing tower is 26 feet high by 9 feet by 7 feet, and is filled with acid-resisting blue bricks. The three chambers have, with the towers and pipes, a total capacity of 108,500 cubic feet. The Gay-Lussac tower is 30 feet by 9 feet by 9 feet, and is filled with coke. The efficiency of the towers is good; the nitre used being less than  $\frac{1}{4}$  lb. per 100 lbs. of vitriol made.

All the ammoniacal liquor is brought by gravitation in pipes from the four gas stations into a large underground storage tank. The present Coffey still, 30 feet by 3 feet by 3 feet, is of old pattern, and about to be replaced. The fixed ammonia is removed in a Colson still, 10 feet by 6 feet diameter. The saturator is circular, with conical bottom; and the sulphate is elevated by a Wilton discharger into a series of travelling buckets, which are emptied where required into the store. The waste liquors from the liming still are run into settling-tanks; the lime sludge being pumped on to the land, and the liquor treated with acid, and the blue recovered. The condensed water from the saturator gases (Devil water) is treated by redistillation in a special Colson still. The vapours are returned to the pipe leading from the saturator; and the water runs away comparatively pure.

About 10 tons of copperas are made per week—chiefly from old tins received from the Corporation refuse destructors.

In the salt-cake furnace, 15 tons of salt are used per week; and about 25 tons of hydrochloric acid and 28 tons of purified Glauber salts are produced.

A few figures as to last year's working may be interesting: 21,000 tons of liquor, of an average specific gravity of 68° Twaddell, were used; 2300 tons of sulphuric acid were made; 2347 tons of sulphate of ammonia were produced, or 29.47 lbs. per ton of coal carbonized; and 450 tons of copperas were made.

Mr. Charles Wood, the Gas Engineer of the Bradford Corporation, and Mr. John Wyld, the Manager of the Chemical Department, were present, and rendered every assistance to the members in their tour of inspection round the works; so that a very good idea was carried away of the various processes by which the residuals of all the Corporation's works are here treated, in order to form a better source of revenue to the department than would result from their sale to outsiders.

On returning to the town, lunch was served in the Midland Hotel; and shortly after 2.30 the members assembled for the business proper of the meeting. On Mr. HADDOCK taking the chair,

The Hon. SECRETARY (Mr. S. S. Mellor, of Northwich) read the minutes of the last meeting, and they were approved.

#### ELECTION OF A NEW MEMBER.

Mr. Arthur Halliwell, of Marsden, was elected a member of the Institution.

#### ELECTION OF PRESIDENT FOR 1899.

Mr. MELLOR proposed that Mr. R. G. Shadbolt, of Grantham, should be elected President of the Institution for the coming year. He had great pleasure in nominating Mr. Shadbolt, because last year that gentleman had relieved the Committee of very considerable difficulty. On that occasion a Senior Vice-President was elected who declined to serve; and then another gentleman was appointed, who declined on the morning of their quarterly meeting. But Mr. Shadbolt very kindly stepped into the breach. Besides, Mr. Shadbolt had been of great service to the Institution at their meetings; and he had contributed many valuable papers—especially the one on purification which he read at Buxton. He was sure Mr. Shadbolt



would do credit to the office of President—an office which had been filled by worthy men in the past, and he hoped would be held by worthy men in the future.

The PRESIDENT seconded the resolution. In promoting Mr. Shadbolt's candidature, the Committee, he said, knew they were doing one of the best things they could for the Institution. Mr. Shadbolt had great capabilities, and also took much interest in the Institution.

Mr. WILLIAM CARR said all those who had taken any continued interest in the affairs of the Institution had looked forward to the time when Mr. Shadbolt would become the President.

The resolution was put and carried unanimously.

Mr. SHADBOLT, in returning thanks for his election, said he should endeavour, with the assistance of the members, to faithfully carry out the duties of the office.

PURIFICATION.

The PRESIDENT said this subject was not being brought forward in the form of a paper, because, unfortunately, they were unable to persuade any member to write a paper; and at their last Committee meeting, it became a question of either abandoning the meeting altogether, or else bringing forward the subject in the present form. He hoped this departure from the usual course would not be detrimental to the interests of the Institution. He was much obliged to Mr. Shadbolt for introducing the subject; and he trusted it would lead to a really profitable discussion.

Mr. R. G. SHADBOLT said, as the President had remarked, this form of introducing the subject was somewhat of an experiment; and he would ask the members to bear with him if his efforts did not come up to the standard of the stereotyped paper. The question of purification was one which interested every gas manager, be his works large or small. It was a matter which all were from time to time called upon to deal with; and the conditions surrounding purification were perhaps more diverse than many people at a cursory glance would imagine. Strictly speaking, it might be taken that purification commenced at the moment the temperature of the gas issuing from the retort began to fall. The question of condensation, which was really the first stage in purification, was one with which they were not greatly concerned that day; the only point about it which, to his mind, it was necessary to refer to being that the operation was one which should be confined within certain limits. If they provided no condensers, the condensation proceeded just the same; the only thing was that it went on to the detriment of those processes which followed. Condensation should be confined to its proper sphere; and it should be accomplished before the gas was subjected to any washing or scrubbing for the removal of ammonia and other impurities. Condensation might be said to consist in the removal of all that was noxious in a gas; but, incidentally, it removed many hydrocarbons, some of which would be of great value if they could succeed in retaining them. Having, as he thought they would all agree, accepted the dictum that condensation must be confined to its proper sphere, the next process which they came to was, both in point of order and of importance, that of scrubbing or washing. Generally speaking, it was assumed that the object of scrubbing was to remove the ammonia from the gas. This was the first object; and it could be very easily performed if they could use an unlimited supply of fresh water. But, unfortunately, commercial and other considerations dictated that they should limit the supply to a very small quantity indeed. This, it had been proved, was not an altogether unmixd evil; for they found that the caustic soda itself had a great affinity for some of the impurities they had to remove. Scrubbing and washing, like condensation, must be confined to their proper sphere if they would have their condensation complete. The condensation was the all-important point in the cost of purification. They were very often puzzled to know why the cost of purification differed so very greatly. If they were to look into it, they would find that it was not due so much to the kind of purifying boxes they used as to the efficiency or inefficiency of the condensing and the scrubbing plant. [Mr. Shadbolt here referred to Statement "A."] These figures were obtained from experimental plant, and were extreme cases; but they all went to show the point that he wished to demonstrate—viz., the varying conditions that one works might labour under compared with another in the composition of the gas in the purifiers. It might be assumed at this stage that the proper thing to aim at in purification was to bring down the proportion of impurities to something comparatively constant; and this might be done by means of the liquor itself. Experiments carried out on a large scale had been pronounced a failure; but although this process had evaded their grasp so far, no doubt good work could be got out of liquor by means of judicious handling. The next table (Statement "B") would show what work the liquor did in this particular respect. It would be evident to all from the above statement that the liquor played a very important part, and that it absorbed, when rightly applied, a great proportion of the impurities which they would otherwise have to deal with in the dry boxes. Alluding to the last analysis in Statement "B," with respect to the washer-scrubber, he said he thought this showed what clean water was capable of doing by the time it became 7° or nearly 5° Twaddel, if rightly used. The next table (Statement "C") would show the actual work that was being done by the scrubbers

STATEMENT A.

Comparative Proportions of Impurities in Gas at Purifier Inlet from Samples of Coal and Cannel.

| Sample.  | Grains of Impurities per 100 Cubic Feet of Gas. |                |                    |
|----------|-------------------------------------------------|----------------|--------------------|
|          | Sulphuretted Hydrogen.                          | Carbonic Acid. | Sulphur Compounds. |
| Cannel . | 683                                             | 2478           | 18'40              |
| Coal .   | 1800                                            | 1750           | 32'50              |

STATEMENT B.

Impurities Contained in Liquor (Percentage by Weight) Drawn from Various Apparatus.

| Source.               | Strength Degrees Twaddel. | Percentage of Impurities. |                |                        |
|-----------------------|---------------------------|---------------------------|----------------|------------------------|
|                       |                           | Ammonia.                  | Carbonic Acid. | Sulphuretted Hydrogen. |
| Hydraulic Main . .    | 3'0                       | 1'55                      | 0'28           | 0'11                   |
| Condenser Inlet . .   | 6'1                       | 3'27                      | 6'49           | 1'05                   |
| Condenser Outlet . .  | 6'0                       | 3'22                      | 6'52           | 0'94                   |
| Scrubbers (General) . | 7'3                       | 3'08                      | 5'59           | 0'76                   |
| Washer-Scrubber . .   | 7'8                       | 2'88                      | 7'04           | 0'94                   |

STATEMENT C.

Impurities Removed by Scrubbers.

| Impurities.           | Scrubber Inlet. | Scrubber Outlet. | Total Removed. | Percentage Removed. |
|-----------------------|-----------------|------------------|----------------|---------------------|
|                       | Grains.         | Grains.          | Grains.        |                     |
| Ammonia . . . . .     | 3598            | 620              | 2978           | 82'76               |
| Carbonic Acid . . . . | 2100            | 1663             | 437            | 20'80               |
| Sulphuretted Hydrogen | 785             | 730              | 55             | 7'00                |

STATEMENT D.

Cost of Purification when CO<sub>2</sub> removed.

Proportion of Materials \* (approximately) = 1'25 lime to 7 oxide.

[\* By weight when new.]

|                                                                                            |        |
|--------------------------------------------------------------------------------------------|--------|
| Lime, cost per ton of coal carbonized . . . . .                                            | 1'50d. |
| Labour, cost . . . . .                                                                     | 2'25   |
| Loss in volume by removal of carbonic acid, 200 cubic feet at (say) 1s. per 1000 . . . . . | 2'40   |
|                                                                                            | 6'15d. |
| Less profit on spent material* . . . . .                                                   | 0'55d. |
| " gain in illuminating power of 1 candle at (say) 3d. per candle x 10 . . . . .            | 7'50   |
|                                                                                            | 8'05   |
| Showing actual profit per ton of coal carbonized . .                                       | 1'90d. |

[\* Profit on spent material includes profit on spent oxide over and above its first cost.]

STATEMENT E.

Cost of Purification when Sulphur Compounds are kept below 20 grains per 100 Cubic Feet.

Proportion of Materials\* (approximately) = 2'5 lime to 7 oxide.

[\* By weight when new.]

|                                                       |        |
|-------------------------------------------------------|--------|
| Lime, cost per ton of coal carbonized . . . . .       | 3'00d. |
| Labour, cost . . . . .                                | 2'75   |
| Loss in volume of carbonic acid (as before) . . . . . | 2'40   |
|                                                       | 8'15d. |
| Less profit on spent material . . . . .               | 0'45d. |
| " gain in illuminating power (as before) . . . . .    | 7'50   |
|                                                       | 7'95   |
| Net actual cost per ton of coal carbonized . . . .    | 0'20d. |

themselves. After the work done by the scrubbers in the particular experiment to which the figures here given related, the gas would be passed through a washer where the remaining 620 grains of ammonia would be removed; but as this would affect the sulphuretted hydrogen to such a very small extent, and likewise the sulphur compounds, he thought it might be regarded as a negligible quantity. It might be taken for granted that, generally speaking, under normal conditions with mixed South Yorkshire and Midland coal, they might expect, with efficient scrubbing and washing, to find 1663 grains of carbonic acid at the inlet of the purifier, and 730 grains of sulphuretted hydrogen. Working on this basis, it was found, from actual experience, assuming that no more than two boxes were charged per week, that the area required per 1000 cubic feet per diem was 2'4 superficial feet, or 0'6 superficial foot per single box, assuming that they had four boxes to work with. The layers of purifying material would be disposed of as follows:—

Purifying Capacity Required.

|                                                                  |                   |
|------------------------------------------------------------------|-------------------|
| Maximum Number of Chances . . . . .                              | 2 Boxes per Week. |
| Superficial Area Required per 1000 cubic feet per diem . . . . . | 2'4 sup. ft.      |
| Superficial Area per Box per 1000 cubic feet per diem . . . . .  | 0'6 sup. ft.      |
| Number of Boxes . . . . .                                        | 4                 |

Layers of Purifying Material.

|                                                                             |                                     |
|-----------------------------------------------------------------------------|-------------------------------------|
| Lime . . . . .                                                              | 4 Layers of 9 inches each, per Box. |
| Oxide . . . . .                                                             | 2 " 18 " " " "                      |
| Or combined as desired with total thickness of material, 36 inches per Box. |                                     |



Having fixed the conditions, and decided upon the capacity of the purifiers themselves, the next and vital question which presented itself was to what extent should they purify. He would divide this subject into three heads: (1) The removal of the sulphuretted hydrogen, which, in itself, was imperative; (2) the removal of the carbonic acid; (3) the removal or the reduction of the sulphur compounds to something like the Gas Referees' requirements. The first might be disposed of very quickly. All would agree that the use of oxide of iron for the purpose of the removal of sulphuretted hydrogen alone cost nothing, when the value of the spent material was taken into account; and, in fact, in some instances, it resulted in an actual profit. Coming to the second stage—the removal of the carbonic acid—from his own experience, corroborated as well as added to by the experience of others, he found that the working would be something approximating to what he had shown in Statement "D." Coming to the third, or more complete stage, it would be found that the cost was a little more (see Statement "E"). These costs were not historical in any shape or form; they were taken from practical everyday working, under conditions approximating to those previously stated. They were not all from his own experience, but were verified by the experience of both larger and smaller works, and, he thought, might be taken to be fairly representative. So far he had dealt with purification unassisted by the use of free oxygen. The point he wished to submit for discussion by the meeting was this: That considering that what might be termed complete purification might be achieved at a cost of 2d. per ton of coal carbonized, taking into calculation the losses and gains on every hand, no one was justified in sending out gas partially purified. Whatever spark of argument to the contrary might be brought forward, would disappear when it was borne in mind (as he pointed out at the Buxton meeting of the Institution) that the life of the oxide itself might be prolonged threefold by the judicious use of air, moisture, and warmth; and that whatever cost there might be remaining would be entirely removed, and an actual profit result, even when complete purification was attained. Sulphur clauses or not, it was their duty to themselves, to their customers, and to everybody interested, that they should religiously purify their gas to the utmost extent, especially when it was seen that it cost practically nothing to do so.

Mr. E. E. J. ANDERSON (Ripon) asked at what point Mr. Shadbolt considered the condensation complete before passing on to the scrubber.

Mr. SHADBOLT replied that he considered condensation complete when what was termed the tar was removed.

Mr. ANDERSON asked if Mr. Shadbolt considered it was complete at 60° to 70°.

Mr. SHADBOLT said he attached very little importance to the temperature, but more to the state of the gas.

Mr. J. H. BREARLEY (Longwood) said that, knowing the subject of purification was going to be introduced, he had taken out some figures in connection with his works. During the last 22 months, they had actually made a profit from the purification; but he did not want anybody to conjure up Utopian dreams of profit from purification, because during this period they were in a favourable position for selling their spent oxide. They actually made a profit of £18 13s. 10d. The quantity of spent oxide sold was 107 tons; and roughly calculating 50 tons of new to replace the 107 tons sold, this would cost, at 25s. a ton, something like £68, which would bring the outlay on purification during the period mentioned to £54 16s. 2d. The quantity of gas sold was 91,478,000 cubic feet; so that allowing for the outlay on new material, which was the first thing to estimate when seeking to arrive at the cost of purification, it was costing them  $\frac{1}{4}$ d. to purify the gas. Their maximum make was about 300,000 cubic feet per day. They had four 20-feet boxes filled with oxide. Lime boxes were used as catch boxes; and the gas was passed through the oxide. The sulphur was kept within reasonable limits; and they had had no complaints either of sulphur or want of illuminating power during the last eighteen months. They also tested the lime boxes, and kept the gas free from carbonic acid. He ought to add that his results had been obtained without the admission of air. He should like to ask Mr. Shadbolt if he would give them any test he had made respecting the admission of steam and air, and as to what effect it had on the illuminating power. He could not convince himself that the admission of air did not reduce the illuminating power. He had carried out experiments, in order to test the utility or otherwise of the admission of air; and at present he was quite content to do without it. On looking through the analyses of 32 large works, he found that there were only three where the figure was below  $\frac{1}{4}$ d.; and seeing that this was the case, he was quite satisfied to leave air alone.

Mr. J. WILKINSON (Drighlington) was much obliged to Mr. Shadbolt for bringing this important subject forward, and giving them his experience. On looking into the purification accounts of various gas undertakings, he found that almost every manager had a different way of making them up. According to the Parliamentary Returns, they were supposed to include in their purification charges the oil and water used on the works; but he failed to see why purification should be debited with these items. Some gas companies were far better situated for the disposal of their spent oxide than others. He had sold oxide at  $\frac{1}{2}$ d. per unit at the works; whereas his next door neighbour had had to be content with  $\frac{1}{2}$ d. He derived his advantage solely through

his trade in vitriol; and it would therefore be unfair of him to compare his accounts with those of his neighbour. He noticed that Mr. Shadbolt allowed for the loss in volume of carbonic acid, but did not allow for loss in volume of the sulphur compounds. The point that struck him in Statement "B" was that 6.1° Twaddel took out 3.72 per cent. of ammonia, 6.49 per cent. of carbonic acid, and 1.05 per cent. of sulphuretted hydrogen. These were the highest figures, with the exception of one item of carbonic acid. He should like to ask Mr. Shadbolt's opinion as to really the best Twaddel for liquor. They found, in the manufacture of sulphate of ammonia, that about 5° Twaddel was the most convenient strength to work liquor; and from this he should judge that it would not be policy to work their liquor at any higher strength.

Mr. WILLIAM CARR (Stalybridge) said Mr. Shadbolt did not tell them how he arrived at the figure of 7.50d. as the gain in illuminating power, which formed a very large feature in the improvement; and he should like fuller particulars with regard to that when he came to reply. The question of purification, as Mr. Shadbolt had stated, began almost as soon as the gas commenced to cool; and the scrubbers or washers played a very important part in it. Some years ago, when they used to sell their liquor, there was no doubt what was the best way to do the washing. But now that they had become sulphate manufacturers, a different complexion was put upon it. He was not quite sure that it was any special advantage to take out the sulphuretted hydrogen from the gas, and then have to remove it again from the sulphate purifiers. If they had a sulphur kiln, it would be another matter. He saw no special advantage in getting the sulphuretted hydrogen into the gas liquor, because they then had to deal with it in a way that was sometimes considerably more troublesome and obnoxious. With regard to the last speaker's query as to what strength of liquor was best calculated to remove impurities, it depended very largely on the quantity of impurities it came in contact with as to its effectiveness. The tables before the meeting could only be taken as approximate, because the quantity of impurities in the gas had to be considered, as well as the liquor used for taking them out. There could be no doubt that a liquor of no strength Twaddel was the best. What they wanted was a solution of caustic ammonia—that was free ammonia—which did not register on the Twaddel hydrometer at all. In testing it by the Twaddel hydrometer, they obtained no guide as to the amount of ammonia there might be in the liquor they were using; and sometimes this was very misleading. As sulphate makers, they would be better without either carbonic acid or sulphuretted hydrogen in their liquor. They would not require to use lime in their still; and, therefore, they would obtain the ammonia from the liquor very much more readily, and probably get a nicer quality of salt. But this was by the way. On the question of purifying in closed vessels, as a sulphate maker he would like to state that the principal point of interest was getting out the ammonia from the gas. There was no advantage in getting it out by the liquor, because they had to deal with it afterwards in a less convenient form than they did in their ordinary purifiers. When they used to sell their liquor by the Twaddel hydrometer, the more impurities they could ram into it the better. He remembered some wonderful results being obtained at one works where they put up tower scrubbers. They got some fabulous results because they charged the liquor with very large quantities of impurities; and as they sold by the Twaddel test, they were paid for ammonia instead of having it deducted, because the liquor was really of less value than other liquor. As had been said, liquor of 5° strength was often the best liquor for working in the ammonia still, and gave the best results of working in proportion to its value. During the present summer, he had been using the air process in trying to work off the oxide purifiers; and a point that had struck both him and his brother was their increased troubles with naphthalene deposits. His brother drew his attention to it in the first place by saying that he found, when his apparatus had been going a very long time, towards the latter portion, the naphthalene troubles increased, and he had been obliged to change his purifiers long before they were shown to be exhausted, in order to prevent the deposit of naphthalene throughout the outlying districts of the town. He found that by reducing the quantity of steam so as to get in about 1½ per cent. of air—which he had never noticed to interfere with the illuminating power in any instance—his naphthalene troubles had diminished. He mentioned this because it might be of advantage to point out to those who were using the air process the advisability of exercising exceeding care in putting the steam in. It was shown by Mr. Shadbolt (and accorded with his own experience) that by getting the steam and air near to the purifiers, so that the steam went in to a certain extent as steam, they got a far higher duty in the way of revivification than they did by putting in the steam a long distance away, so that it was condensed before it got to the purifiers. The moisture being in conjunction with the air seemed to give a greater effect to the action of the air in the purifiers. He had found it a very easy matter to set the oxide on fire in his sulphate purifier. This led to a little trouble; but it showed that the activity of the oxide in the air took place to a much greater extent, or with much greater energy, when it was accompanied by the warmth and moisture of the steam than it did if it were put in in a dry condition. The only difficulty in dealing with it was that they had to remember that when they let in the steam, when the oxide



was nearly spent, a larger quantity went forward with the gas, and then when it got out into the street-mains, more especially in small services and places where it was exposed to changes of temperature, the steam was condensed, and in the act of condensation deposited naphthalene. There was no doubt it had some effect upon naphthalene, because it was still as elusive as ever, and they were still as far off any solution of the naphthalene question as ever. But he had no doubt, from his own experience and from what he had gathered from others, that the fact of the steam being admitted into the purifiers did affect the deposit of naphthalene in the street-mains. He was much obliged to Mr. Shadbolt for the way in which he had opened the discussion, which was certainly a new departure that was well worth following. It was not always convenient to the members of the Institution to write papers, but probably when they found they could introduce a subject in the way this had been introduced, they might feel more disposed to do it than they would if they had to set to work to write out a set paper in the usual way. Mr. Shadbolt had put before them a very important subject; and he (Mr. Carr) only regretted that he did not know a little beforehand the lines he was going to take, so that he might have prepared himself for the discussion. He hoped they would hear something more on the lime question; and he trusted that Mr. Townsend would give them a word or two on the point.

Mr. H. TOWNSEND (Wakefield) said, as Mr. Carr had dragged him into the discussion, there was no way of getting out of it except by following on the lines indicated. In the first place, he wished to congratulate Mr. Shadbolt on the excellent way in which he had introduced the subject. He (Mr. Townsend) was taken by surprise, and did not expect to receive all the information he had obtained. If Mr. Shadbolt had prepared a set paper, it could hardly have contained more. With regard to the question of purification, he (Mr. Townsend) certainly did hold some rather strong opinions. He had not the slightest doubt in his own mind that it was the right thing to extract all the carbonic acid; and he was very glad to find that Mr. Shadbolt also took such a strong line, and had so unhesitating an opinion in favour of taking out the sulphur compounds as well. At Wakefield, although they were only under the ordinary provisions of the Gas-Works Clauses Act, and therefore merely limited to removing the sulphuretted hydrogen, yet, as the Corporation had appointed a chemist to analyze their gas, they found it would be expedient to remove all the sulphur compounds—so that, although they were under no obligation in this respect, they did take out all the carbonic acid and all the sulphur compounds. The reason he had so strong an opinion about the former impurity was this: As most of the members were well aware, some two or three years ago he was Engineer of the Plymouth Gas-Works. When he first went to that place, he travelled down on a winter's day. He had a very long journey, and not having much to do, he amused himself by looking at the gas at the different stations through which he passed, and trying to settle in his own mind the method of purification adopted. This he found to be a very easy task. It was not difficult for any expert to detect when the purification was simply done with oxide of iron, and when the process was backed up by the elimination of all the carbonic acid. Purification simply by oxide of iron produced a gas that was distinctly yellow; while gas purified of carbonic acid was white. He made some notes with the object of ascertaining whether or not his impressions were correct; and on making inquiries subsequently, he found they were. When he got into the southern part of Devonshire, he was struck with the difference in the appearance of the gas from what it was in the Midlands. There it was exceptionally white. He found in town after town a gas of very low illuminating power, but very white; and he came to the conclusion that this part of Devonshire was a limestone district. Next morning, when he visited the gas-works, he was anxious to find out whether or not the deductions he had drawn were correct. Accordingly, one of the first questions he put to his predecessor was as to whether they did the purifying altogether with lime. The reply was in the affirmative. He was told that it was entirely a limestone district, and that the buildings were all of limestone. On one occasion while at Plymouth, having to visit the Midlands, he went to the Post Office of one of the large towns, and was struck by the sulphurous atmosphere caused by the gas. Of course, by purifying altogether with lime, as they did at Plymouth, the gas was exceptionally pure. He then came to the conclusion that it certainly paid to take out the sulphur compounds; and further experience had amply confirmed him in this opinion. He was quite at one with Mr. Shadbolt that, apart from the financial aspect of the question, as a commercial transaction it paid to remove all the sulphur compounds they could possibly take out, and also every particle of carbonic acid. If they wanted to take the sulphur compounds out, they must remove the carbonic acid. He also agreed that it cost very little to do; and that, taking out the carbonic acid made a difference of at least one candle in the illuminating power. Of course, he was not in a position to criticize Mr. Shadbolt's figures, as they had only just come into his hands.

Mr. G. E. STEVENSON did not know whether Mr. Townsend had lately visited the city of Manchester; but if he had, he would have found that the gas was a little whiter than it was in some modern towns. He was afraid that Mr. Townsend was not

quite right in suggesting that the absence of carbonic acid was the sole reason for the gas appearing white. He was rather inclined to think that there were various ways of making gas a pure white—some, perhaps, more costly than others. He was much indebted to Mr. Shadbolt for bringing the subject forward in the way he had. Of course, purification was a vast subject, and one that had so many side branches that any one of them would form the subject of discussion. It was better to have the question brought before them on general lines, so that they might take general views of it. They would all accept Mr. Shadbolt's proposition that the beginning of purification was the deposition of tar from the gas—in fact, purification could not take place until this had been accomplished—and then began the abstraction of further impurities. He was inclined to think, from his own experience of the last half dozen years, that the abstraction of carbonic acid was perhaps one of the most important factors. There was no doubt in his mind that the great proportion of carbonic acid in the gas in northern towns was very largely attributable to the reluctance of some gas-works' proprietors to launch out into the question of sulphur purification. Where considerable amounts of cannel, of the medium coal from the Wigan district and the Nottingham district were used, the proportion of carbonic acid was very rarely less than  $2\frac{1}{2}$  per cent. Now this was a very difficult quantity to deal with in sulphur purification. In London and the southern towns generally, the carbonic acid did not exceed  $1\frac{1}{2}$  per cent.; and then, of course, it was more amenable to control. But if, with  $2\frac{1}{2}$  per cent. of carbonic acid in the gas, they in Manchester were to go in for sulphur purification, it would mean a very great consumption of lime. He did not say it could not, or ought not to be done; but seeing that the expenditure of lime would be great in proportion as the carbonic acid in the gas was high, he thought they ought to cast about to see if there were not means of previously reducing the carbonic acid in the gas. This he saw from Mr. Shadbolt's figures could be done to a certain extent—in fact, according to these figures it would be seen that something over 25 per cent. of the carbonic acid was taken out in the condensing and washing appliances previous to the purification. This was a very good result, so far as it went. But he believed they were all acquainted with the fact that there were gentlemen in the profession who were endeavouring to do something much further than this, by washing gas with liquor which had been freed to a large extent from its carbonic acid fixed in combination with ammonia, and using the liquor over again. He really thought that many of them might with advantage devote some attention to this side of the question, and endeavour to ascertain whether it was not possible, by means of apparatus of moderate cost, to effect the abstraction of a much larger proportion of the carbonic acid—in fact, something amounting to 40 or 50 per cent., instead of 25 per cent. If they could do this, they would be in a much better position to deal with the question of purification from sulphur. Of course, it was rather difficult to discuss Mr. Shadbolt's figures, or to call them in question; but he was inclined to think that he erred in one respect—viz., in regarding the keeping of the sulphur compounds below 20 grains as involving greater expense in time than the purification of carbonic acid. He could not conceive why more lime should be required in purifying from sulphur compounds than in purifying from carbonic acid, if the purification from carbonic acid was complete. There was no doubt that the consumption of lime, in purifying with lime, was to be regulated by the carbonic acid in the gas. It was always in excess. It always had to be taken out before the sulphur compounds could be reduced; and the quantity of lime that required to be used depended entirely, in his opinion, upon the proportion of carbonic acid. Mr. Carr had made some very pertinent remarks in regard to the use of air and steam in oxide purification. To his (the speaker's) mind, the application of air was far more useful in connection with lime than with oxide. It had been found by those who used lime in sulphur purification that it was absolutely necessary to maintain the sulphur purifiers at a certain temperature, approximating to  $90^{\circ}$ . The simplest and best way to do this was to introduce into the purifiers a certain proportion of air, which, having a chemical action in conjunction with the lime and the sulphur, maintained the temperature. The easiest method of injecting this air into the gas was by a steam-jet. In using steam, there was something to be said in favour of the oxide lasting a longer time, and doing more work. It lasted longer, perhaps, because it remained in a porous and free condition, and did not cake. There was no doubt it wanted a good deal of careful control and supervision, because one got a good deal of moisture in the gas which tended to produce naphthalene deposits. He was convinced that the more saturated the gas was with moisture as it entered the street-mains, the more likely it was to cause naphthalene troubles. In conclusion, he expressed his appreciation of the way in which Mr. Shadbolt had come forward with the subject, putting it before the meeting in a general way so that it was open to discussion on all sides.

Mr. G. H. NIVEN (Cleckheaton), as an old friend of Mr. Shadbolt, wished to thank him for the able manner he had dealt with the question of purification. Having had some experience in the matter, he should like to ask Mr. Shadbolt for his hypothesis on the use of moisture. When Mr. Shadbolt had charge of the North Bierley works, he saw his system, which he would now term (for want of a better word) "hot purification."



He introduced it at his own works with great advantage, for some time, so far as the life of the oxide in the purifiers was concerned; but the advantage so gained was discounted by that pest to which Mr. Carr had referred—naphthalene in the services, &c. In considering oxide purification, any one thinking over the matter for a moment would come to the conclusion that the time at which oxide of iron was doing most work in abstracting the sulphuretted hydrogen from the gas was when it was anhydrous. If that were so, they must look for a new hypothesis. From certain experiments he had made, and from his experience with naphthalene troubles, he had now come to the conclusion that the extra life obtained for the oxide of iron in the purifiers was not due altogether to the amount of moisture introduced by the steam, but to the fact that, condense as they would, certain light hydrocarbons would find their way into the purifier boxes, and, under the system of cold purification, as soon as they came in contact with the under side of the lid, and the sides of the purifier, they condensed and filled up the cells of the oxide of iron which was lying in the purifier, and in so doing they robbed them of the bulk of the material lying in the boxes. The benefit that was derived from the introduction of hot purification was due to the fact that, owing to the temperature in the boxes being raised, the light hydrocarbons were sent forward, and the cells of the oxide remained open, and offered a larger surface for chemical action to the incoming gas. With the hot purification process, when they pumped the gasholder syphons, he found they had a large amount of light oils floating on the water so pumped from the syphons, and he had some trouble with naphthalene deposits in the mains. In his opinion, the members meeting together and discussing this important subject was of great benefit to all.

The PRESIDENT, before calling upon Mr. Shadbolt to reply, wished to thank him for the very interesting subject he had brought forward that day. He thought the way in which the matter had been introduced would lead to great benefit being derived both by the consumers of gas and the managers of works. The profit of 0.2d. shown in Statement "E" depended very much upon the cost of the lime, and the price they could get for the spent lime. In Warrington some years ago they got 4s. a ton for it, whereas now he did not think they could get rid of it at any price, but would have to go to the expense of finding a tip for it. Lime certainly gave gas a brighter appearance. They had to use rather more cannel; but in Warrington, being near to the cheap cannels, they could buy them at practically the same price as coal. Now they only used lime on very exceptional occasions. In using lime, they found great difficulty in working the oxide and lime together. The boxes were so situated that they could not have one box and devote it entirely to lime; and consequently they had to clean out their boxes every time they used them. Otherwise, they had a great loss in the spent material. Another difficulty that they met with was in the traces of sulphuretted hydrogen they found. He had had a return showing the quantity of sulphuretted hydrogen leaving the purifiers. The purifiers were put in a row 47 feet by 20 feet. The first purifier took out practically all the sulphuretted hydrogen. The quantity of sulphur passing after the first purifier was about 100 grains per 100 cubic feet. In the second purifier it was reduced to 50 grains. The next contained only a trace of sulphuretted hydrogen; and so on from one purifier to another. The lime would take out the traces of sulphuretted hydrogen much more readily than the oxide would. They had tried one little experiment at Warrington with the introduction of air by the steam jet, with a very melancholy result. They started at noon and put in 1 per cent. of air for six hours; and next morning he was informed that the whole of the street-lamps were blocked. If they used steam, it was very necessary that they should start with their oxide fresh; for if they started with old oxide, it had a tendency to drive the naphthalene forward.

Mr. SHADBOLT, in reply, said that when he brought forward the subject he was rather doubtful of raising any discussion; but he was happy to say this doubt had been dispelled. Mr. Brearley stated that his purification cost him 3d., and that he removed carbonic acid. Statements "D" and "E" showed the benefit to be derived from removing the carbonic acid. Mr. Brearley did not show a profit because he did not credit himself with any gain in illuminating power. There was a decided gain in this respect by removing 2 per cent. of carbonic acid. In reply to Mr. Brearley's question as to the effect on the illuminating power produced by using steam and air, he would refer to the paper that he read at the Buxton meeting, at the end of which would be found a short statement giving the effect of introducing various proportions of air. If his memory was correct, anything up to 1½ per cent. had no deteriorating effect. In reply to Mr. Wilkinson, as to the loss of the sulphur compounds, he had treated this almost as a negligible quantity with regard to the effect upon the volume of the gas. Perhaps some of them would wonder why he had omitted giving sulphur compounds in his analyses; but this was because he had not got them. As to the strength to which the liquor should be worked, as a sulphate maker he should prefer to have his liquor not above 5° Twaddel. His aim was to show what could be done with the liquor in the way of removing impurities; but as to the effect in sulphate making, perhaps Mr. Wilkinson would let them know something later on. It would ill become him to attempt to deal with Mr. Carr's remarks, which were very exhaustive.

With regard to the illuminating power gained for the gas by the removal of the carbonic acid, he could only say in corroboration of what he had stated, that the water-gas makers said there was a distinct loss experienced by leaving in the carbonic acid, but that they could enrich so cheaply that they did not trouble to take it out. With respect to the naphthalene troubles, he was sorry to say that naphthalene could be largely increased by the adoption of the air and steam process. He had discovered this after using it for some considerable time; but the difficulty was not insurmountable. It was a question of regulating the moisture. When using oxide boxes, if a thin layer of lime were placed at the bottom, and care taken to condense out the greater proportion of the steam before it entered the purifier, he thought the moisture could be kept within such bounds as to have no detrimental effect with regard to naphthalene. He was much obliged for Mr. Townsend's remarks, which corroborated his own. He could not quite agree with Mr. Stevenson, though he felt he must bow to his more extended experience; but, so far as his observations, and those of his friends went, he was certainly correct when he said that it took more time to remove the sulphur compounds under the conditions he stated than it did to remove the carbonic acid. He was sorry to hear that he had brought Mr. Niven into such trouble. He seemed to have got a lot of people into trouble with the steam process. He took it that the action in question was this—that the use of the moisture was not so much to assist the oxide (as such) to do its work, as to re-oxidize the spent material. He did not think the effect of the use of moisture was an hypothesis; it was a demonstrable fact. He thanked the President for adding to his statement, and commiserated him upon his melancholy experience. He remembered one gentleman who lived in the neighbourhood, and was a chemist of the first order, who adopted the process only to drop it like a hot potato, for the simple reason that he saturated his gas to such an extent with steam that his oxide was literally mud. Of course, in such a case as this, the result would be most melancholy indeed; but there was a happy mean which should be adopted. He could not give the exact humidity required; but there was not the slightest doubt that, when the happy mean was once found, the effect would be beneficial all round.

#### THE LATE ROBERT HUNTER.

The PRESIDENT said before proceeding with the next business on the agenda, he had a melancholy duty to perform, and one that he would have brought forward earlier in the day but for the fact that he had waited till there was a full meeting. He wished to propose the following resolution: "That the Manchester District Institution of Gas Engineers tenders a vote of condolence to the widow of the late Robert Hunter."

Mr. R. PORTER (Elland) seconded the resolution. He said he had been intimately acquainted with Mr. Hunter for many years; and he was quite sure the members of the Institution had the sincerest sympathy for his widow and children. The members were already showing their sympathy in a practical way; and if there were any members present who from any cause whatever had refrained from subscribing to the fund which was being raised for this purpose, he hoped they would reconsider any decision they had come to, and look upon it as a duty to help Mrs. Hunter and her young children. He knew what it was to have to battle with life; and when he heard of the death of Mr. Hunter, and knew that his family were not well provided for, he felt it was his duty and the duty of every member of the Institution to do something for the fatherless and the widow.

The vote was carried unanimously.

The SECRETARY wished to call the members' attention to the present state of the fund which had been raised in response to the circular he had sent out on Nov. 1. It was very desirable that the fund should be closed as early as possible; and therefore, it was intended to have a Committee meeting to deal with it on Tuesday week, so that if there was any member who had not yet subscribed he should be glad if he would send his mite as soon as possible. Their fund was confined to members of their own Institution, and up to that morning the amount promised was £112 10s. 6d. Included in this amount there were ten subscriptions of 5 guineas, and one of £5. There were only 51 subscriptions in all, out of a total number of members of something like 130 to 140, which to his mind was not enough. There had also been a fund raised by the "JOURNAL OF GAS LIGHTING" from friends of the late Mr. Hunter; and Mr. King had intimated that this fund would be disposed of in a somewhat similar manner to the one they were themselves raising, as they were more likely to know the circumstances in which Mrs. Hunter was placed and how the money could be most beneficially applied. He purposed sending out another circular to those who had not subscribed, and he trusted they would reply to it by the first Tuesday in December.

Mr. J. H. BREARLEY (Longwood) then read the following paper—

#### THE BALANCE-SHEET.

This subject is a far-reaching and important one; and when the treatment of certain items in the preparation of the balance-sheet may produce serious difference in the purchase value of a statutory company, careful consideration is called for. The method of treatment, too, of various items of expenditure, produces a material influence upon comparative analyses; and an



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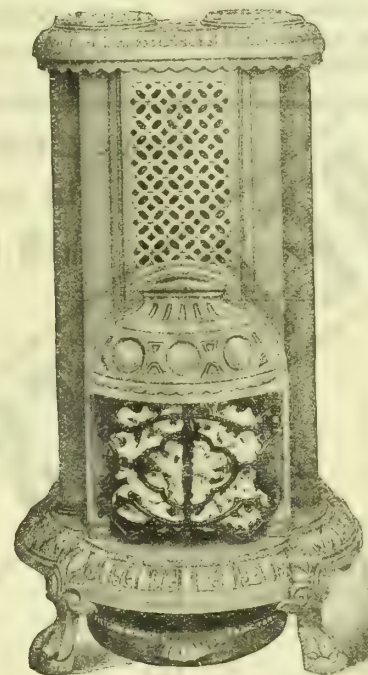


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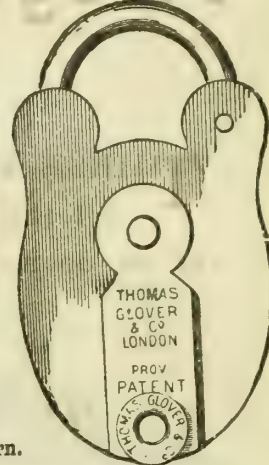
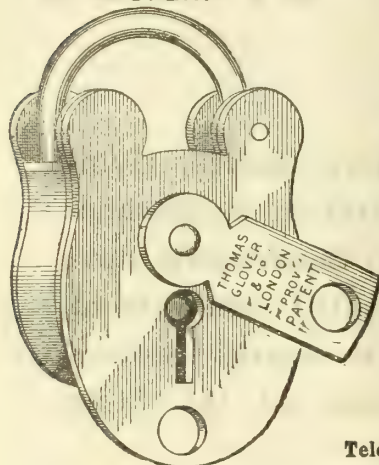
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absence of uniform methods renders the latter more or less unreliable. But more will be said about this later.

In opening the balance-sheet of a statutory company, one usually finds the "Statement of Share and Loan Capital" at the head. Generally speaking, these accounts afford a rough idea of the stability or otherwise of the financial side of the undertaking when compared with the amount of gas sold. But this, in many cases, may be more apparent than real. The following comparative table of nine Yorkshire Companies of similar size gives an effective illustration of this. The figures are taken from the Board of Trade returns for 1896.

| No.                  | Annual Sale. | Capital Paid Up. | Average per Million Cubic Feet. | Dividend on Ordinary Stock. |
|----------------------|--------------|------------------|---------------------------------|-----------------------------|
|                      | Cubic Feet.  |                  |                                 | Per Cent.                   |
| 1                    | 39,234,000   | £40,920          | £1043                           | 5                           |
| 2                    | 50,854,000   | 24,500           | 481                             | 12                          |
| 3                    | 48,833,800   | 39,500           | 808                             | 10                          |
| 4                    | 46,127,000   | 44,270           | 959                             | 7                           |
| 5                    | 40,607,000   | 24,877           | 612                             | 11                          |
| 6                    | 41,099,700   | 25,000           | 608                             | 10                          |
| 7                    | 41,577,900   | 43,304           | 1041                            | 8½                          |
| 8                    | 51,000,000   | 18,666           | 366                             | 9                           |
| 9                    | 34,996,800   | 25,500           | 728                             | 10                          |
| Totals . .           | 394,330,200  | £286,537         | ..                              | ..                          |
| Average of<br>works. | 43,814,466   | £31,837          | £727                            | ..                          |

In one or two of the above cases, the obtaining of statutory powers was attended with keen opposition. Lawyers, parliamentary agents, and experts, had a harvest home. The capital accounts of the poor companies became considerably larger, under the heading of "Costs of Promoting Special Act;" and either shareholders or consumers have had to pay the piper ever since.

But this is an abstruse matter. Something else is needed to explain why the ratio of capital per million of works of similar size in the same county should vary from £366 to £1043. The most plausible explanation seems to be that the undertakings with the smallest ratio have been working too near the borderline of disaster, and have neglected to keep the works well abreast of the requirements of the district. On the other hand, when the proportion of capital per million sold gets into four figures, it seems to indicate a lavish and injudicious expenditure at some period in the history of the undertaking. In very small works, especially if an Act has been applied for, the four-figure ratio may have been unavoidable; but in any case of this kind, whether in large or small works, it ought to be the special aim of those responsible to foster the consumption by all possible means, without unduly adding to the burden of capital. Among the accounts of companies which I received, the ratio of capital per million sold was found to extend from £351 to £1364.

In circularizing the members for a copy of their last accounts, it was my intention to get out some figures respecting the actual amount of unredeemed capital on corporate undertakings; but I had reckoned without mine host, the balance-sheet. The producers of some of these interesting documents seem to have got the impression that simplicity is not by any means the acme of perfection; and the way in which the sinking funds, annuities, and loans get inextricably mixed up with other matters is enough to drive a man crazy, even though he may fancy himself a bit of an accountant. On the other hand, there are corporate accounts that it is a real pleasure to peruse—one has but to read to understand; and were it not that I had pledged myself not to mention the names of undertakings, I should feel impelled to give special commendation to the lucid accounts issued by a few corporations, and copies of which I have been fortunate enough to secure. In despair, I turned to the Parliamentary Returns; and though their publication is something akin to ancient history, they proved to be of some value, and helped to extricate me from the fog into which I had unwittingly plunged myself.

For 1896, the returns give the amount of capital paid up and gas sold by Companies to be as follows:—

|                           |             |
|---------------------------|-------------|
| Share and premium capital | £41,433,325 |
| Loans issued              | 8,185,700   |
| Total                     | £49,619,025 |

|                                                |                       |
|------------------------------------------------|-----------------------|
| Gas sold                                       | 73,750,533,649 c. ft. |
| Ratio of capital per million cubic feet, sold. | £673                  |

The returns for Local Authorities for the same year are as follows:—

|                                                                                     |             |
|-------------------------------------------------------------------------------------|-------------|
| Amount of loans and capitalized value of annuities authorized                       | £29,984,828 |
| Less amount of loans repaid, annuities redeemed, and amount placed to sinking fund. | 6,057,445   |
| Net capital                                                                         | £23,927,383 |

|                                               |                       |
|-----------------------------------------------|-----------------------|
| Gas sold.                                     | 43,132,780,085 c. ft. |
| Ratio of capital per million cubic feet sold. | £555                  |

This gives a difference in favour of corporations of £118 per million. The companies, too, have a greater percentage of interest or dividend to raise upon the larger ratio of capital.

The question of municipal *versus* company control of gas-works, was ably dealt with at Bath last year; but there is one point to which an allusion may be made here—that is, that the amount required for sinking fund and repayment of annuities cannot be set off as a permanent disadvantage to the corporate consumer, for he is gradually reducing the capital ratio, and if he lives long enough will obtain his reward in cheaper gas. But this is subject to one condition; and the whole question hinges upon it. As Mr. Isaac Carr has so ably shown us, he ought not to be called upon to practically make a free gift to the local authority of the control of the gas supply, and be fleeced on behalf of the rates in addition. Then municipalization becomes a disadvantage. At this point, one instance comes to my mind of a large corporation heavily burdened with capital, with a big price for gas, quite recently appropriating a large sum in aid of the rates. Yet all the while the large expenditure on capital account hangs like a millstone round the neck of the gas undertaking. Is there any wonder that, under such circumstances, electric light is rapidly developing? Another corporation claim credit for having placed a sum of nearly £1500 for new mains, services, and meters, to revenue, which should have been placed to capital; while in the same year the consumers were taxed to the extent of 2'63d. per 1000 cubic feet for the sinking fund, and 1'77d. for the borough fund. The consumer would probably not have objected to being excused payment of the last item. This is but typical of most corporate undertakings.

In these days, when so much is being said and published about cheap gas, it is well to bear in mind the anomalous position which statutory companies hold as compared with local authorities, in respect to the capital employed. Parliamentary obligations render it practically impossible for even over-capitalized companies to effect a reduction of capital, since profits must not be utilized for this purpose. A substantial increase in the sale of gas may improve the proportionate ratio; but interest and dividend must be provided year after year on a never reducing, but almost invariably increasing, capital account. Local authorities, on the other hand, are compelled to repay their loans, and redeem their annuities, in a given term of years; and year by year the ratio of interest decreases. In this way, those local authorities who were fortunate enough to secure the gas undertakings a good many years ago, are now reaping the reward of the reduction of capital expenditure; but, generally speaking, the first few years following the acquirement of a gas undertaking press more hardly upon the consumer than if the concern had not changed hands.

It has been stated that the rate of interest on loans which companies are called upon to pay, as compared with corporations, is about 15s. per cent. more. As bearing upon this matter, it may be said that out of 26 companies effecting loans, 11 have been able to secure all or part of their loans on promissory note or mortgage at 3 per cent. The rate of interest on all loans varied from 3 to 4½ per cent.; and unless the companies paying the latter rate have bound themselves to retain the loan for a long term of years, there seems to be little reason why they should continue to pay 50 per cent. more interest than others. Another remarkable instance was supplied in the fact that a large corporation pay 3½ per cent. on over £70,000, while a neighbouring gas company have managed to secure a loan of £10,000 at 3 per cent. About twelve months ago, a Yorkshire company endeavoured to reduce the rate of interest paid on loans. An advertisement was inserted in several Yorkshire papers offering 3½ per cent. for loans on promissory note; but only one application of £500 was received.

Now as to the capital and revenue accounts. Under the prescribed form of accounts, provision is made in the capital accounts for new meters (not in place of old ones), including fixing. It seems to be quite a common thing for local authorities to debit the cost of all new meters to revenue—a practice that will ultimately hurt the consumers less than the appropriation of profits. One corporation, for example, finished the year with a loss of £118; and a foot-note in the statement of accounts explains that this unhappy result was brought about by placing items to the revenue account which ought to have been placed to capital. But several companies do the same thing, even paying for prepayment meters out of revenue. The rush for prepayment meters proved too much for some companies paying for meters out of revenue; and they struck a middle course—prepayment meters being debited against capital, and ordinary meters against revenue. I am speaking, of course, purely of meters for new consumers. Debiting revenue with all meter charges undoubtedly conduces to the stability of an undertaking; and if over-capitalized, it may be a very shrewd policy to adopt. But where the shadow of being purchased by a local authority hangs over the concern, then it effects a reduction of net income or profit, upon which the purchasing value is usually estimated. If a company (say) debits revenue with £200 per annum for meters that could legitimately be placed to capital, the loss in purchase value, at 28 years' purchase, would be £5600. This holds good with any other item put to revenue that could be properly debited to capital. But there is another phase to the question. Any undertaking whose Special Act incorporates with it the Gas-Works Clauses Act of 1871, is, according to clause 35 of the latter, liable to a penalty of not less than £2 per day so long as the accounts are not made out in compliance with the particulars specified in Schedule B annexed to that Act. This schedule clearly interprets that new meters not in place of old ones should be charged to capital.



The practice of paying for items of capital expenditure out of revenue, cannot be said to injure a company who continually realize an amount sufficient to pay maximum dividends. It is the consumer who then suffers. One company paying maximum dividends actually charge all the cost of new meters (including prepayments) to revenue, and a large proportion of the cost of new stoves which are let out on hire, in addition. This is undoubtedly an injustice to the consumer. As no stocks of fittings or stoves are kept, it is easy to imagine, too, how this company can cut its coat to suit its cloth. If a good year has been experienced, a large stock of stoves may be laid in (say) in December, and thus keep the revenue profits within manageable limits. If adversity strikes the company in any succeeding year, the stock can be reduced to the advantage of current expenditure; and as new stoves will not weigh so heavily on the debit side of revenue, the profits will still be good. Meters can be manipulated in the same way. Of course, I do not for a moment suggest that the responsible persons of this company are guilty of these tactics; but they have proved themselves remarkable tacticians when burdened with too much surplus. As ratepayers, the consumers may some day get their own or a portion of it, if the mantle of purchase should happen to settle in that district.

In some balance-sheets, receipts for spent lime or oxide are placed on the credit side of revenue account. It would be better to deduct receipts of this kind from the outlay on purification, as, indeed, is already done in most cases. The net cost of the latter is then obtainable at a glance. When comparing analyses of the cost of purification in small or medium-sized works, an average should be taken over four or five years, as it frequently happens that a purchase of oxide will suffice for two or three years. If in a given year no oxide is bought, and at the same time a consignment of spent material is sent away, the cost of purification will be much below its normal average.

In all instances, comparisons of the cost of repairs and maintenance of works, mains, and meters should extend over a number of years. Published analyses should form a good index of what a fair average expenditure is. Yet, in a recent arbitration case, there seemed to be a difference of opinion even among experts as to whether 4d., 5d., or 6d. per 1000 cubic feet was a fair expenditure on maintenance of works. Some companies and corporations, too, prefer to swell the expenditure under "Repairs" with items that could legitimately be placed to capital account under the heading of "New Works;" while under some circumstances there is a temptation to adopt the opposite and less excusable policy. Of the balance-sheets which have been sent in, the average rate per 1000 cubic feet sold (not including used on works) at which maintenance of the works was carried out during the past twelve months has been taken—see Tables A to G, on opposite page. The rate of 30 companies was found to vary from 1'42d. to 6'73d.; while the average over all was 3'14d. A digest of the accounts of 25 local authorities showed the average rate to be 3'24d.; the rates varying from 1'13d. to 8'02d. Figures covering no less than 55 works must be taken as fairly representative, since works having a minimum of repairs are balanced by those engaged upon extensive alterations, and consequent writing off of abnormal sums for old plant displaced, &c. For example, the engineer of No. 8 in Table G, writes me to say that they have been spending heavily on renewals and repairs. They have closed one works as a manufacturing station, and enlarged another works to the extent of three-quarters of a million cubic feet per diem. Yet, in spite of this heavy expenditure, the rate only works out at 7'63d. The total gas sold by 32 undertakings was 62,119,939,000 cubic feet and the repairs were carried out for £886,560, or 3'425d. per 1000 cubic feet sold. As these figures cover the operations of more than half the gas manufacture of the United Kingdom, they afford convincing proof that 3½d. per 1000 cubic feet is a liberal allowance for repairs and maintenance of works.

It was my desire to get out a similar analysis of maintenance and repairs of mains and meters; but the practices already alluded to of unmercifully debiting revenue with meters for new consumers, precludes all possibility of arriving at a fair average from the balance-sheets. A bone of contention is still left, therefore, to the experts, even if 3½d. is accepted as a fair repair and maintenance of works rate.

Much could be said about rates and taxes. Most of us have looked with dismay upon the increasing amount under this head. With respect to the valuation of gas-works, the valuer of a neighbouring board of guardians told me in a patriarchal sort of way, that the best advice he could give to gas companies was to "lay low," for if they appealed against the valuation, ten to one it would be increased if the works were re-valued.

One phase of the income-tax business may be touched upon. While the Commissioners allow in private business a sum for depreciation, they insist—placed us, at all events—upon charging income-tax upon all sums plus to depreciation in gas accounts. They certainly seem to be in possession of a good argument, in the assertion that gas companies are allowed, and expected, to maintain their works; and that if this is conscientiously done, there need be no depreciation. Acting on this advice, one company made certain that their meters did not depreciate by putting a sum of £200 for new meters to repairs of meters, instead of charging it to capital. Under other circumstances this sum would have been capitalized, and an equal amount carried to depreciation fund. Income-tax saved, £6 13s. 4d.

We will pass on to the receipts side of revenue. Slight improvements could be effected in many balance-sheets. Some companies having prepayment meters do not separate them from the ordinary sales; while others give the receipts for gas-rental, but do not state the price charged or the quantity of gas sold equivalent to the amount received. Discount, too, figures as a cost or item of expenditure in some accounts, though the most accurate method of treatment is to deduct it from the gross amount of gas-rental.

The following table will show how general the system of allowing discounts has become. The accounts of 68 undertakings were examined, out of which 16 do not sufficiently define whether discounts are allowed or not. Of the remaining 52, the figures are as follows:—

|                            | Local Authorities. | Companies. |
|----------------------------|--------------------|------------|
| Allow discounts . . . .    | 21                 | 19         |
| Do not allow discounts . . | 7                  | 5          |
| Total . . . .              | 28                 | 24         |

Therefore, out of 52 undertakings, no less than 40 allow discounts.

In the general balance-sheet or statement appear the sundry stocks of fittings, coals, &c. In this connection may be discussed the method of treating stoves on hire in the balance-sheet. Of 41 companies and corporations hiring out gas-cookers, 11 place the cookers to stock account, 24 place them to capital, and 6 charge the cost to revenue without taking credit for the expenditure in stock. In placing the cost to capital, some depreciate, and some do not. If an amount is not written off for depreciation periodically, the stoves can never stand at the full value at which they are capitalized after the first year. It may be suggested that, when one wears out, it would be replaced out of revenue; but still the bulk would be considerably less valuable than when first fixed and capitalized. Taken as stock, and depreciated by from 10 to 15 per cent., seems to me to be the most judicious way of treating them. Of 67 gas undertakings (companies and local authorities), 41 have the hired-stove system in operation, while 26 have not; showing a big majority in favour of this means of increasing the consumption of coal and water gas.

With many accounts, a working statement is incorporated; and if there is one thing that will put a manager on his best behaviour it is to find that someone else is producing results considerably better than his own. One or two comments on those accompanying the accounts sent in to me may not be altogether unacceptable. One return gave a make of just over 11,000 cubic feet to the ton. But this was destined to be left far behind; for the perusal of another statement revealed a make of 11,514 cubic feet, and still another 11,595 cubic feet per ton, of which no less than 11,112 cubic feet were sold. It would be interesting to know by what means such excellent results are obtained, and what is the proportion of cannell used. The cost per ton of coal and cannell works out to a fraction over 11s. 8d. One large works is able to show a leakage account of only 2'13 per cent. It should be stated that the works in question supply a level district, and therefore they do not labour under the disadvantages accruing from varying levels and pressures.

These are results that are not extracted from the realms of fancy, but appear in plain black and white in the working statements of gas undertakings. Hitherto most of us—in fact, nearly all of us—have had to be content with dreams of them; and if an allusion to them here should ultimately result, through discussion, in the dream spectres being materialized, these remarks will not have been made in vain.

The PRESIDENT said, as it was very late, Mr. Brearley had given his sanction to his paper being brought before the next meeting for discussion.

#### THE STANDARDIZING OF METER-UNIONS.

The PRESIDENT read the following letter which had been received from the Incorporated Gas Institute:—

"Dear Sir,—I beg to inform you that at a meeting of the Council on the 8th inst., the following resolution was passed unanimously: 'That the Council consider it desirable that an application be made to the Board of Trade with the object of obtaining their recognition of a set of standards for meter-unions in the United Kingdom, but that before any action be taken a circular be issued to kindred Institutions and Associations asking for their views and co-operation in the matter.' Will you kindly take the earliest opportunity of placing the subject before your Executive, and let me know their decision? Yours truly, Walter T. Dunn."

It was the wish of the Committee to support the Institute in the application they proposed to make to the Board of Trade, and he, therefore, should be glad if the meeting would give their permission to this course being adopted.

The SECRETARY said it would be remembered that the question of the standardizing of gas-meter unions had been knocking about from pillar to post for some years. A paper was read on the subject at the meeting of The Gas Institute at Belfast, and it was then decided to leave the matter in the hands of the Council of the Institute. The Council were desirous of memorializing the Board of Trade to adopt a set of standards for meter-unions; but they first of all wanted to know what other kindred Institutions and Associations were prepared to do in the matter. He would, therefore, now propose: "That the Committee of this



TABLES REFERRED TO IN MR. BREARLEY'S PAPER.

TABLE A.—Statutory Companies Selling Less than 30 Million Cubic Feet per Annum.

| No.              | Gas Sold.   | Amount Spent on Repairs and Maintenance of Works. | Rate per 1000 Cubic Feet of Gas Sold. |
|------------------|-------------|---------------------------------------------------|---------------------------------------|
|                  | Cubic Feet. | £ s. d.                                           | d.                                    |
| 1                | 8,213,000   | 121 18 10                                         | 3'56                                  |
| 2                | 12,847,000  | 246 8 0                                           | 4'60                                  |
| 3                | 19,709,300  | 260 14 1                                          | 3'17                                  |
| 4                | 16,500,000  | 297 16 3                                          | 4'33                                  |
| 5                | 10,200,000  | 136 2 1                                           | 3'20                                  |
| 6                | 29,497,500  | 455 15 0                                          | 3'71                                  |
| 7                | 27,696,500  | 228 18 4                                          | 1'98                                  |
| 8                | 25,458,000  | 214 2 10                                          | 2 02                                  |
| 9                | 13,829,500  | 204 15 6                                          | 3'55                                  |
| 10               | 3,500,000   | 21 7 5                                            | 1'46                                  |
| 11               | 17,112,200  | 234 15 6                                          | 3'29                                  |
| Totals           | 184,563,000 | 2,422 13 10                                       | ..                                    |
| Average of works | 16,778,455  | 220 4 10                                          | 3'15                                  |

TABLE B.—Statutory Companies Selling between 30 and 100 Million Cubic Feet per Annum.

| No.              | Gas Sold.   | Amount Spent on Repairs and Maintenance of Works. | Rate per 1000 Cubic Feet of Gas Sold. |
|------------------|-------------|---------------------------------------------------|---------------------------------------|
|                  | Cubic Feet. | £ s. d.                                           | d.                                    |
| 1                | 52,661,000  | 1,407 9 9                                         | 6'41                                  |
| 2                | 43,752,000  | 751 1 7                                           | 4'12                                  |
| 3                | 71,688,400  | 1,205 5 8                                         | 4'03                                  |
| 4                | 85,744,800  | 1,101 9 6                                         | 3'08                                  |
| 5                | 42,091,900  | 1,185 12 11                                       | 6'73                                  |
| 6                | 46,300,000  | 1,199 19 11                                       | 6'22                                  |
| 7                | 50,398,700  | 990 16 9                                          | 4'72                                  |
| 8                | 98,869,000  | 1,362 3 7                                         | 3'30                                  |
| 9                | 46,122,700  | 423 16 0                                          | 2'20                                  |
| 10               | 32,678,000  | 420 13 1                                          | 3'09                                  |
| 11               | 63,185,200  | 1,286 2 2                                         | 4'88                                  |
| 12               | 53,208,000  | 1,255 13 0                                        | 5'66                                  |
| 13               | 36,300,000  | 253 15 10                                         | 1'67                                  |
| 14               | 70,000,000  | 913 3 1                                           | 3'13                                  |
| 15               | 63,500,000  | 381 15 3                                          | 1'42                                  |
| Totals           | 856,497,700 | 14,138 18 1                                       | ..                                    |
| Average of works | 57,099,847  | 942 11 10                                         | 3'96                                  |

TABLE C.—Statutory Companies Selling over 100 Million Cubic Feet per Annum.

| No.              | Gas Sold.   | Amount Spent on Repairs and Maintenance of Works. | Rate per 1000 Cubic Feet of Gas Sold. |
|------------------|-------------|---------------------------------------------------|---------------------------------------|
|                  | Cubic Feet. | £ s. d.                                           | d.                                    |
| 1                | 102,601,000 | 1,002 16 4                                        | 2'34                                  |
| 2                | 320,000,000 | 2,440 8 2                                         | 1'83                                  |
| 3                | 112,892,000 | 1,524 5 3                                         | 3'24                                  |
| 4                | 214,313,000 | 1,897 17 5                                        | 2'12                                  |
| Totals           | 749,806,000 | 6,865 7 2                                         | ..                                    |
| Average of works | 187,451,500 | 1,716 6 9                                         | 2'19                                  |

SUMMARY.

| No. of Companies. | Sale per Annum.  | Total Annual Sale. | Amount Spent on Repairs and Maintenance of Works. | Rate per 1000 Cubic Feet of Gas Sold. |
|-------------------|------------------|--------------------|---------------------------------------------------|---------------------------------------|
|                   | Millions.        | Cubic Feet.        | £ s. d.                                           | d.                                    |
| 11 (Table A)      | Under 30         | 184,563,000        | 2,422 13 10                                       | 3'15                                  |
| 15 (Table B)      | Between 30 & 100 | 856,497,700        | 14,138 18 1                                       | 3'96                                  |
| 4 (Table C)       | Over 100         | 749,806,000        | 6,865 7 2                                         | 2'98                                  |
| 30 Totals         | ..               | 1,790,866,700      | 23,426 19 1                                       | ..                                    |

Average rate of repairs and maintenance of works of 30 Companies of all sizes, per 1000 cubic feet of gas sold, 3'14d.

Institution be empowered to support the Council of the Gas Institute in any action they might take in the matter of memorializing the Board of Trade with regard to obtaining a set of standards for meter-unions in the United Kingdom."

Mr. TOWNSEND seconded the resolution, which was passed unanimously.

VOTES OF THANKS.

Mr. G. E. Stevenson proposed that a hearty vote of thanks be accorded to the Corporation of Bradford for having so kindly permitted the members to visit the chemical works that day, and to Mr. Charles Wood, the Engineer, for having escorted them, and given them every opportunity of seeing the processes of manufacture of the various chemical products carried on there. Mr. T. N. Ritson, of Kendal, followed with a vote of

TABLE D.—Local Authorities Selling Less than 30 Million Cubic Feet per Annum.

| No.              | Gas Sold.   | Amount Spent on Repairs and Maintenance of Works. | Rate per 1000 Cubic Feet of Gas Sold. |
|------------------|-------------|---------------------------------------------------|---------------------------------------|
|                  | Cubic Feet. | £ s. d.                                           | d.                                    |
| 1                | 25,118,000  | 386 1 4                                           | 3'68                                  |
| 2                | 13,152,000  | 439 15 8                                          | 8'02                                  |
| Totals           | 38,270,000  | 825 17 0                                          | ..                                    |
| Average of works | 19,135,000  | 412 18 6                                          | 5'17                                  |

TABLE E.—Local Authorities Selling between 30 and 100 Million Cubic Feet per Annum.

| No.              | Gas Sold.   | Amount Spent on Repairs and Maintenance of Works. | Rate per 1000 Cubic Feet of Gas Sold. |
|------------------|-------------|---------------------------------------------------|---------------------------------------|
|                  | Cubic Feet. | £ s. d.                                           | d.                                    |
| 1                | 72,778,000  | 382 5 10                                          | 1'26                                  |
| 2                | 99,597,000  | 1,683 7 0                                         | 4'05                                  |
| 3                | 52,260,000  | 790 8 5                                           | 3 63                                  |
| 4                | 67,211,000  | 656 16 9                                          | 2'34                                  |
| 5                | 30,749,000  | 504 7 4                                           | 3'93                                  |
| Totals           | 322,595,000 | 4,017 5 4                                         | ..                                    |
| Average of works | 64,519,000  | 803 9 1                                           | 2'98                                  |

TABLE F.—Local Authorities Selling between 100 and 200 Million Cubic Feet per Annum.

| No.              | Gas Sold.     | Amount Spent on Repairs and Maintenance of Works. | Rate per 1000 Cubic Feet of Gas Sold. |
|------------------|---------------|---------------------------------------------------|---------------------------------------|
|                  | Cubic Feet.   | £ s. d.                                           | d.                                    |
| 1                | 128,626,300   | 3,233 0 8                                         | 6'03                                  |
| 2                | 146,065,000   | 896 13 5                                          | 1'47                                  |
| 3                | 103,604,000   | 1,235 13 10                                       | 2'86                                  |
| 4                | 139,861,000   | 1,481 12 4                                        | 2'54                                  |
| 5                | 157,916,000   | 1,762 8 2                                         | 2'67                                  |
| 6                | 130,000,000   | 3,036 5 11                                        | 5'60                                  |
| 7                | 114,929,700   | 1,115 3 9                                         | 2'32                                  |
| 8                | 105,511,000   | 1,627 8 3                                         | 3'70                                  |
| 9                | 137,312,600   | 649 18 11                                         | 1'13                                  |
| 10               | 176,213,000   | 1,277 6 7                                         | 1'75                                  |
| Totals           | 1,340,038,600 | 16,305 11 10                                      | ..                                    |
| Average of works | 134,003,860   | 1,630 11 2                                        | 2'92                                  |

TABLE G.—Local Authorities Selling over 200 Million Cubic Feet per Annum.

| No.              | Gas Sold.     | Amount Spent on Repairs and Maintenance of Works. | Rate per 1000 Cubic Feet of Gas Sold. |
|------------------|---------------|---------------------------------------------------|---------------------------------------|
|                  | Cubic Feet.   | £ s. d.                                           | d.                                    |
| 1                | 309,354,400   | 1,564 13 2                                        | 1'21                                  |
| 2                | 358,914,000   | 6,268 16 6                                        | 4'19                                  |
| 3                | 256,932,000   | 1,670 7 3                                         | 1'56                                  |
| 4                | 527,553,000   | 4,509 3 0                                         | 2 05                                  |
| 5                | 1,588,000,000 | 28,261 10 11                                      | 4'27                                  |
| 6                | 1,036,009,000 | 9,030 17 4                                        | 2'08                                  |
| 7                | 519,783,000   | 7,817 0 9                                         | 3'60                                  |
| 8                | 260,000,000   | 8,268 1 6                                         | 7'63                                  |
| Totals           | 4,856,542,400 | 67,390 10 5                                       | ..                                    |
| Average of works | 607,067,800   | 8,423 16 4                                        | 3'33                                  |

SUMMARY.

| No. of Local Authorities. | Sale per Annum.   | Total Annual Sale. | Amount Spent on Repairs and Maintenance of Works. | Rate per 1000 Cubic Feet of Gas Sold. |
|---------------------------|-------------------|--------------------|---------------------------------------------------|---------------------------------------|
|                           | Millions.         | Cubic Feet.        | £ s. d.                                           | d.                                    |
| 2 (Table D)               | Under 30          | 38,270,000         | 825 17 0                                          | 5'17                                  |
| 5 (Table E)               | Between 30 & 100  | 322,595,000        | 4,017 5 4                                         | 2'98                                  |
| 10 (Table F)              | Between 100 & 200 | 1,340,038,600      | 16,305 11 10                                      | 2'92                                  |
| 8 (Table G)               | Over 200          | 4,856,542,400      | 67,390 10 5                                       | 3'33                                  |
| 25 Totals                 | ..                | 6,557,446,000      | 88,539 4 7                                        | ..                                    |

Average rate of repairs and maintenance of works of 25 Local Authorities of all sizes, per 1000 cubic feet sold, 3'24d.

thanks to Mr. Shadbolt for his "Notes on Purification," and to Mr. Brearley for his communication on the "Balance-Sheet." Mr. Townsend seconded the resolution; and it was supported by the Hon. Secretary, and passed unanimously. Mr. Brearley returned thanks, and this concluded the business of the meeting.



ACETYLENE.

By VIVIAN B. LEWES, F.I.C., F.C.S.,

Chief Superintending Gas Examiner to the Corporation of London,  
Professor of Chemistry at the Royal Naval College, Greenwich.

[The First of a Course of Cantor Lectures at the Society of Arts, delivered  
Nov. 21, 1898.]

At a meeting of the Royal Dublin Society, in March, 1836, Edmund Davy, who was at the time Professor of Chemistry to the Society, first described acetylene gas, and experimentally demonstrated some of its more remarkable properties, and in the autumn of the year, at the Bristol meeting of the British Association, read a paper upon it and the method of production—showing that when the metal potassium was made by heating a mixture of calcined tartar and charcoal in a large iron bottle, a black substance was frequently formed which was readily decomposed by water and yielded a gas which we now know as acetylene, but which he at that time christened bicarburet of hydrogen. It was in this paper that the author pointed out that from the brilliancy with which the new gas burnt in contact with the atmosphere, it was admirably adapted for the purpose of artificial light, if procured at a sufficiently cheap rate. Twenty years elapsed after Davy's discovery before any important addition was made to our knowledge of acetylene; and although Quet and Boettger made some observations on the formation of metallic acetylides in 1857, it was not until Berthelot's classical researches upon this compound, extending from 1859 to 1862, that anything was definitely known as to its true composition and method of formation. It was Berthelot who showed that acetylene was formed during the decomposition of many organic substances by heat, and that ethylene, methane, alcohol, and ether all yielded this compound when passed through heated tubes, and that it was therefore almost invariably found in the products of the destructive distillation of organic compounds; while he finally demonstrated the possibility of synthesizing acetylene by passing the electric current between carbon points in an atmosphere of hydrogen.

Acetylene has shared with many other bodies the troubles incidental to the constant changes of nomenclature which have occurred during the past century. Christened bicarburet of hydrogen by its discoverer, it soon became known as klumene; while at a much later date the name acetylene was bestowed upon it, being derived from the hypothetical radical acetyl ( $C_2H_3$ ), to which acetylene bears the same relationship as ethylene ( $C_2H_4$ ) does to the radical ethyle ( $C_2H_5$ ). It was also proposed at one time to call it ethine; but the name which has survived the diseases common to incipient nomenclature is that of acetylene, by which it is now universally known. On analysis, this gas is found to contain—

|                    |       |
|--------------------|-------|
| Carbon . . . . .   | 92.3  |
| Hydrogen . . . . . | 7.7   |
|                    | 100.0 |

It has a density of .92. When prepared by the action of water upon calcic carbide, it has a very strong and penetrating odour; but when the gas is thoroughly purified from sulphuretted and phosphuretted hydrogen—which are invariably present with it in minute traces—this extremely pungent odour disappears, and the pure acetylene has a not unpleasant ethereal smell.

Acetylene is readily soluble in water, which at normal temperature and pressure takes up a little more than its own volume of the gas, and yields a solution giving a purple red precipitate with ammoniacal cuprous chloride, and a white precipitate with silver nitrate—these precipitates consisting of acetylides of the metals. The solubility of the gas in various liquids, as given by different observers, is—

| 100 Volumes of              | Volumes of Acetylene. |
|-----------------------------|-----------------------|
| Brine . . . . .             | absorb 5              |
| Water . . . . .             | " 110                 |
| Alcohol . . . . .           | " 600                 |
| Paraffin . . . . .          | " 150                 |
| Carbon disulphide . . . . . | " 100                 |
| Fusel oil . . . . .         | " 100                 |
| Benzene . . . . .           | " 400                 |
| Chloroform . . . . .        | " 400                 |
| Acetic acid . . . . .       | " 600                 |
| Acetone . . . . .           | " 3100                |

It will be seen from this table that, where it is desired to collect and keep acetylene over a liquid, brine—i.e., water saturated with salt—is the best for the purpose; but in practice, it is found that unless water is agitated with acetylene, or the gas bubbled through water, the top layer soon gets saturated, and the gas then dissolves but slowly.

The great solubility of acetylene in acetone was pointed out by MM. Claude and Hess, who suggested charging acetone with the gas under pressure; a litre of acetone dissolving 360 times its own volume of the gas under a pressure of 12 atmospheres. On relieving the pressure, the gas again escapes, and it was thought that this would prove a better method of storing the gas than liquefying it; but experiment has shown that acetone saturated in this way under pressure shares many of the disadvantages of liquid acetylene itself.

When acetylene was first introduced on a commercial scale, grave fears were entertained as to its safety. It was represented that it had the power of combining with certain metals—more

especially copper and silver—to form acetylides of a highly explosive character. If acetylene be passed through an ammoniacal solution of cuprous chloride, copper acetylide is formed; and when dry this explodes with great violence when struck or when heated. Even with coal gas, which contains less than 1 per cent. of acetylene, such copper compounds have been known to be formed in cases where the gas distributing mains were composed of copper; and some accidents have happened from this cause. It was therefore predicted that the introduction of acetylene on a large scale would be followed by numerous accidents, unless copper and its alloys were rigidly excluded from contact with the gas. These fears, however, have fortunately proved to be absolutely unfounded; and the original gas-fittings can be used with perfect safety for this gas.

In the summer of 1895, Mr. H. Gerdes, the Chief Engineer of Messrs. Pintsch, of Berlin, made an exhaustive series of experiments upon this point, not only with the gas under ordinary pressure, but with mixtures of acetylene with oil and coal gas at pressures of nearly 10 atmospheres. This was done by placing the metals to be tested in steel cylinders; the slips being fitted in wooden frames so arranged as to prevent any contact either between the individual metals or the walls of the metal cylinder. Two of these cylinders were filled with pure acetylene, two with a mixture of 80 per cent. of acetylene and 20 per cent. of oil gas, and one with a mixture of acetylene with 20 per cent. of coal gas; a small quantity of water being placed in each cylinder in order that the gas should be moist, as it was expected that this would greatly facilitate the action upon the metals. These cylinders were filled with the gases at a pressure of 9 to 10 atmospheres; and they were exposed on the roof of a shed from July 18, 1895, to April 9, 1896—this range of time exposing them to the highest temperature of an exceptionally hot summer and the lowering of temperature incidental to a very cold winter. Of all the metals and alloys used, the ones which are known to resist ordinary oxidation in the air remained perfectly unaffected, while the easily oxidizable metals suffered on the surface; but in no instance was it possible to trace any acetylene compound, and no explosion could be produced by either heating or hammering. Further experiments with acetylene, ammonia, and water showed clearly that such corrosion as had taken place by the simultaneous action of ammonia gas and acetylene was due exclusively to the action of the former gas, and no explosive compounds were formed.

Independent observations by M. Bullier at about the same period showed that, in order to obtain this explosive compound of acetylene and copper, it was necessary that the gas should come in contact with a sub-salt of the metal in the presence of excess of ammonia; and as in actual practice these conditions would never be realized, it is manifest that the alleged danger may be disregarded.

Acetylene shows some extremely interesting actions with regard to other metals. If it be passed over red-hot sodium or potassium, these metals burn in the gas with the formation of carbides which, on being brought into contact with water, decompose with explosive violence, again setting acetylene free. Moissan and Mourreu have made the interesting observation that with certain metals in the spongy condition, strong action takes place with acetylene, and that if this gas be passed over reduced iron which has been prepared at as low a temperature as possible, bright incandescence is produced, and carbon is copiously deposited and quickly chokes the tube, hydrogen at the same time appearing as a gaseous residue.

The second drawback that has always been urged against acetylene in its early days was that it was a highly poisonous gas; the researches of Bistrow and Liebreich having apparently shown that it acted upon the blood, in the same way that carbon monoxide did to form a stable compound. Experiments upon the toxic action of gases, however, are open to considerable error, partly depending upon the method by which the gas has been prepared and which will affect its purity, and partly upon the nature of the animals upon which the experiments are tried. Rabbits and other rodents resist the action of gaseous poisons like carbon monoxide far better than carnivorous animals such as dogs; and it is impossible to argue from the action of the gas upon the one what the action will be upon the other, while it has not yet been made clear that the action upon either is a very safe index to the action of the gas upon man. Very extensive experiments, however, made by Dr. Gréchant, Brociner, Malooz, Crismer, and others, conclusively show that acetylene is much less toxic than carbon monoxide, and, indeed, than coal gas.

Acetylene gas can be condensed into the liquid state by cold or by pressure; and the experiments by Ansell show that if the gas be subjected to a pressure of 21.53 atmospheres at a temperature of 0° C., it is converted into the liquid state—the pressure needed increasing, of course, with the rise of temperature, and decreasing with the lowering of the temperature, until at - 82° C. acetylene becomes liquid under ordinary atmospheric pressure. The critical point of the gas is 37° C., at which temperature it requires a pressure of 68 atmospheres to liquefy it; while immediately this temperature is passed, no pressure that could be brought to bear upon it will convert it into the liquid state. This phenomenon, which is common to all gases, of resisting all efforts to liquefy them above a certain temperature, was first investigated by Andrews; and the resolution of liquid acetylene into a gas on reaching its critical point can be very beautifully illustrated by taking a small tube half filled with the



liquid, and projecting an image of it upon the screen. On now gently warming the tube, the meniscus of the liquid, which at first was perfectly clear, is seen to flatten itself, and in a few minutes to entirely disappear as the temperature passes the critical point. On removing the source of heat, and allowing the tube to cool, as soon as the critical point is again reached on the downward scale, a violent storm of acetylene rain is seen to be going on in the tube, as the gas condenses to the liquid state once more.

Long before the discovery by Willson of the method of making calcic carbide on a commercial scale had placed acetylene at every experimentalist's disposal, acetylene had been liquefied by Cailletet, Andrews, and Ansell. But with the advent of calcic carbide, liquid acetylene assumed a position of commercial importance; and Messrs. Dickerson and Suckert, seeing the business possibilities, made it on a fairly large scale, and kept it in steel cylinders, while some time afterwards Pictet also set up the manufacture of the liquid. A great future was expected from its use in this condition, as a cylinder fitted with the necessary reducing valves would supply the gas to light a house for a considerable period; the liquid occupying between  $\frac{1}{15}$  to  $\frac{1}{10}$  the volume of the gas. But in the States and on the Continent, where liquefied acetylene was made on a large scale, several fatal accidents occurred owing to its explosion under not easily explained conditions.

As a result of these explosions, Berthelot and Vieille made a very valuable research upon the explosion of acetylene under various conditions; and they found that, if liquid acetylene in a steel bottle is heated at one point by a platinum wire raised to red heat, the whole mass decomposes and gives rise to such tremendous pressures that no cylinder would be able to withstand them. These pressures vary from 71,000 to 100,000 lbs. per square inch. They moreover tried the effect of shock upon the liquid, and found that the repeated dropping of the cylinder from a height of nearly 20 feet upon a large steel anvil gave no explosion; but that when the cylinder was crushed under a heavy blow, the impact was followed after a short interval of time by an explosion. This, however, was manifestly due to the fracture of the cylinder and ignition of the escaping gas mixed with air from sparks caused by the breaking of the metal; and a similar explosion will frequently follow the breaking in the same way of a cylinder charged with hydrogen at a high pressure. Continuing these experiments, they found that in acetylene gas under ordinary pressures the decomposition brought about in one portion of the gas, either by heat or the firing in it of a small detonator, did not spread far beyond the point at which the decomposition started, but was local; while if the acetylene was compressed to a pressure of more than 30 lbs. on the square inch, the decomposition travelled throughout the mass, and became in reality detonation.

These results showed clearly that liquefied acetylene was far too dangerous for general introduction for domestic purposes, as although the occasions would be rare in which the requisite temperature to bring about detonation would be reached, still if this point were attained, the results would be of a most disastrous character; while the fact that several accidents had already happened, accentuated the risk. In this country, the storage and use of liquefied acetylene is prohibited. When liquefied acetylene is allowed to escape from the cylinder in which it is contained into ordinary atmospheric pressure, some of the liquid assumes the gaseous condition with such rapidity as to cool the remainder below the temperature of  $90^{\circ}\text{C}$ ., and converts it into a solid snow-like mass.

Acetylene has the property of inflaming spontaneously when brought into contact with chlorine. If a few pieces of carbide be dropped into saturated chlorine water, the bubbles of gas as they reach the surface spontaneously catch fire; while if a jet of acetylene be passed up into a bottle of chlorine, it takes fire and burns with a heavy red flame, depositing its carbon in the form of soot. If chlorine be bubbled up into a jar of acetylene standing over water, a violent explosion, attended with a flash of intense light, and the deposition of carbon at once takes place. When acetylene is kept in a small glass holder exposed to direct sunlight, the surface of the glass soon becomes dimmed; and Mr. Bone has shown that when acetylene is exposed for some time to the sun's rays, it undergoes certain polymerization changes which lead to the deposition of a film of heavy hydrocarbons on the surface of the tube. It has also been observed by Cailletet, and later by Villard, that when allowed to stand in the presence of water a solid hydrate is soon formed.

Acetylene, as has been shown, is readily decomposed by heat; polymerizing under its influence to form an enormous number of organic compounds. Indeed, acetylene, which can itself be directly prepared from its constituents—carbon and hydrogen—under the influence of the electric arc, can thus really be made the starting point for the construction of an enormous number of different organic compounds of a complex character. Acetylene in contact with nascent hydrogen builds up ethylene; ethylene acted upon by sulphuric acid yields sulphovinic acid; and this can again be decomposed in the presence of water to yield alcohol, while it has even been proposed to manufacture sugar from this remarkable body. Picric acid also can be obtained from it, by first treating acetylene with sulphuric acid, converting this into phenol by dissolving in potash, and then treating the phenol with fuming nitric acid.

Acetylene is one of those bodies the formation of which is attended with the disappearance of heat; and it is for this reason termed an endothermic compound, in contra-distinction to those bodies which evolve heat in their formation, and which are called exothermic. Such endothermic bodies are nearly always found to show considerable violence in their decomposition, as the heat of formation stored up within them is liberated as sensible heat; and it is undoubtedly this property of acetylene gas which leads to its easy detonation by either heat or a shock from an explosion of fulminating mercury when in contact with it while under pressure. The observation that acetylene would be resolved into its constituents by detonation is due to Berthelot, who by starting an explosive wave in acetylene by firing in it a charge of 0.1 gramme of mercuric fulminate, succeeded in doing this. It has since been shown, however, that unless the gas is at a pressure of more than 2 atmospheres this wave soon dies out and the decomposition is only propagated a few inches from the detonator.

If acetylene be heated in contact with air to a temperature of  $480^{\circ}\text{C}$ ., it ignites and burns with a flame the appearance of which varies with the way in which the acetylene is brought in contact with the air. With the gas in excess, a heavy lurid flame emitting dense volumes of smoke results; while if the gas be driven out in a sufficiently thin sheet, it burns with a flame of intense brilliancy and almost perfect whiteness, by the light of which colours can be judged as well as by daylight. The ignition point of the gas being below that of ordinary gas, it can be ignited by any red hot carbonaceous matter, such as the brightly glowing end of a cigar.

For its complete combustion, 1 volume of acetylene needs  $12\frac{1}{2}$  volumes of air, and forms as its products of combustion carbon dioxide and water vapour. When, however, the air is present in much smaller ratio, incomplete combustion ensues, and carbon, carbon monoxide, carbon dioxide, hydrogen, and water vapour are produced. This is well shown by taking a cylinder one-half full of acetylene and one-half of air. On applying a light to this mixture, a lurid flame runs down the cylinder and a cloud of soot is thrown up; the cylinder also being thickly coated with it, and often containing a ball of carbon. On waiting a few moments to allow some air to diffuse into the cylinder, and again applying a taper, an explosion, due to a mixture of carbon monoxide and air, takes place. It is probable that when a flame is smoking badly, distinct traces of carbon monoxide are being produced; but when an acetylene flame burns properly, the products are as harmless as those of coal gas, and light for light very much less in amount.

When acetylene is mixed with air, like every other combustible gas it forms an explosive mixture. Observers differ somewhat as to the range between which mixtures of acetylene and air are explosive. Dr. Clowes states that any mixture containing from 3 to 82 per cent. of the gas is explosive; while Dr. Bunte gives from 3.8 to 40 per cent. as the explosive limit for the mixture. These discrepancies are probably due to differences in the method of igniting the mixture, and also as to what is to be taken as an explosion. A light applied to a mixture containing 3 or 80 per cent. of acetylene will propagate combustion throughout the mass, but so slowly under all ordinary conditions as not to attain to the dignity of an explosion; and for all practical purposes the explosive limit may be taken as 3.5 per cent. of acetylene, the upper limit being of no importance, as so large a volume of the gas is never likely to be present in the air. An explosive mixture of acetylene and air attains its maximum power with a mixture of  $12\frac{1}{2}$  volumes of air to 1 of acetylene; while ordinary coal gas forms explosive mixtures between the limits of 6 and 29 per cent., and yields its maximum result with a mixture of 1 volume of coal gas to about 10 volumes of air.

The methods which could be, and have been, employed from time to time for the formation of acetylene in small quantities are excessively numerous; but before the commercial production of calcic carbide made acetylene one of the most easily obtainable gases, the methods which were most largely adopted for its preparation in laboratories were: First, the decomposition of ethylene bromide by dropping it slowly into a boiling solution of alcoholic potash, and purifying the evolved gas from the volatile bromethylene by washing it through a second flask containing a boiling solution of alcoholic potash, or by passing it over moderately heated soda lime; and, secondly, the more ordinarily adopted process of passing the products of incomplete combustion from a bunsen burner, the flame of which had struck back, through an ammoniacal solution of cuprous chloride, when the red acetylides of copper was produced, and this on washing and decomposing with hydrochloric acid yielded a stream of acetylene gas. This second method of its production, which was the one most usually adopted, has, however, the great drawback that, unless proper precautions are taken to purify the gas obtained from the copper acetylide, it is always contaminated with certain chlorine derivatives of acetylene.

In the years 1890 and 1891, I devoted much time to trying to ascertain the various actions which take place in coal-gas flames, and which lead to their luminosity. The classical researches of Sir Humphry Davy first clearly showed that luminosity was due to particles of solid carbon heated to incandescence within the luminous zone; and my endeavour was to find the causes which led to the setting free of these solid particles. The gas which is supplied to us for illuminating purposes—whether it be coal gas, carburetted water gas, or oil gas—consists of a mixture of many



gaseous bodies, of which hydrogen, carbon monoxide, and members of the methane and ethylene families form the largest proportion; while a small percentage is composed of gases—such as carbon dioxide, oxygen, and nitrogen—which are simply impurities.

When the homogeneous mixture of these varied constituents leaves the burner-tip, and the gases find themselves in the presence of the atmosphere, they at once begin to diffuse into it with a rapidity inversely proportional to the square roots of their densities, with the result that the lightest and most abundant member of the gas mixture, hydrogen, finds its way quickly to the exterior, and methane soon follows. These two gases, constituting some 85 per cent. of the mixture, on meeting the air bear the brunt of the combustion, and in burning form the main portion of the sheath of complete combustion surrounding the lower part of the flame. The heavier constituents of the coal gas are naturally those least affected by diffusion; and the desertion of the hydrogen and methane concentrates them in the centre of the flame, and they flow upwards, forming the non-luminous inner zone of the flame, or, as it is more often termed, the zone of non-combustion. These gases are chiefly the unsaturated and heavier members of the saturated hydrocarbons present in the coal gas; and in their upward travel the baking action of the heat from the completed combustion going on in the outer envelope of the flame, causes a resolution of the more complex hydrocarbon molecules into the simpler compounds acetylene and methane. As these in turn diffuse outwards, they reach the outer wall of combustion, which is undoubtedly the hottest part of the flame; and just below the inner side of the outer zone, the acetylene, heated to above its temperature of decomposition, instantaneously splits up into finely divided carbon and hydrogen, and the heat liberated by the decomposition and by the change of state of the carbon, being localized by the rapidity of the action to the solid particles, so augments the temperature given to them by the flame, that they glow with high incandescence, and form the luminous sheath which caps the inner zone of non-combustion.

Experiments made by withdrawing the gases from various parts of luminous flames, showed that no matter what was the initial character of the hydrocarbon present, acetylene was always produced before luminosity made its appearance; and, moreover, that the illuminating power of the flame followed the ratio of acetylene so produced. This fact, taken in conjunction with the observation that when acetylene free from air is allowed to flow through a Jena glass tube heated up to a temperature of  $780^{\circ}\text{C}$ . it is decomposed with luminosity; while the carbon set free in flowing forward through the zone of heat is perfectly non-luminous, formed the basis of what is now known as the acetylene theory of luminosity.

Stated in its simplest form, this theory is as follows: In the same way that the decomposition of the acetylene in flowing through a heated tube endows the carbon particles with a luminosity which the heat of the tube alone is unable to impart, so does the decomposition of the acetylene generated in a hydrocarbon flame increase the light-yielding power of the carbon particles liberated by its decomposition over what might have been the light emitted had they only been heated to the temperature of the flame itself. When it is considered what an enormous difference is produced by a few degrees of temperature in the light-emitting power of solids heated in a flame, it at once becomes manifest that it is at least injudicious for opponents of this theory to sneer at the effect likely to be produced by such increase in temperature as is given rise to by the decomposition of acetylene. It is perfectly well known to everyone interested in the methods employed for burning coal gas, that regeneration increases the light emitted by a flame over 100 per cent., and in some cases three times this amount; and yet the increase in the temperature of the flame due to warming the gas and air before combustion is but a small one.

I freely admit that, when I first brought this theory forward in 1895, I placed too much dependence upon the measurements of flame temperatures by the methods at our disposal for such investigations; and in so doing, I laid the theory open to attack—an opportunity that was taken full advantage of. But in spite of all the criticism which has been bestowed upon it, the main issue has never been shaken; and I am as fully convinced now as I was then that in all luminous hydrocarbon flames acetylene may be truly looked upon as “the mother of the luminosity.”

There are conditions under which acetylene can be burnt without the development of light. If acetylene be diluted with about 92 per cent. of hydrogen or carbon monoxide, the molecules are burnt up without decomposition; and there being no solid matter in the flame to heat to incandescence, the flame remains non-luminous. This is due to the acetylene requiring a higher temperature to decompose it when it is diluted than when it is pure; and the greater the dilution, the higher the temperature needed.

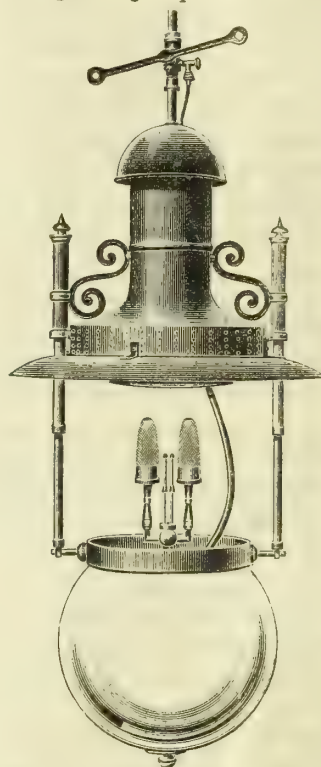
If burning alcohol, which in the open air gives a faintly luminous flame, be placed under a bell jar, the temperature of the flame is lowered by some of the products of combustion being checked in their escape, and the flame becomes absolutely non-luminous. If now oxygen be supplied to the flame, its temperature becomes greatly increased, and not only does the flame become highly luminous, but freely deposits carbon on a cold surface held within it; while gas withdrawn from the interior of the flame under each condition is found to contain acetylene.

Another very striking example of the same kind is to be found in cyanogen—a gas which has always been noted for the beauty of the rose-pink flame with which it burns. Though cyanogen contains the same amount of carbon as acetylene, and is even more endothermic, no one until lately had ever thought of the possibility of its burning with a luminous flame; this being due to the fact that the temperature necessary to break up the molecule was so far above the heat of the flame that the cyanogen molecule burnt as a whole, and there being no deposition of carbon no luminosity would result. If, however, the cyanogen flame be surrounded with pure oxygen instead of air, a faint luminosity appears in the flame owing to the increase of temperature; while if the flame be surrounded by nitrogen dioxide—another endothermic compound—the temperature is so increased that the flame becomes more intense in its illuminating power than the acetylene flame itself, and yields a dense deposit of carbon and paracyanogen to any cold surface held within it.

[The lecture was illustrated by several brilliant experiments.]

#### THE “BEACON” GLOBE LAMP.

The new lamp which we here illustrate, and which has been appropriately named the “Beacon,” appears to possess several points which will commend it for use with the incandescent gas system. It is the invention of Mr. H. Talbot, and is being placed on the market by Messrs. H. Greene and Sons, Limited, of 19, Farringdon Road. It can be readily fitted for one, two, or three burners; and is equally suitable for the new Welsbach burner or the “C” form, with chimney. In the event of a change being required in the number of burners used, it can be



accomplished by simply removing the existing fitting on the supply-pipe of the lamp and screwing on a new piece with the necessary arms. The bypass tube is arranged inside the gas-supply pipe; so that only one pipe is visible inside the lamp. The construction of the top of the body of the lamp renders it entirely wind and weather proof. The cold air passes through a separate chamber, and descends over a cone, which acts as a shield to the burners, and assists in warming the air before it reaches the mantles. This is a decided advantage, especially with the new incandescent burner. When the lamp is intended for use in shops or sheltered places, provision has also been made for the admission of air in the bottom of the globe; and the inflow can be adjusted according to requirements. For obtaining access to the interior of the globe for cleaning purposes and renewal of mantles, the inventor has applied a simple but ingenious arrangement. The globe is let down on

runners, and can also be turned up to an angle on its bearings. The lamp is only being made in one size; so that all parts are interchangeable. While it is substantially built, the demand for an ornamental appearance has not been overlooked by its designer.

**The Value of the Calorie.**—A correspondent of “Engineering” points out that in works on physics the calorie is the amount of heat required to raise the temperature of 1 gramme of water from a temperature of  $4^{\circ}$  to that of  $5^{\circ}\text{C}$ .; its value being thus 0.00396 British thermal units. In works on the steam-engine, and similar manuals, showing both French and English, the calorie is generally taken as the amount of heat required to raise 1 kilogramme of water  $1^{\circ}\text{C}$ .; its value being thus equal to 3.96 British thermal units—a value 1000 times greater than that first named. He wishes to be informed as to what means are taken in French practice to avoid confusion between these two values of a calorie.

**The Effect of Wall Colouring on Illumination.**—Reflection plays a very important part in the illumination of rooms; and the proportion of the light which falls on the walls which is reflected by them, depends on their colour and substance. Experiments recently made for the purpose of determining the extent to which walls of various colours reflected light falling upon them, are reported by “Der Gastechner” to have given the following figures for the reflected light, in percentages of the total light: Black velvet surface, 0.4; black cloth, 1.2; black paper, 4.5; dark blue, 6.5; dark green, 10.1; bright red, 16.2; dark yellow, 20; blue, 30; bright yellow, 40; bright green, 46.5; bright orange, 54.8; white, 70; and mirrors, 92.3.



## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

## Carburation of Coal Gas.

SIR,—I was very pleased indeed to notice in your issue of Nov. 22 that Mr. William Young had, in your "Correspondence" columns, lent his valuable aid to the discussion of the above subject. With reference to the question of temperature and the formation of naphthalene deposits, the main influence in this connection is undoubtedly, as mentioned by Mr. J. W. Helps, the extremes of temperature between the night and the day. Regarding, however, the most interesting theories put forward by Mr. Young, like many other gentlemen who have not seen the apparatus at work, I fear he is under misapprehension as to the part the compressed gas plays in the process; and I would therefore say, with the desire of making this perfectly clear, that only a small amount of gas (about 100 cubic feet or so per hour) is compressed in connection with the production of the oil mist. The temperature of this compressed gas, when used at the atomizers, is precisely the same as the gas in the carburator and the town mains, and therefore cannot affect the question.

In view of the above explanation, Mr. Young will doubtless look into the matter again; and that I may assist him, I would add that the process does not deteriorate the illuminating power of the gas. On the contrary, as has already been pointed out several times, it has been noted that at the extremes of our district it is better maintained than formerly was the case. Also the syphons outside the works are only pumped once a month—following our custom here for many years past. The amount of condensation, which is partly of oil and partly of water, is slightly more than formerly; but in view of the very greatly increased output of gas, this, of course, is only to be expected. There is, undoubtedly, naphthalene in solution in the liquid found in the syphons about the town. But it is not of the quantity the theory advanced by Mr. Young would imply; the oil used having but slight solvent properties.

The oil which collects in the drip-well of the carburator itself, is used over and over again, until its specific gravity has reached about .845 to .850; and it does not contain naphthalene. The syphons of the town mains, within the area of the works, contain oil and water in widely varying proportions; but, again, this oil is nearly always quite free from naphthalene, and after separation is used in the water-gas plant, unless its specific gravity renders it suitable for use again in the carburator. There is also absolute proof that the carburated gas retains, and to a degree absorbs (when present in the mains), naphthalene right up to the burner. Mr. Young suggests that oil may be found in the consumers' fittings, but this is not so in the ordinary way, and has not given any trouble. Besides, the quantity used is so minute.

I look forward to Mr. Young's further contribution on the subject with great interest.

Hastings, Nov. 25, 1898.

CHAS. E. BOTLEY.

## Prepayment Meters.

SIR,—The interesting article by Mr. E. W. T. Richmond would be more so if some inaccuracies were corrected. Wallace's patent was not twelve months prior to Brownhill's, but in the same year; the one being dated Feb. 1, 1887, and the other May 13, 1887. In his provisional specification, Wallace made no mention of supplying gas at all; his invention being one for the delivery of articles of an undefined character, but which the description shows cannot be gas. The proposed delivery of fluids is not mentioned until his complete specification, which was lodged on Dec. 1, 1887. In the meantime, Brownhill had applied for his patent under the specific title of "An Improved Gas-Meter for Supplying Gas in Exchange for Coin or an Equivalent," and this evidently gave Wallace the inspiration as to gas.

I also notice that Mr. Richmond goes out of his way to speak of Mr. Price's invention as "one of the few master patents." He ought to know that there can only be one master patent in any class; and, if such a thing exists (as I believe it does), it is not Price's, which was No. 15,410 of 1887, but his predecessor Brownhill's, No. 7620 of 1887. Further, so far as I am aware, Price's meter never came into extensive use; and Mr. Richmond forbears to mention the first attachment which was largely employed—viz., that of Thorp and Marsh, No. 7233 of 1889, made by Messrs. Sawyer and Purves. This is the one which was fixed in Liverpool, and which proved to be an operative success.

I would not have troubled you with this letter were it not that Mr. Richmond is in some sense making history, and it is as well the facts should be accurately stated.

Manchester, Nov. 21, 1898.

JOSEPH NASMITH.

## Tramway Traction.

SIR,—In view of Mr. J. Allen Baker's report on the above subject, and his recent communication to the Press thereon, I should like, with your permission, to make a few remarks on the question.

As pointed out in your second article on "Mechanical Tramway Traction," Mr. Baker, as well as other electrical engineers, entirely shirks the question of gas traction, although no electrical system whatever can show the cost of energy to be so low as that of the gas-motors at Blackpool, where 0.92d. is the cost of the power to run a car one mile. Some of the electrical papers have dealt with the question of gas cars facetiously, being apparently unable to controvert the figures put forward in support of their economical working. Banter is not argument; and some of these would-be wisacres seem to think this method of tramway propulsion is at a standstill—that no advance whatever has been made in connection with its mechanism, and that no improvements have been introduced. Whole installations of electrical apparatus may be scrapped to make room for more modern ideas or better machinery, as has been done in America; but this is not taken as indicating a weakness on the part of the electrical industries, but rather as a proof that the goal of perfection is being reached. The same consideration, however, is not shown in the case of the gas cars; the argument used being: It was bad once; it cannot be good now. In the early days of gas traction, difficulties had to be met, and occasionally objec-

tionable features cropped up; but some of those who witnessed the trials at that time have these disadvantages still in their minds, and cannot yet get the idea of smell removed from their memories. They therefore continue to condemn in the cars what does not now exist. Both smell and vibration are entirely eradicated—the one by the introduction of special lubricating arrangements, and the other by a simple process of balancing; and as cars every day and all day ascend at Blackpool gradients of 1 in 26, and at the same time go round a curve of 30 feet radius, it cannot logically be affirmed that the system is by any means out of the running.

In the "New York Herald" of the 27th of October, there is a report of a paper given by Mr. A. A. Kundson before the American Institute of Electrical Engineers; and the following extracts prove, even after so many years of American experience of electrical traction, that the question of electrolytic action is still a pertinent and ever-present one, although electrical partisans on this side would have us believe otherwise: "He started out by quoting the report of E. E. Brownell, a civil engineer who was employed to examine the water-mains of Dayton (Ohio). 'To my surprise I have found in this city a 6-inch water-main that was corroded to the depth of  $\frac{1}{4}$ -inch.' Subterraneous New York is honeycombed with wild cat electric currents that are playing havoc with water and gas pipes, and endangering the foundations of the 'L' structure. This startling revelation was made last night to the members of the American Institute of Electrical Engineers by A. A. Kundson. . . . By leakage in Harlem. . . . the electrolysis where the current left the rails was so great at this point that the Company was recently obliged to lay new rails." There is more; but the above is a sufficiently striking commentary on Mr. Baker's deductions in favour of electricity.

It will be easier to deal with the merits of the three systems if I tabulate the disadvantages and advantages of each. To my mind, the main disadvantages of the electrical systems are—

## Conduit.

- 1.—Excessive initial cost. In some cases, £20,000 was expended on a mile of single track, and £15,000 on one junction alone.
- 2.—Danger of slot to vehicular traffic.
- 3.—Filling of slot with water, slush, or snow. Our climate is too humid; and the system at Blackpool has been stopped for hours, and Berlin has had a similar experience, through the snow filling the troughs.
- 4.—High working costs. In view of different rates of speed, 5d. cannot seriously be taken as a criterion of English experience, with the Board of Trade limit of eight miles per hour.
- 5.—Cars not self-contained.

## Trolley.

- 1.—Heavy capital expenditure.
- 2.—Cars not self-contained.
- 3.—Trolley wires dangerous. Even on a new installation on the Springburn route at Glasgow, a trolley wire broke with a vivid flash, and alarmed the passengers. Other examples can readily be recalled by your readers.
- 4.—Dangers of electrolysis. Either take American experience or digest the expert evidence given at the late British Association meeting; both corroborate the destructiveness of electrical currents.
- 5.—Cost for energy high. Taking 0.95 of a unit as being necessary to propel a car a mile, the cost for power can easily be calculated from the statistics given in "Lightning" week by week. The average rate is about 4d. per unit, although in some cases it is less; but in Edinburgh, where the cost of production is cheapest, the actual cost is 1.2d., and the selling price for power 2d.

From this it can safely be inferred that most corporations adopting the trolley would find their electricity bills too heavy to be either comfortable or profitable.

These are sufficient arguments to induce the "powers that be" to hesitate before committing their ratepayers to any electrical installation.

Mr. Hersey, in his letter (*ante*, p. 976), gave ample proof that gas traction was quite capable of holding its own in the field of tramway enterprise; but it may be useful to set out again the main reasons why gas-motor cars are so admirably suited for tramways. They are as follows:—

- 1.—Low capital expenditure. The cost of compressing plant for, say, twenty cars would only be about £2000—an infinitesimal sum compared with that required to instal electric cars.
- 2.—The cars are self-contained. There is no chance of disorganizing the system should a car break down.
- 3.—Energy to run a car-mile costs only 0.92d.
- 4.—Cars can run on any well-laid line.
- 5.—System can be gradually adopted, and gas-motor cars can run in general traffic with horse cars, either as an experiment or until the time is ripe for a complete organization.

In your excellent articles, you are bringing forward strong arguments which it will be difficult for our electrical friends to controvert, and are giving the gas-motor industry a fillip for which the thanks of all those interested in gas undertakings will be gratefully given. Whatever gas traction may have been in its initial stages, the gas-motor cars of to-day will compare favourably with those of any other system, more particularly as those in use at Blackpool will shortly be brilliantly lighted with incandescent mantles; and if the Company are given an opportunity of demonstrating their merits and advantages of their system on the London tram-lines, electric partisans will find that the gas-motors cannot be swept out of the tramway field by a sneer, or utterly demolished by a hoary-headed jokelet.

London, Nov. 17, 1898.

A BELIEVER IN GAS-TRAMS.

**A New Retort-House at Spalding.**—Alderman Mills, the Chairman of the Gas Committee of the Spalding District Council, opened a new retort-house at the gas-works last Thursday. The building, which has been constructed to accommodate twelve beds of retorts, has cost upwards of £3000. The gas-works during recent years have been very profitable. They are free from debt, the price of gas has been reduced to 2s. 6d. per 1000 cubic feet, and the public lighting done at a nominal cost.



## PARLIAMENTARY INTELLIGENCE.

### NOTICES GIVEN FOR BILLS (SESSION 1899) RELATING TO GAS AND WATER SUPPLY AND ELECTRIC LIGHTING.

- Airdrie and Coatbridge Water.**—Permission will be sought by the Airdrie and Coatbridge Water Company to abandon a reservoir and certain incidental works authorized by their Amendment Act of 1892, and construct new works comprising a reservoir in the parish of Lamington and Wandel, in Lanarkshire, and an aqueduct or pipe-line. Additional capital will be required.
- Arbroath Corporation Gas.**—Application will be made by the Corporation of Arbroath for authority to borrow additional money for the purposes of their gas undertaking, and to alter and define the rights and privileges of creditors. It is proposed to amend the Corporation's Act of 1871 with reference to the quality and illuminating power of the gas supplied, and reduce the number of candles prescribed, and make further provision with respect to the quality, lighting power and pressure, and testing of the gas; also to amend section 47 of that Act, limiting the standard price charged for gas consumed by meter, and make all necessary provisions for altering the rates for gas, meters, and residual products so that the yearly income to be derived therefrom shall, as nearly as may be, meet the expenditure for each year, including annuities, interest, and sinking fund. Provision will be made for the application of the revenues to the formation of a contingent, reserve, depreciation, renewal, or other fund in connection with the undertaking.
- Ayr Burgh.**—The Corporation of Ayr intend to apply for power to construct new water-works, comprising a service reservoir, a pumping-station, and three pipe-lines, together with a road giving access to the pumping-station. Further borrowing powers will be applied for.
- Barking Improvement.**—The Barking Urban District Council purpose applying, among other things, for authority to purchase the undertaking of the Barking Gas Company, improve and extend the works, and supply gas, meters, fittings, &c., as well as electric wires, fuses, and fittings, in their district. The necessary money powers will be required.
- Barton-on-Sea Water.**—Authority will be sought for the incorporation of a company for the purpose of constructing works to supply water within the parishes of Highcliffe, Milton, Hordle, Milford, Sway, Brockenhurst, Boldre, and Lymington, the township or parish of Rhinefield, and the borough of Lymington, all in the county of Southampton, or in one or more of these places. The works will consist of a well, pumping-station, and service reservoir in the parish of Milton, and two conduits or pipe-lines. The usual powers of water companies will be applied for.
- Belfast Corporation.**—In a General Bill to be promoted by the Corporation of Belfast, authority will be sought to use for gas-works purposes certain lands now occupied as an abattoir and store-yard; also to amend the enactment regulating the allowance of discount to gas consumers, and make new provisions in regard thereto, and to repeal section 138 of the Belfast Water Commissioners Act, 1840, with respect to the laying and maintenance of gas mains and pipes.
- Belfast Water.**—The Water Commissioners of Belfast purpose applying for an extension of their limits of supply, so as to include certain places in the parishes of Shankill and Drumberg. New works, comprising two filter-beds, three conduits, an aqueduct, and the widening of a bridge, are proposed. Provisions are to be made in regard to the laying of gas-pipes, the prevention of waste of water and damage to fittings, and other matters. Additional borrowing powers will be applied for.
- Birmingham Corporation.**—The Corporation of Birmingham intend to apply for authority for the transfer to them of the undertaking of the Birmingham Electric Supply Company, Limited. The Bill to be promoted will contain provisions in regard to the Company's debts, liabilities, contracts, &c., and to the distribution of the purchase-money on the winding up of the concern. The Corporation will require more money.
- Blackpool Improvement.**—In a Bill to be promoted by the Blackpool Corporation for authority to carry out improvements in the town, regulations will be included in regard to electric fittings, the measurement of electric energy, and arrears of payments for such energy and for gas; the Corporation seeking power to refuse to supply either commodity to any person whose payments are in arrear.
- Bognor Urban District Water.**—Authority will be sought by the Bognor District Council to purchase, by compulsion or agreement, the undertaking of the Bognor Water Company, and carry it on with the usual privileges granted to suppliers of water. The Company will be wound up. Borrowing powers will be required.
- Bootle Corporation.**—In a General Powers Bill to be promoted by the Corporation of Bootle, provision is to be made for the extension to districts outside the borough of some or all of the powers conferred by the Corporation's Electric Light Order of 1895, and for the alteration of the date to which accounts under that Order are made up.
- Bradford Improvement.**—In a Bill to be promoted by the Bradford Corporation to enable them to carry out an extensive system of tramways, provisions will be included for the acquisition, compulsorily or by agreement, of the mains, pipes, and appliances in the city belonging to the Clayton, Allerton, and Thornton Gas Company, the Pudsey Gas Company, and the Shipley Gas Company, and the extension of the gas limits of the Corporation to the whole city. Authority will be sought to supply electric fittings. Additional borrowing powers will be required.
- Brigg Urban District Gas.**—The Urban District Council of Brigg intend to apply for power to purchase the undertaking of the Brigg Gas Company, Limited, improve and extend the existing works, and supply gas, meters, fittings, &c. Permission to borrow the necessary money will be sought.
- Bristol Gas.**—The Bristol Gas Company intend to apply for power to erect storage plant, with the accessory appliances, on land at Horfield, in Gloucestershire; supply stoves, meters, engines, dynamos, &c.; prescribe and regulate the position and size of pipes, fittings, &c.; and allow discounts. Authority will be sought to lay down, maintain, alter, and renew mains, pipes, and culverts within the limits of the

Company for the supply of gas, as defined by the Act of 1853, for the purpose of conveying or disposing of any oil or other materials used in or resulting from the manufacture of gas or residual products, or for any purpose connected with their business; and for any of these objects to utilize any of their existing mains, pipes, or works, whether laid in any street or road or elsewhere. It is proposed to consolidate the existing debenture stock of the Company into one general class of stock, and to ask for authority to raise further capital.

**Burley-in-Wharfedale Urban District Water.**—The Urban District Council of Burley-in-Wharfedale intend to apply for power to acquire, by compulsion or agreement, certain lands, with the two reservoirs and water-works erected thereon, situate on Burley Moor, known as higher and lower Lanshaw reservoirs, with the catchwaters and other works connected therewith, together with all water rights, minerals, and mineral and other rights appertaining thereto, or held and enjoyed therewith, reputed to belong to Mrs. Sophie Crofton and her Trustees. They will seek permission to make and maintain a reservoir on Carr Beck, on Burley Moor, and construct three lines of pipes in connection therewith. The usual powers granted to suppliers of water will be sought; as well as authority to raise more money.

**Bury Corporation.**—In a general Bill to be promoted by the Bury Corporation, authority will be sought for the consolidation of the gas-works loans, the extension of the periods for their repayment, and the application and investment of the sinking funds.

**Bury Corporation Water.**—The Bury Corporation will apply for power to construct new water-works; consisting of a storage reservoir on the Ogden Brook, with an aqueduct connecting it with the Black Carr reservoir at Bury, and a service reservoir at Slates, in Haslingden, with an aqueduct to it from the existing reservoir at Holden Wood. Authority will be sought for the compulsory purchase of lands, the alteration and increase of the water-rates, the raising of additional money by the issue of stock, &c.

**Cambridge Gas.**—The Cambridge University and Town Gas Company intend to apply for authority to raise additional capital, extend their limits of supply so as to include the parish of Histon and the portions of Grantchester, Trumpington, Chesterton, Girton, Fen Ditton, and Cherryhinton which are not already included therein. It is proposed to make special provision with respect to the appointment of an auditor or auditors of the accounts of the Company and his or their qualification and remuneration, and to alter the dates at which the ordinary meetings of the Company may be held. The Company will ask to be authorized to call in and cancel the certificates of any stock issued by them, and to grant new certificates, and make provision for ensuring and enforcing the delivery of existing certificates to the Company for cancellation. The Company wish to have power to supply stoves, meters, engines, dynamos, prepayment apparatus, &c., and to make provisions for securing the payment and recovery of gas-rates, rents, and other charges, the testing of gas, the protection of the Company's property from distraint, and the inspection of fittings. The Company will ask permission to lay a line of pipes for conveying oil or other materials from their railway sidings to the works.

**Central Electric Supply.**—The Central Electric Supply Company, Limited, will make application for power to generate and supply electrical energy to other bodies, and for this purpose to construct a generating station, railway, dock, and other works, at North Bank, St. John's Wood, in the parish of Marylebone.

**Church Stretton Water.**—The sanction of Parliament will be sought for the incorporation of a company for the construction of works and the supply of water within the parish of Church Stretton, in Shropshire. The works will comprise a reservoir and an intake-tank on the Carding Mill stream, and four aqueducts or pipe-lines. The usual powers granted to water companies will be applied for.

**Clay Cross Water.**—The Clay Cross Urban District Council desire to acquire, by compulsion or agreement, the undertaking of the Clay Cross Water Company, to purchase water in bulk, and to provide new storage reservoirs and other works. The usual privileges accorded to suppliers of water will be applied for, as well as power to raise money for the general purposes of the undertaking. Provision will be made for the dissolution of the Company and the distribution of the purchase-money.

**Coalville Urban District Gas.**—Authority will be sought by the Urban District Council of Coalville to purchase the undertaking of the Whitwick and Coalville Gas Company, renew the existing works, and supply gas in the above-named parishes and others in the county of Leicester. Provision will be made for the confirmation of any agreement for purchase entered into between the Council and the Company prior to the passing of the Bill. Borrowing powers will be applied for.

**Cobham Gas.**—Application will be made for the incorporation of a Company to construct works and supply gas in the parishes of Cobham, Stoke D'Abernon, Ockham, Wisley, and Byfleet, as well as a portion of Walton-on-Thames. Power will be sought to acquire the undertaking of the Cobham Gas Company, and also to apply for authority to supply electricity.

**County of London and Brush Provincial Electric Lighting Company.**—This Company will apply for power to erect generating stations, extend their districts of supply, and construct connecting mains within and beyond those districts.

**Crowborough District Water.**—The Crowborough District Water Company will apply for authority to construct additional works, consisting of wells, pumping-stations, reservoirs, and conduits in the parishes of Rotherfield and Mayfield, in Sussex, and extend their area of supply so as to include Mayfield and Hartfield, and so much of the parishes of Buxted, Rotherfield, Withyham, Wadhurst, and Frant, in that county, and of Speldhurst, in Kent, as are not already comprised within the Company's district. Provision will be made for increasing the rates and charges, the supply of fittings, and the sale of water by meter, and in bulk or otherwise, outside the limits. Additional share and loan capital will be required. The Company's Act of last year, as well as others, is to be amended.

**Crowborough Gas.**—It is proposed to incorporate a company to construct works for the supply of gas at Crowborough and other places in Suffolk, and to acquire the undertakings of the Crowborough and Mayfield Gas Companies; and application will be made for the necessary authority. Permission will also be sought to apply for electric lighting powers.

**Darwen Corporation.**—The Corporation of Darwen will apply, among



other things, for authority to construct a conduit or pipe-line in connection with the existing main line of pipes, and to make provision for the improvement of the water-works and the protection of the water. The Corporation will ask to be empowered to supply electrical fittings, and to prevent the connection or disconnection of gas-meters with gas-pipes without notice. Further borrowing powers will be sought.

**Derby Corporation Water.**—The Derby Corporation give notice of their intention to apply for an Act to enable them to carry out their scheme of water supply from the Rivers Derwent, Ashop, and Noe, and the Burbage Brook. The works proposed consist of a reservoir (to be called the Ronksley) to be formed upon the Derwent, and be situated partly in Hope Woodlands, in Derbyshire, and partly in Bradfield, in the West Riding of the county of York; another reservoir, to be called the Howden, and a third the Derwent, also to be formed upon that river; the Woodlands and Ashopton reservoirs, upon the Ashop; the Bamford reservoir, upon the Derwent; the Edale reservoir, upon the Noe; the Burbage reservoir, upon the Burbage Brook; four conduits or catchwaters; sixteen conduits or pipe-lines; three service-tanks; and a number of road diversions and tram roads. Special powers will be applied for with regard to the execution of works by the Corporation in conjunction with other Corporations, County Councils, and Local Authorities or bodies, and powers to those bodies to enter into agreements in reference thereto. Provision will be made for the confirmation of any agreement entered into with the County Council of Derbyshire with respect to the supply of water to Urban and Rural District Councils. Special powers are to be given to the County Council of Derbyshire to create water districts, and to constitute Joint Committees or Boards for providing a supply of water within such districts; and also to promote any Bills which may be necessary to carry out any arrangements made with the Corporation for a supply of water. The Bill will contain provisions as to the sale of water in bulk, the protection of the sources of supply and the prevention of pollution, and the framing of bye-laws and regulations; and power will be sought to make arrangements with landowners in reference thereto. It is proposed that further borrowing powers shall be conferred upon the Corporation, the Derbyshire County Council, and other public bodies.

**Dorchester Corporation Gas.**—The Corporation of Dorchester purpose applying for power to acquire the undertakings of the Dorchester Gas and Coke Company, Limited, and the Dorchester Gas-Fitting Company, Limited, or either of them; improve and extend all or some of the existing gas-works; supply gas, meters, and fittings, &c.; and generally carry on the business of suppliers of gas. Authority will be sought to raise the necessary money.

**Dublin Corporation.**—The Dublin Corporation intend to apply for power to carry out a scheme of extension, so as to include within the city the townships of Rathmines and Rathgar, Pembroke, New Kilmainham, Drumecondra, Clonliffe, Glasnevin, and Clontarf, and also certain portions of the county of Dublin. The Township Commissioners are to be dissolved, and their property, rights, powers, and privileges transferred to the Corporation. The water undertaking of the Rathmines and Rathgar Commissioners will, of course, be taken over. The new conditions will necessitate a re-adjustment of the municipal, water, and other rates. The Corporation will seek authority to supply water and electricity within the added area, and to borrow further money for the various purposes set forth in the notice. The scheme will necessitate the repeal or amendment of a number of Acts of Parliament relating to the districts concerned.

**Dumbarton Burgh.**—In a General Bill which the Town Council of Dumbarton intend to promote, power will be sought to extend the municipal and police boundaries of the burgh, and consequently the present limits of gas and water supply.

**Dundee Gas, &c.**—The Gas Commissioners of Dundee intend to apply for power to discontinue and remove portions of their existing gas-works, and erect and maintain others, comprising manufacturing, purifying, and storage plant, on lands belonging to them upon which the existing works stand, and on others which have been acquired by agreement. Authority will be sought to obtain possession of additional lands, and to raise more money. The boundaries of the city are to be extended.

**East London Water.**—The East London Water Company will apply for authority to construct new reservoirs and lines of pipes, and draw more water from the Thames, in accordance with a scheme of which particulars were given in the "JOURNAL" last week (p. 1174). Further money powers will be required.

**Falmouth Corporation Gas and Water.**—The Corporation of Falmouth gave notice to apply for power to acquire the undertakings of the Falmouth Gas and Water Companies, and carry them on; but it will be seen by the report in another column that the ratepayers have rejected the scheme.

**Fishguard Water and Gas.**—Application will be made for the incorporation of a company to construct and maintain works for the supply of water and gas, as well as residual products, within the parishes of Fishguard, Manowren, and Llanwnda, in Pembrokeshire. The usual powers will be required, and also authority to apply for permission to undertake electric lighting.

**Fylde Water Board.**—Authority will be sought by the Fylde Water Board to issue stock to the shareholders of the Fylde Water-Works Company. The Bill to be promoted will sanction the creation of the stock, give power to trustees to invest therein, and make better provision with regard to the supply of water, the prevention of waste, the inspection and testing of fittings, and the letting thereof, as well as meters, &c., on hire.

**Gainsborough Gas.**—The Urban District Council of Gainsborough seek power to manufacture and supply gas, acquire the undertaking of the Gainsborough Gas Company, maintain and renew the existing works, and sell gas, fittings, &c., or let them on hire, in the Company's district, comprising Gainsborough and the parish of Morton.

**Gaslight and Coke Company.**—Application will be made by The Gaslight and Coke Company for further powers, including authority to raise additional share and loan capital, increase the insurance fund, and make consequential or incidental provisions. Land in the parish of East Ham is to be acquired for the construction of works for the manufacture and storage of gas and residual products, and for the general purposes of the undertaking. It is proposed to extend the time

for the sale of superfluous lands, and to alter or repeal the provisions of the Lands Clauses Act, 1845, with respect thereto.

**Glasgow Corporation Gas and Water.**—Authority will be sought by the Glasgow Corporation for the acquisition of lands for gas purposes, and for the abandonment of the Dalmarnock works. The scheme of the Corporation was described in the "JOURNAL" for the 8th inst. (p. 1040). In the Bill to be promoted, provisions will be included for making tenants liable for the gas and electricity rents of sub-tenants, and generally with regard to the supply and payment for gas and electricity, and the inspection of service-pipes. The Sale of Gas Act, 1859, is to be amended in respect of meter registration. It is proposed to acquire the Partick and other electricity works, and supply current beyond the city. Additional borrowing powers will be applied for.

**Glastonbury Water.**—The Corporation of Glastonbury intend to ask for authority to construct certain water-works, consisting of a well and two conduits or pipe-lines, and supply water not only in Glastonbury, but also in Pilton, North Wootton, West Pennard, Baltonsborough, Sharp-ham, and Street, all in the county of Somerset. Additional borrowing powers will be sought.

**Godalming Water.**—The Corporation of Godalming wish to acquire, by agreement or compulsion, the undertaking of the Frith Hill, Godalming, and Farncombe Water Company, Limited, and have the exclusive right to supply water within certain limits. In the Bill to be promoted, provisions will be included for the prevention of the pollution of the water, the regulation of the supply, &c. The Company will be wound up. Borrowing powers will be required.

**Goole Urban District Council.**—The Urban District Council of Goole intend to apply for power to construct new water-works, consisting of a pumping-station in the township of Pollington and three aqueducts. The limits of supply are to be extended, so as to include the townships of Rawcliffe, Snaith and Cowick, Pollington, and Gowdall, all in the West Riding of the county of York. The Council will require additional borrowing powers both for water and gas works purposes.

**Great Yarmouth Water.**—Authority will be sought by the Great Yarmouth Water Company to construct additional works, consisting of two pipe-lines, and to extend the limits of supply so as to include part of Southtown, Runham, and the detached portion of Acle lying near Great Yarmouth. Additional capital will be required.

**Hastings and St. Leonards Gas.**—The Hastings and St. Leonards Gas Company wish for authority to purchase, by agreement, certain lands for the construction of gas-works. The Bill to be promoted will include provisions for the maintenance of the existing works, the erection of houses and cottages for officers and servants, and the construction of sidings and ancillary works. It is proposed to extend the limits of supply so as to include Bexhill and Crowhurst; and power will be sought to purchase the gas and water undertakings of the Bexhill Water and Gas Company. It is intended to apply for power to accept from the Hastings Corporation, the Hastings and St. Leonards Electric Light Company, and the Bexhill Urban Sanitary Authority, a transfer of the electric lighting powers which have been conferred upon them; and the Company will seek permission to apply their funds in making application for a Provisional Order under the Electric Lighting Acts. Provisions will be included in regard to the manufacture and supply of stoves, fittings, &c., the regulation of meters and fittings, and the exemption thereof from liability to distress. Additional capital will be required.

**Herne Bay Water.**—The Herne Bay Water Company will apply for power to construct new works, consisting of a service reservoir to the north of the existing pumping-station of the Company at Mickleburgh Hill, and two aqueducts or pipe-lines. Authority will be sought to purchase lands, waters, and easements compulsorily. Additional capital will be required.

**Highland Water Power.**—Application will be made for the incorporation of a Company to supply water for power and other purposes from Loch Erich. The works comprise a water power and electricity generating station near the head of Loch Leven, in Inverness-shire, and reservoirs, aqueducts, and other works in that county, as well as in Perthshire and Argyllshire; also stations and apparatus for developing water power, and for generating, storing, and distributing electricity. In the Bill to be promoted, provision will be made for acquiring lands compulsorily, giving compensation water, and making agreements with public bodies.

**Horsforth Urban District Council (Water Transfer).**—The Urban District Council of Horsforth intend to apply for power to purchase, by compulsion or agreement, the undertaking of the Horsforth Water Company, with the rights and privileges attaching thereto. In the event of the purchase taking place, the Company will be wound up.

**Horsforth Water.**—Application is to be made by the Horsforth Water Company for power to construct works consisting of a reservoir, to be situated in Burley-in-Wharfedale, four aqueducts or pipe-lines, and a waste-water conduit. Additional capital will be applied for.

**Ilford Gas.**—The Ilford Gas Company will ask for authority to extend their works on land lately purchased, dissolve and re-incorporate the Company, consolidate and increase the existing capital, and raise more money.

**Ilford Urban District Gas.**—The Urban District Council of Ilford seek authority to acquire the undertaking of the Ilford Gas Company, and so much of that of the Barking Gas Company as is situate within the district of the Council, who desire to have exclusive powers to supply gas therein; also to maintain, improve, and extend all or some of the existing works, and construct new ones. The usual powers for the supply of meters, fittings, &c., will be sought; as well as authority to raise money.

**Lanarkshire (Middle Ward District) Water.**—The District Committee of the Middle Ward of Lanarkshire desire power to construct additional water-works, consisting of three service reservoirs. It is proposed to alter or repeal certain provisions of the Lanarkshire (Middle Ward District) Water Acts of 1892 and 1896 with respect to the domestic water-rate. More money will be required.

**Lancashire Electric Power Company.**—Application will be made for the incorporation of a company to construct works and supply electrical energy in a number of places in Lancashire and Cheshire, including Liverpool and Manchester, and to enter into agreements with local authorities and others for the sale of electricity in bulk or otherwise.



**Lea Bridge Gas.**—Application will be made by the Lea Bridge District Gas Company for power to convert and consolidate the existing capital, and raise more. Authority will be sought for the purchase of additional lands, and for the construction of works for the manufacture and storage of gas on those already acquired. Power will be applied for to supply gas in bulk, lay pipes for telegraphs or telephones, and for the conveyance of water or oil, make regulations for the supply of gas for engines, and purchase or hire railway waggons and trucks.

**Leicester and Warwickshire Electric Supply Company.**—It is proposed to apply for powers of incorporation for a similar company to the one mentioned above to supply electrical energy within parts of the counties of Leicester, Warwick, and Derby.

**Leicester Corporation Water.**—The Corporation of Leicester will apply for power to construct new water-works, comprising four storage reservoirs in the parish of Hope Woodlands, one in that parish and in Derwent, an intake in the parishes of Derwent and Bamford, a large number of road diversions, aqueducts, and pipe-lines, and several service reservoirs and overflows. Authority will be sought to appropriate the waters of the Rivers Derwent and Ashop and all their tributary streams and springs above the point where the Bamford reservoir will cross the first-named river. The usual privileges granted in connection with the supply of water will be applied for, as well as authority for the creation of a Joint Board composed of the Corporations of Leicester and Derby, and the transfer to them of certain powers of the intended Act as to the construction of works and the acquisition of lands therefor, the borrowing of money, and the levying of rates and charges.

**Leigh-on-Sea Urban District Council.**—Power will be sought by the Urban District Council of Leigh-on-Sea, in Essex, to manufacture and supply gas within their district, and to purchase, by compulsion or agreement, the works and plant, or some portion thereof, belonging to Messrs. S. & H. S. While, trading as the Leigh-on-Sea Gas Company. The Council desire authority to maintain the existing works and construct new ones, and to acquire land for the purpose by compulsion or agreement. The usual privileges granted to gas companies will be applied for.

**London County Council (General Powers).**—In a General Bill of which notice has been given by the London County Council, power will be sought to dissolve and re-constitute the Lea Conservancy Board. It is proposed to define the number of members of the new Board, and to abolish or alter the right of any corporation, body, company, or person to nominate, appoint, or elect members. Provision is to be made for the nomination or appointment of members by the Council, the Corporations of London and West Ham, and the County Councils of Middlesex, Essex, Bedford, and Hertfordshire, or some of those bodies, and by such other companies, bodies, and persons as may be named in the Bill or be determined by Parliament. The powers of the existing Board are to be vested in the new one. The Lea Conservancy Act, 1868, and Acts of the New River and East London Water Companies are to be altered or amended.

**London Water (Aqueducts and Works).**—The London County Council notify their intention of applying for power to construct storage and service reservoirs on the River Yrfon, in Brecknockshire, and at Boreham Wood, in Hertfordshire, together with filter-beds near Edgware and Hendon, and other works, as set forth in the "JOURNAL" last week (p. 1174).

**London Water (Finance).**—The London County Council intend to apply to Parliament for power to raise money for the purchase of the Water Companies' undertakings; and a Bill will be promoted to sanction the creation and issue of stock or annuities (terminable or otherwise) to such amount as may be necessary for the purpose. The stock or annuities will be charged upon the revenue derivable from any undertaking purchased, and collaterally upon the county rate of the Administrative County of London. The Bill may provide that, in the event of the Council being empowered to construct water-works, or purchase lands, water, or water rights for the purposes of water-works, the moneys necessary for such construction or purchase, and purposes incidental thereto, may be raised in the manner above provided.

**London Water (Purchase of Companies).**—The London County Council will seek authority to acquire, by agreement or upon arbitration terms, the undertakings of the eight London Water Companies, and that of the Staines Reservoirs Joint Committee. In the Bill to be promoted, provision will be made for the appointment and procedure of the arbitrator, and the settlement of the terms of purchase; the connection of the Companies' systems, and the management and administration of the supply; the appointment of Committees, and the representation of the London Corporation thereon; the transfer of parts of the entire undertaking to extra-Metropolitan Local Authorities, and the combination of such Authorities; the management of the water supply in districts outside the Metropolis, &c. The several Companies and the Staines Reservoirs Committee will be dissolved. Stock and annuities are to be created; and the sinking funds held by the Chamberlain of London are to be applicable to the proposed purchase.

**London Water (Welsh Reservoirs and Works).**—The London County Council will also apply for authority to carry out their scheme for the supply of London and the adjoining districts with water from Wales. This scheme has so recently been dealt with at great length in our columns, in connection with the elaborate report of Sir B. Baker and Mr. G. F. Deacon thereon, that it is only necessary to give a bare outline of the notice. The works comprise the Yrfon, Towy, Upper Wye, and Llanafan reservoirs, several aqueducts, and a number of road diversions. The waters of the Yrfon, Towy, Wye, Chwefri, and tributary streams, are to be impounded, lands and buildings submerged, and a section of the London and North-Western Railway diverted. Provision will be made for the purchase by agreement of lands in the watersheds of the three rivers first above named, and for other lands and easements; the supply of compensation water; the creation of stock and annuities; and the charging of the cost of the scheme upon the water-rates and revenue of the undertaking.

**Loughborough Corporation.**—The Corporation of Loughborough will apply for power to purchase the undertaking of the Loughborough Gas Company; maintain, extend, and construct works; and supply gas in the borough and the adjacent parishes of Nantpantan, Thorepeare-

cum-Dishley, Hathern, and Woodthorpe. Authority will be sought to erect a generating station and supply electricity; also gas and electric light fittings, stoves, &c. Further money powers will be needed.

**Loughborough Gas.**—The Loughborough Gas Company will apply for authority to raise additional capital, deal in stoves, fittings, &c., supply gas in bulk, apply for an Electric Lighting Order, and erect dwellings for persons in their employ.

**Lowestoft Water and Gas.**—Application will be made by the Lowestoft Water and Gas Company for power to construct additional works, comprising a service reservoir, situated in Lowestoft, and four conduits or pipe-lines. Permission will be sought to extend the time for the purchase of lands and the completion of works sanctioned by the Lowestoft Water and Gas Act, 1897, and for the preparation of the scheme thereby authorized for the consolidation of the preference share capital of the Company. Additional capital will be applied for.

**Maidstone Corporation Water.**—The Corporation of Maidstone give notice of their intention to apply for authority to purchase the undertaking of the Maidstone Water Company, maintain and extend the existing works, and supply water within the present limits, which it is proposed to enlarge so as to include Barming, East Farleigh, Loose, Boxley, and Aylesford. In the Bill to be promoted, provisions will be included in regard to the pressure at which the water will be supplied, the sale of water by meter and in bulk, the inspection of premises, and the supply of fittings; and measures will be adopted for preventing the contamination of the supply. Further borrowing powers will be sought.

**Manchester Corporation.**—In a Bill to obtain general powers, the Manchester Corporation will seek to make better provision for the lighting of "no thoroughfares" and other places, and apply for authority to purchase electrical motors and apparatus, and let the same on hire; also to amend and extend the expression "any district adjacent to the city," contained in section 39 of the Corporation's Act of 1897. An insurance fund is to be established; and more money will be needed.

**Menstone Water.**—The Menstone Water Company will seek to be dissolved and re-incorporated with increased capital, which is to be defined. Authority will be sought for the construction of a storage reservoir in the township of Menstone, and for the appropriation of springs on Hawksworth and Burley Moors. The usual powers granted to suppliers of water will be applied for.

**Metropolitan Electric Supply.**—Power will be sought by the Metropolitan Electric Supply Company, Limited, to supply electricity or electric energy within the City of London, and to enter into agreements with the Corporation in regard thereto.

**Metropolitan Water Companies (Intercommunication of Mains and Works).**—The scheme projected by the London Water Companies for effecting intercommunication between their mains and works, for carrying out which they will apply for power next session, was fully dealt with in the "JOURNAL" last week (p. 1174).

**Mid-Kent Gas.**—Authority will be sought for the incorporation of a company to construct works and supply gas and residual products in the parishes of Snodland, Halling, Birling, Leybourne, Cuxton, Meopham, Luddesdown, East and West Malling, Watlington, East and West Barming, Wrotham, Ightham, Kemsing, Hadlow, East and West Peckham, Capel, Pembury, Brencley, Horsmonden, Yalding, Marden, Staplehurst, Wouldham, Burham, Aylesford, Ryarsh, Offham, Nettlestead, Teston, Ditton, Stanstead, Trotterscliffe, Addington, Sutton Valence, and Headcorn, all in Kent, and so much of the parish of Lamberhurst as is situate in that county. The usual powers will be asked for in regard to purchasing land, breaking up streets, levying rates and charges, supplying gas in bulk, inspecting fittings, and holding patent rights. The promoters wish to be authorized to apply for a Licence or Provisional Order under the Electric Lighting Acts, and to purchase or lease any gas-works belonging to other parties.

**Nene Valley Water.**—Power will be sought to incorporate a company to construct works and supply water in a number of places in the county of Nottingham. A well is to be sunk at Little Addington, and the water drawn therefrom will be conveyed by a conduit or pipe-line to a service reservoir at Finedon. The usual privileges granted to water companies will be applied for.

**Newhaven and Seaford Water Board.**—Authority will be sought for the constitution and incorporation of a Water Board, composed of representatives of the Urban District Councils of Newhaven and Seaford, to acquire and carry on the undertaking of the Newhaven and Seaford Water Company. The Board are to have power to maintain the existing, and construct other works, and to take, use, and supply water within the limits of the Councils and the parishes of Bishopstone, Denton, South Heighton, Tarring Neville, Piddinghoe, Telscombe, Southsea, Rodmell, Iford, and Kingston-near-Lewes, all in Sussex. Provision will be made for the representation of other districts upon the Board, for the levying of rates and charges, and for the borrowing of money; also for the dissolution of the Company.

**New Mills Urban District Council Water.**—Application will be made by the New Mills Urban District Council for power to acquire the undertaking authorized by the Ollerset Water-Works Act, 1831, and a portion of the undertaking of the Stockport District Water Company, and to supply water to that part of the urban district of New Mills known as the parish of Newtown. The Council propose constructing works comprising a number of aqueducts, two reservoirs, wells, adits, &c., and also extending their existing works. In the Bill to be promoted, provisions will be included in regard to the prevention of waste, the supply of water-fittings, and the sale of water to other authorities and companies. Additional borrowing powers will be applied for.

**Nottingham Corporation.**—In a Bill to be promoted by the Corporation of Nottingham to enable them to carry out an extensive scheme of tramways, to be worked by electricity and other motive power, provisions will be included for the construction of water-works. They will comprise a covered reservoir in the parish of Bestwood Park, another in the parish of Greasley, and seven aqueducts or pipe-lines. Authority will be sought to abandon the aqueduct described as No. 1 in the Corporation's Act of 1897, and also a portion of No. 3. The new works will, of course, form part of the water undertaking of the Corporation. Power will be applied for to hold any property acquired under the intended Act free from provisions of the Lands Clauses Consolidation



Act, 1845, with respect to any superfluous lands; and also to exempt the Corporation from the operation of section 92 of that Act, so as to enable them to purchase compulsorily part only of certain properties. Additional money powers will be sought.

**Nuneaton and Chilvers Coton Urban District Council.**—Application will be made by the Nuneaton and Chilvers Coton Urban District Council for power to construct additional water-works, comprising two wells and three conduits or pipe-lines. It is proposed to vary the East Warwickshire Water Act of 1897 in regard to rates and charges, and amend other Acts. More money will be required.

**Otley Water.**—The Otley Urban District Council will apply for power to construct additional water-works, comprising two reservoirs and two aqueducts, impound the waters of certain streams and their tributaries, and raise further money.

**Perth Water, Police, and Gas.**—The Perth Commissioners will apply for authority to construct new water-works, consisting of a reservoir and three aqueducts, with a road diversion. Borrowing powers will be required in respect of both the water and the gas undertakings of the Commissioners.

**Rawtenstall Water.**—The Corporation of Rawtenstall will apply to be severed from the water undertaking of the Bury Corporation, and to have power to purchase the mains, &c., in the town, at a price to be settled by agreement or arbitration. It is proposed to construct new works, consisting of a storage reservoir in the parish of Ramsbottom, and a conduit therefrom to Walmersley-cum-Shuttleworth, two other reservoirs in these parishes, and various aqueducts. The usual provisions in regard to the protection of the sources from pollution, the provision of compensation water, the supply of water and fittings, the sale of water to public bodies, &c., will be included in the Bill to be promoted. Borrowing powers will be applied for.

**Redditch Gas.**—The Redditch Town and District Gas Company desire to be dissolved and re-incorporated with power to supply gas in a more extended district than that defined in their Provisional Order of 1873. Power will be sought to maintain and continue the existing gas-works and construct others connected therewith, manufacture gas and residual products, supply meters, fittings, &c., and raise additional capital.

**Reigate Corporation Gas.**—The Corporation of Reigate will apply for power to purchase, by compulsion or agreement, the undertakings of the Redhill and Reigate Gas Companies, maintain, continue, and extend the existing works of these Companies, and supply gas within the present limits of the Redhill Company. Authority will be sought to sell gas in bulk, supply fittings, &c., levy rates and charges, and acquire additional lands. It is proposed to amend or repeal the Redhill Gas Act, 1865, and make it applicable to the Corporation. Provision will be made for the payment of the costs of the opposition by the Corporation to the Bills promoted by the above-named Companies last session. Power to borrow money will be sought.

**Rhondda Urban District Council.**—Application will be made by the Rhondda Urban District Council for an extension of the time limited by the Ystradgynodwg Urban District Council (Gas and Water) Act, 1896, for the purchase of lands and the construction of works authorized thereby. It is proposed to carry out certain new works, comprising tram and carriage roads, four wells and pumping-stations, a pumping-station and a tank, an aqueduct, and a service reservoir. Land in the parish of Rhigos is to be acquired for the purposes of the water undertaking. Further money will be needed.

**Rushden and Higham Ferrers Gas.**—The Rushden and Higham Ferrers District Gas Company, Limited, will apply to be dissolved and re-incorporated with power to supply gas and residual products, stoves, fittings, &c., in the above-named towns and the neighbourhood. In the Bill to be promoted, provision will be made for the inspection and regulation of meters, pipes, and fittings, and the exemption of the last named from distress; also with respect to any purchase of the Company's undertaking by the Corporation of Higham Ferrers and the Urban District Council of Rushden which they or either of them may be empowered by Parliament to effect. The Company wish authority to apply for power to supply electricity, and also to raise more capital.

**St. Albans Gas.**—The St. Albans Gas Company intend to apply for power to extend their limits of supply so as to include portions of the parishes of St. Alban, St. Peter Rural, St. Michael Rural, Sandridge Rural, and St. Stephen. It is proposed to acquire land in either the last-named parish or St. Alban for the construction of gas-works. Provision will be made with regard to the erroneous registration of meters, the scale of voting at meetings, the qualification of Directors, the dividends, and the price of gas. The capital is to be consolidated, and more will be asked for. The Company will seek to be enabled to agree for, and accept, a transfer from the Corporation of their electric light undertaking.

**St. David's Gas and Water.**—It is proposed to incorporate a company to construct water and gas works, and supply water and gas in the city of St. David's, the Cathedral Close, and the parishes of St. David's and Whitchurch, in the county of Pembroke. The water-works will consist of a well or wells and a pumping-station on Morfa Common, a service reservoir, and three aqueducts or pipe-lines; and the gas-works are to be erected adjoining the public road at Porthclais. The Bill to be promoted will contain provisions in regard to the supply of gas in bulk, the sale or letting on hire of meters, fittings, stoves, &c., and the protection of the sources of water.

**St. Marylebone Vestry Electric Lighting.**—Application will be made by the Vestry of St. Marylebone for power to purchase the portion of the undertaking of the Metropolitan Electric Supply Company, Limited, within that parish, and produce and supply electricity and electric apparatus, or to purchase electrical energy in bulk from the Company or any other company, body, or person. Additional borrowing powers will be required.

**St. Neots Water.**—Application will be made by the St. Neots Water Company for power to construct new works, consisting of wells and pumping-stations, several pipe-lines, and a covered service reservoir. It is proposed to extend the limits of supply to include several parishes in Bedfordshire, and to exempt the Company from giving a constant service of water in the added area, or delivering it at a higher level than can be served by gravitation from the intended reservoir. It is proposed to change the name of the Company. Additional capital will be required.

**Salford Corporation.**—In a General Bill to be promoted by the Salford Corporation, authority will be sought to extend to water rates, rents, and charges payable to the Corporation, the provisions of the Preferential Payments in Bankruptcy Act, 1888, as to priority of local and parochial rates.

**Scunthorpe Gas and Water.**—The Scunthorpe Urban District Council will apply for power to purchase, by compulsion or agreement, lands for gas and water works purposes, and to construct thereon works for the manufacture and storage of gas and residual products. The works and plant, or a portion thereof, belonging to Messrs. Cliff, trading as the Frodingham Iron and Steel Company, are to be acquired. Authority will also be sought to construct water-works. The limits of supply will be Scunthorpe, Brumby, and Frodingham, and the township of Crosby in the rural district of Glanford Brigg, all in Lincolnshire. The Local Authorities of Brumby, Frodingham, and Crosby are to take over portions of the mains and pipes in certain events. The Bill will sanction the payment by the Council of £500, and by the Brumby and Frodingham Council of £100, towards the costs of promoting the Frodingham Gas Bill of the past session. Additional capital will be required.

**Sheffield Corporation (Derwent Valley) Water.**—Application is to be made by the Corporation of Sheffield for power to carry out works for obtaining a supply of water from the Derwent and Ashop Rivers, and other rivers and streams and their tributaries. The works comprise three reservoirs on the Derwent; a weir across the Ashop; an aqueduct commencing just above the weir, and terminating in the Ouzelden Brook, near its junction with the Derwent; another commencing at the Howden reservoir, and terminating near the Mytham Bridge across the Derwent; a third commencing at the Derwent reservoir, and joining the existing pipes of the Corporation immediately to the east of the embankment of the Rivelin lower reservoir; together with various road diversions and a new road. Powers will be sought for taking water from the above-named rivers and a number of streams, brooks, and springs, and for giving compensation water. It is proposed to provide for the constitution of a Joint Committee, to consist of members of the Corporations of Rotherham and Doncaster, and any other corporation, urban or other local or sanitary authority, and to vest in a Committee such of the powers, whether with reference to the construction, management, or maintenance of works conferred by the intended Act on the Corporation, as may be prescribed; also to confer such other powers as may be necessary or expedient on the Joint Committee, and to define and regulate its duties, make provision for the election, appointment, retirement, rotation, and qualification of the members, and for the appointment and payment of officers. The water and other works proposed to be authorized by the intended Act are to be constituted a part of the water undertaking of the Corporation; and all or some of the enactments now in force in relation to those works are to be extended and applied to the proposed additional works. Sanction will be sought for the supply of water in bulk to the Corporations of Rotherham and Doncaster, as well as to other authorities; and it is proposed to confer on those Corporations power to borrow more money. The promoting Corporation will apply for permission to issue further stock.

**Shirebrook and District Gas.**—Application will be made for the incorporation of a company for the construction of works and the supply of gas and residual products in part of Pleasley (including part of the township of Shirebrook), Scardcliffe, and Upper Langwith, in Derbyshire, Nether Langwith and Sookholme, in Nottinghamshire, and part of Warsop, in the same county. Authority will be sought for the confirmation of an agreement made or to be made with the Mansfield Corporation for the transfer to the promoters of certain rights and privileges; and it is proposed to repeal portions of the Mansfield Commissioners' Gas Act of 1878. Permission will be asked by the promoters to apply for power to supply electricity for lighting and other purposes.

**Shotley Bridge and Consett Gas.**—The Shotley Bridge and Consett District Gas Company will apply for power to extend their limits of supply, so as to include the whole or a portion of Healey Field, in the parish of Lanchester. Authority is to be sought for raising additional capital, consolidating and converting the stock, altering the provisions of the Company's Act of 1869 with regard to illuminating power, and for effecting other changes.

**Skipton Gas.**—The Skipton Gas Company require authority to purchase certain lands by agreement, increase the illuminating power of their gas from 14 to 15 candles, adopt the sliding-scale, and raise additional capital.

**Skipton Gas.**—The Urban District Council of Skipton intend to apply for authority to purchase the undertaking of the Skipton Gas Company, and maintain, improve, and extend the existing works, construct new ones, and acquire land for the purpose. They will also seek power to supply gas, meters, and fittings; levy rents, rates, and charges; and raise money for the purposes set forth.

**South Essex Water.**—The South Essex Water Company notify their intention of applying for power to construct water-works, comprising a well and pumping-station in the parish of Mucking, a reservoir in the parish of Laindon Hills, and an aqueduct or pipe-line connecting them. Power will be sought to acquire the undertaking of the Herts and Essex Water Company, Limited; also to form pension and superannuation funds. Additional capital will be required.

**South Hants Water.**—Application will be made by the South Hants Water Company for power to construct new works, comprising a pumping station in the parish of King's Somborne, a conduit thence to the pipes leading to the existing reservoir of the Company in Michelmersh, an adit at Tinsbury, a covered service reservoir on Lyndhurst Hill in the New Forest, and a pipe-line therefrom to the present distributing system. It is desired to extend the limits of supply so as to include a number of places in the county of Southampton. The Company wish to make it compulsory on owners of property to provide cisterns; and they will prescribe the size thereof, and make regulations in regard thereto. They also desire to purchase the undertaking of the Bishop's Waltham Water Company, Limited; and to supply Brokenhurst with water if the West Hampshire Company fail to do so. Application will be made for an extension of the time limited by section 4 of the South Hants Water Act, 1894, for the supply of water by the Company to



certain parishes therein mentioned, with regard to the restriction imposed by section 52 of the Public Health Act, 1875, on the construction of water-works by a local authority; and various amendments of Acts are proposed. Further money powers are required.

**South Lancashire and Cheshire Electricity Company.**—Power will be sought to incorporate a company for the construction of works for the production and supply of electrical energy in a number of towns in Lancashire and Cheshire; and to enable the company to make agreements for the sale of electricity in bulk.

**Stockport Corporation Water.**—The Corporation of Stockport are desirous of purchasing the undertaking of the Stockport District Water Company, and carrying on their works with the exclusive right of supply within the Company's limits. In the Bill to be promoted for this purpose, provision will be made for the settlement by arbitration, in default of agreement, of the amount of the purchase-money or compensation for, and the terms and conditions of, the transfer. Additional borrowing powers will be required.

**Stockport Water.**—Application is to be made by the Stockport District Water-Works Company for authority to confirm three agreements, dated respectively March 17, 1859, Oct. 9, 1877, and Feb. 15, 1897, made between the Manchester Corporation and the Stockport Water Company and the Stockport District Water Company, and to amend or repeal such provisions of the Acts of 1861, 1863, and 1864 of the latter Company as may be necessary.

**Stockton and Middlesbrough Water.**—The Stockton and Middlesbrough Water Board will apply for power to construct a new service reservoir and aqueduct in the parish of Long Newton, in Durham. The former will be 390 yards square, have a superficial area of 30 acres, and be capable of holding about 100 million gallons; the latter will connect the new reservoir with one of the existing conduits. It is proposed to extend the limits of supply so as to include the parish of Croft, in the North Riding of the county of York. Certain provisions of existing Acts are to be repealed—in the first place, to allow of the abstraction of water from the Grassholm reservoir; secondly, to alter the charge for water used for trade purposes; and, lastly, as to fish passes. The corporate name of the Joint Board is to be changed. Further money powers will be needed.

**Stretford Gas.**—The Stretford Gas Company purpose applying for an extension of their limits of supply so as to include the parishes of Carrington and Partington, in Chester. Additional lands are to be purchased; and in the Bill to be promoted provisions will be included in regard to the supply of stoves and fittings, the inspection of pipes and fittings in new buildings, and other matters. The present capital is to be consolidated, and more will be applied for.

**Totland Water.**—The Totland Water-Works Company, Limited, desire to be dissolved and re-incorporated with powers of supply within limits which are fully defined in the notice. The present works are to be maintained, and new ones constructed, comprising a service reservoir at Headon Hill and subsidiary works in connection therewith. It is proposed to repeal so much of the Freshwater and Yarmouth Water Order, 1887, as authorizes the Freshwater and Yarmouth Water Company, Limited, to supply water within the portion of the parish of Totland intended to be served by the Totland Company, and to determine the powers of the Freshwater Company within that area. Additional capital will be required.

**Wakefield Corporation.**—The Corporation of Wakefield intend to apply for an extension of time for the construction of works authorized by their Act of 1889, and for general powers to carry out such others as they may deem necessary.

**Walker and Wallsend Union Gas Company (Electric Lighting).**—Application will be made by the Walker and Wallsend Union Gas Company for power to construct works for the production and supply of electricity within their gas limits, and to make agreements with local bodies with respect to such supply, or for the sale or transfer of the undertaking or powers of the Company, or some part thereof, to such parties. Additional capital will be required. In the Bill to be promoted, the Company will seek permission to apply to the purposes therein set forth any of their unexpended or additional funds; and will, if deemed advisable, constitute the new undertaking a separate one for which special accounts will be kept.

**Walton-on-Thames and Weybridge Gas.**—The Walton-on-Thames and Weybridge Gas Company will apply for power to consolidate and convert their existing capital, and raise more money. Authority will be asked for the supply of stoves, fittings, &c.

**Warrington Corporation.**—In a General Powers Bill to be promoted by the Warrington Corporation, authority will be sought for the construction of water-works, comprising a pumping-station in the parish of Winwick-with-Hulme, a reservoir in that parish, another in the parish of Appleton-with-Hull, a large reservoir (the Daresbury) situated in four parishes, and a storage reservoir (the Dennow) in the above-named parish of Appleton-with-Hull; together with various wells, boreholes, tunnels, pipe-lines, &c. Powers will be applied for to purchase lands compulsorily, interfere with streams and other property, and frame regulations for preventing waste and contamination of water. It is proposed to consolidate the existing loans of the Corporation; and permission will be sought for raising more money.

**West Gloucestershire Water.**—The West Gloucestershire Water Company will apply for an extension of the limits within which they may supply water under their Acts of 1884 and 1887, so as to include a number of other places named in the counties of Gloucester and Somerset. It is proposed to make owners liable for water-rates in the case of premises let for less than a quarter of a year. Additional capital will be required.

**West Middlesex Water.**—The West Middlesex Water Company intend to apply for power to put down a new main between their pumping-station at Hampton and their works at Barnes. The Company will seek authority, pending the completion of the reservoirs and works authorized by the Staines Reservoirs Acts, 1896 and 1898, or during such other period as may be prescribed or defined by the intended Act, to take from the River Thames such quantity of water, in excess of that which they may now draw, and on such terms and conditions, as may be agreed between them and the Conservators of the Thames, or may be prescribed by the intended Act. Additional capital will be required.

**Wetherby District Water.**—Powers of incorporation will be sought for a company to construct works and supply water in a number of parishes, townships, and places in the West Riding of the county of York. There will be a pumping-station at Wigton, another at Scarcroft, and a third at Bardsey-cum-Rigton; a water-tower at Wigton and a service reservoir at Bardsey; and seven conduits or pipe-lines. The Bill to be promoted for carrying out the above-named objects will contain the usual provisions as to the compulsory purchase of lands, water-rights, and easements; the supply of fittings; the sale of water in bulk; the levying of rents, rates, and charges; and the making of agreements with public bodies. The capital and borrowing powers of the Company will be defined.

**Whitehaven Corporation.**—Application will be made by the Whitehaven Corporation for a revival of the powers conferred by the Whitehaven Town and Harbour Incorporation Act, 1885, in regard to the construction of works at Ennerdale Lake to allow of a supply of water being obtained from that source, and for authority to construct additional works. The Corporation will also apply for an extension of their electric lighting area so as to include the whole of the existing borough, or any enlargement thereof which may be sanctioned. Additional money will be required, as well as power to alter the present water-rates, and increase them.

**Wishaw Water.**—The Commissioners of the Burgh of Wishaw intend to apply for an enlargement of the borrowing powers conferred by the Wishaw Water (Additional Supply) Act of last session, the principal provisions of which were noticed in the "JOURNAL" for Nov. 8, for the purposes of their water-works. The extra money to be borrowed will rank with the sums authorized by that Act to be raised.

**Woking Water and Gas.**—The Woking Water and Gas Company will apply for authority to construct additional works, consisting of several wells and pumping-stations, aqueducts, or pipe-lines, all in the county of Surrey. The limits of supply are to be extended so as to include portions of several parishes in that county; and power will be sought to make provision for the prevention of waste and undue consumption. It is proposed to increase the capital.

**Wolverhampton Corporation.**—In a Tramway Bill to be promoted by the Wolverhampton Corporation, authority will be sought to enter into contracts and agreements with the Bilston, Coseley, and Sedgley Urban District Councils, and the South Staffordshire Water Company, with reference to the supply of water within the urban districts of Coseley and Sedgley, or any part thereof.

**Workington Corporation Water.**—The Corporation of Workington intend to apply for power to construct new works, consisting of a service reservoir, two aqueducts or pipe-lines, and two weirs upon the River Cocker. Various streams and waters are to be impounded; and the level of Crummock Water is to be raised. Authority will be sought for the purchase of the shares of the Cocker-mouth Urban and Rural District Councils in the Cocker-mouth and Workington Joint Water Committee's undertaking, and the dissolution of the Committee. Borrowing powers will be required.

**Yeadon and Guiseley Gas.**—The Yeadon and Guiseley Gas Company notify their intention to apply for authority to amend their Acts of 1868 and 1880, so as to substitute the sliding-scale for a fixed maximum price for the gas supplied by them.

The applications to the Board of Trade and the Local Government Board for Provisional Orders under the Gas and Water Works Facilities Act, 1870, and the Public Health Act, 1875, as well as those made to the former Board under the Electric Lighting Acts, 1882 and 1888, will be dealt with next week, when all the notices in regard thereto have appeared in the "London Gazette."

**Saltash Water Supply.**—On the recommendation of the Water Committee, the Saltash Town Council decided last Tuesday to take steps for the construction of a reservoir. The water supply is obtained from Plymouth by means of a pipe laid across; the bed of the River Tamar; and Messrs. Jenkin and Son, who are to advise the Committee respecting the reservoir, will be asked to consider the question of the duplication of this main in order to ensure a continuous supply.

**The Quality of Portsmouth Gas.**—It may be remembered that at the meeting of the Portsmouth Corporation on Sept. 13, complaint was made as to the quality of the gas supplied by the Portsea Island Gas Company; the quantity of ammonia present being much in excess of that permitted by statute. A proposal was submitted to prosecute the Company unless the ammonia were reduced within a month; but an amendment was brought up to the effect that proceedings should be instituted at once. However, in the end, neither proposition was carried; and accordingly the matter was left as it stood. Since then the Company have taken steps to remove the cause of complaint; and the result came before the Council at their meeting last Tuesday. The Finance Committee reported that the Gas Examiner in his return for the quarter ending Oct. 12, stated that 42 tests of the gas had been made for ammonia, and that, although 33 of them showed an excess, all since Sept. 28 had been within the prescribed limit; the average, however, had been 9.54 grains per 100 feet.

**Portsmouth Water Company.**—The half-yearly general meeting of this Company was held last Thursday—Mr. W. Grant, J.P., in the chair. In moving the adoption of the report, noticed in the "JOURNAL" last week (p. 1176), the Chairman referred to the gratifying fact that during the past four years the water rental had increased by 11 per cent. The Directors were carrying forward a large balance which they thought was necessary. With reference to the drought of last summer, he could only say that but for the lavish expenditure, spread over a long time, by the Board, the supply of the last two years could never have been maintained. He also spoke in terms of satisfaction as to the proposed payment of another series of back dividends. Colonel C. L. Owen seconded the motion; and it was carried unanimously. On the proposition of Mr. J. H. Hefferman, seconded by Major-General R. M. Westropp, the Directors' fees were raised from £840 to £1000 per annum; the mover remarking that while during the past seventeen years the capital of the Company had doubled, the revenue had increased from £30,000 to £58,000 per annum. The Chairman thanked the shareholders for this renewed mark of their confidence; and the meeting closed.



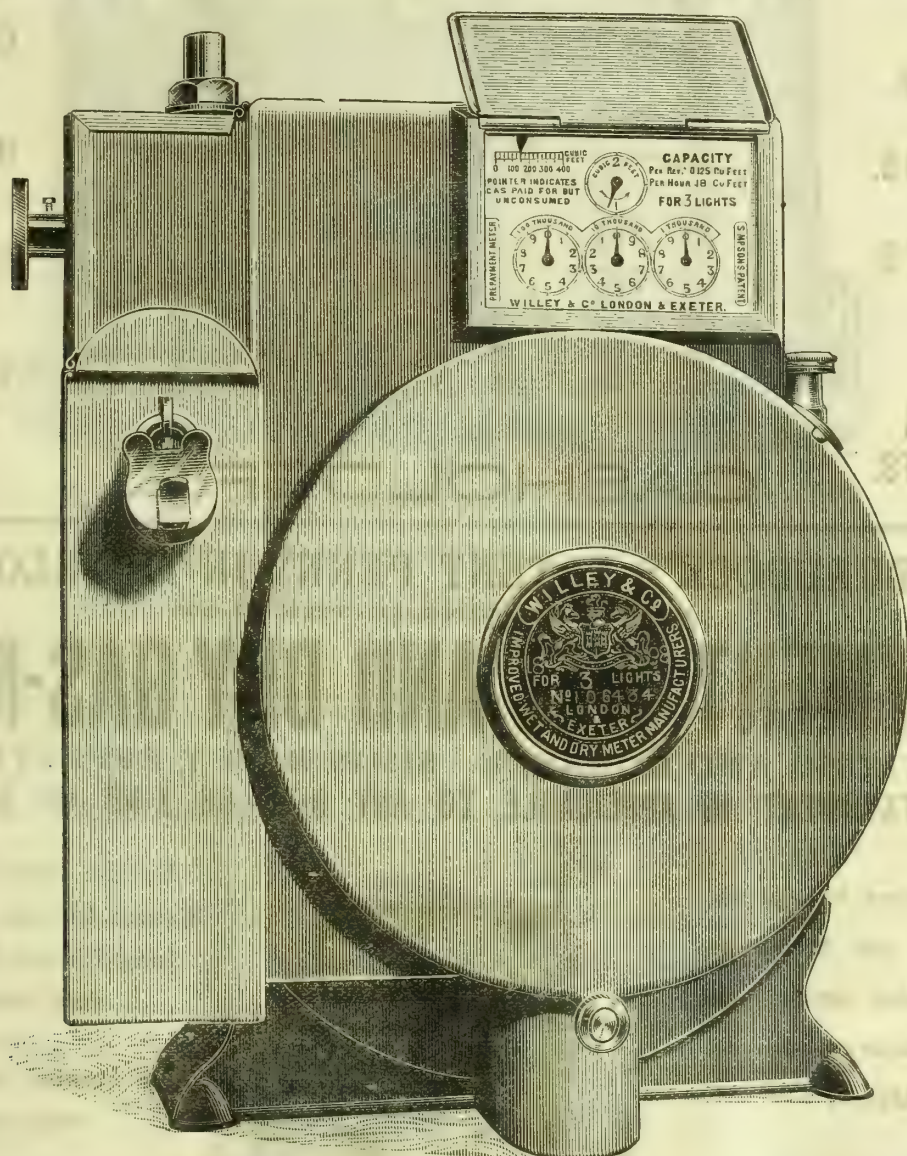
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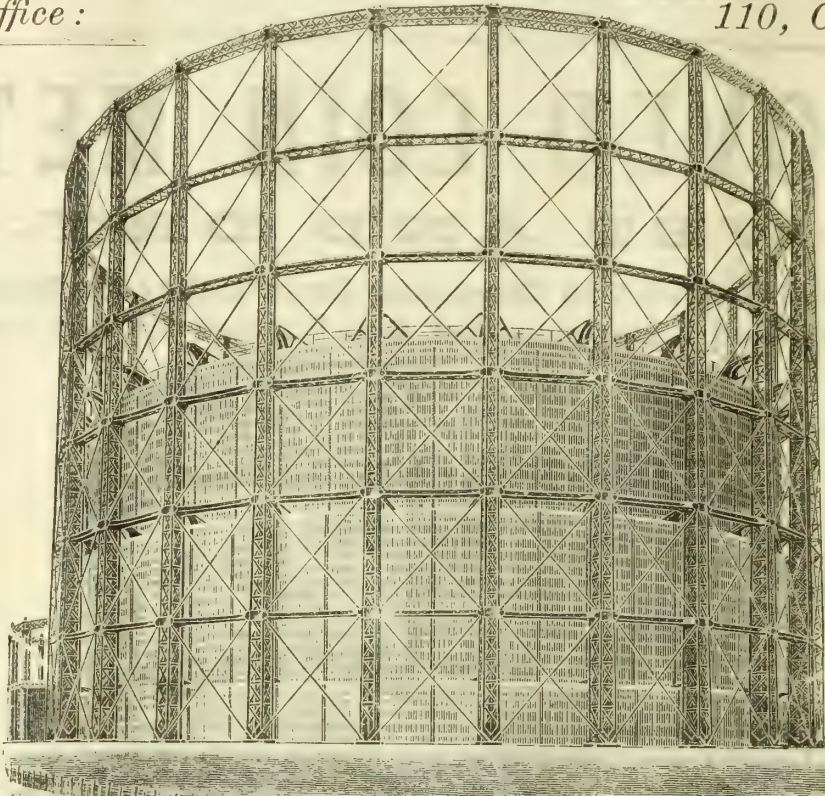
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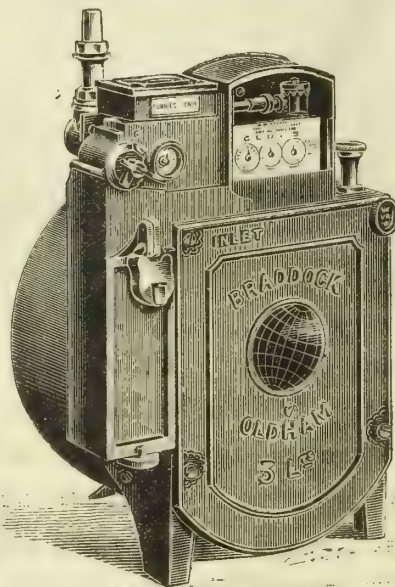
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## LEGAL INTELLIGENCE.

## HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, Nov. 22.

(Before Mr. Justice KEKEWICH.)

*Holophane, Limited, v. O. Berend and Company.*

This was an action brought by the plaintiff Company against the defendants for infringement of patent.

Mr. JESSEL, who appeared for plaintiffs, said that at the last moment the defendants had agreed to submit to an injunction—the plaintiffs waiving any inquiry as to damages—and to pay the plaintiffs' costs. He therefore had to ask simply for two things—a certificate that the particulars of breaches were reasonable and proper; and another that the validity of the patent had come in question.

Justice KEKEWICH said he thought he was bound by authority.

Mr. JESSEL having cited cases to show that such certificates had been granted, even when the defendant did not appear.

Mr. CANN, who represented the defendants, said he had agreed with his learned friend, as had been already stated, and there was an honourable understanding that he should abide by his Lordship's decision on this point about the certificates, and, if he thought that they should be granted, not oppose it.

Justice KEKEWICH said this left him in rather an awkward position, as his attention had not been called to some of the more recent cases; but he was quite satisfied that the tendency of the Court had been to refuse such certificates, unless it were satisfied, which it could only be by hearing evidence and examining the documents, that they ought to be granted. It might be opening the door to possible oppression on other defendants if a certificate were granted without evidence; and he must therefore decline. The judgment would be in the terms agreed upon.

## WESTMINSTER COUNTY COURT—Monday, Nov. 21.

(Before His Honour Judge LUMLEY-SMITH, Q.C., and a Jury.)

*Suckling v. The Gaslight and Coke Company.**Gas Poisoning, Heat Apoplexy, and Employers' Liability.*

This was an action brought by Frederick Suckling against The Gaslight and Coke Company to recover damages, under the Employers' Liability Act, for an alleged injury—viz., gas poisoning—which occurred to him while engaged in assisting to discharge a foul purifier at the Becton Gas-Works.

Mr. A. H. RUEGG, Q.C., and Mr. W. M. THOMPSON appeared for the plaintiff; Mr. H. W. LOEHNS (instructed by Messrs. Bedford, Monier-Williams, and Robinson) for the defendants.

Mr. RUEGG, in opening the case, said that the Employers' Liability Act stated that, under certain circumstances, a workman was entitled to recover compensation from his employers, always provided he could prove there was some negligence or carelessness either on the part of the employer himself or his managers or superintendents, or those placed in authority over him. In this case, they said that the works of the defendants were in a defective state, owing to negligence on the part of one of their superintendents—Mr. T. Goulden, the Chief Engineer of the Becton Gas-Works. He asserted that this gentleman was guilty of carelessness and gross negligence, and that the injury caused to plaintiff was the direct result of negligence and improper orders given in the first place by a foreman named Berry, and in the second place by Mr. Goulden. Among his duties, plaintiff had, with other men, to clear out the purifiers, which were about 30 ft. by 20 ft. and 5 to 6 feet deep. In doing its work, the lime which the purifiers contained became impregnated with most noxious gases; and, unless very great care was taken, the vessels became almost death-traps to the men who had to discharge them. It was safer to remove the foul lime immediately the lid was lifted than a short time after, as the action of the air rendered the lime extremely hot, and caused it to throw off dangerous gases; or if it stood for 24 hours then it became perfectly harmless. On the afternoon of Aug. 11 last, the plaintiff (who was earning £1 10s. a week ordinary wages, and £2 with overtime), with some other men, was told by Berry to clear out a purifier in No. 5 house. The men found that this particular vessel (learned Counsel did not know whether or not it was due to the hot weather) was more than usually dangerous, and that they could not work there. They saw an Assistant Engineer (Mr. J. N. Reeson), and told him the purifier was dangerous; but he said it must be cleared. They returned for half an hour, but could not keep on, and so went to refill another vessel. Then Mr. Goulden came, and said they must empty the purifier in No. 5 house; if not, he would order out his mechanics and day men to do the work. Thereupon, one of the men named Barnes said to Mr. Goulden, "If you will go and work there yourself, I will go and work by your side." But Mr. Goulden would not do that. Then another man, no doubt with the view of obtaining the commendation of the Chief Engineer, said he would go and do the work. To him, Mr. Goulden made a remark of this kind: "Ah, you are a man; the others are not." The gang could not stand such a taunt as that, and returned to the work. The plaintiff was working in one corner of the purifier; and it seemed that sometimes the draughts in the building would blow the gas more into one part of an open purifier than into others. Suckling had only been working there a few minutes, when he was suffocated, and fell down unconscious. He was taken home, and remained unconscious for nearly twenty-four hours. When he recovered consciousness, he was in the most terrible pain, and had suffered very serious inconvenience and had been unable to work since. Could the jury, Counsel asked, imagine a more proper case for damages to be paid as compensation to a workman? Here was a man who, without any fault of his own, but under an absolute threat of dismissal and a taunt, went to do the work. He (the learned Counsel) did not suppose the Engineer, when he sent him into such a dangerous place, thought he would suffer serious bodily injury. If he did, and the man had died, it would have been manslaughter. But there was grave negligence. No test was applied by the Company to ascertain whether the gases in the

purifiers were dangerous to the men. That was bad enough. But when it was pointed out to him that they were dangerous, and that the men could not work there, what did the jury think of the Manager of such works who said to those men "You must go." Mr. Goulden made a terrible mistake; and, for his mistake and carelessness, it was right the Company should pay.

Frederick Suckling, the plaintiff, was then examined. He said he was 40 years of age, and had worked for the Company 17 or 18 years. His wages were 30s. a week for eight hours a day, and £2 with overtime. He had helped to clear out sulphur purifiers many times. They had orders to get into them immediately the covers were lifted; but at times they could only remove three tiers of the material out of the six, as they got stronger and hotter the lower they went. The gas was tested to see whether the vessels were foul; but no test was applied to ascertain whether they were fit for the men to work in. On Aug. 11, the gang in which he worked received orders from Berry to clear out one of the purifiers in No. 5 house; and so far as he could see, that was directly the lid had been removed. Plenty of the purifiers were left a day and night before being cleared; and they were then much better to work in, as the stuff got cool, and there was not so much smell. The material in the purifier in question was green and was steaming more than usual. There were twenty men in the gang; and he worked in one corner with two others. The first grid was very strong; and they worked at it for about half an hour, but could not stand it. They then left to see Mr. Goulden; and at first he said they might recharge another vessel in No. 11 purifier-house, which would take about two hours. He (plaintiff) told him that no man would be able to work in No. 5 after the two hours, as the lime would then be worse than it was when the lid was first taken off. But a man named Kemp who was present volunteered to get out two more layers; and Mr. Goulden said to him: "You're a man; I don't consider the others are." Mr. Goulden then said they would have to go and get the stuff out as best they could. He also heard Barnes's challenge to Mr. Goulden, and the threat of the latter to get out his mechanics and day men to do the work. The gang then went back; and after he had been working a few minutes, something seemed to "regularly draw his breath" and his inside "came up in knots," and down he went. His wife told him he was unconscious for about twenty-four hours. When he recovered consciousness, his inside was very sore; and it hurt him to swallow. He belonged to the Gas-Works Sick Club; and Dr. Pell had been attending him. He had been unable to work since; and even now he threw up nearly everything he ate or drank. His breathing was bad; and he had passed blood several times with his evacuations. When he was lying in bed, Mr. Goulden went to see him. While there, Mr. Goulden said it was entirely his own fault that the accident happened; and he was sorry for it. He also offered to send him away to the seaside. Mr. Reeson was there, and two more gentlemen.

Cross-examined: Mr. Goulden and Mr. Reeson went twice to see him. Mr. Goulden said: "I am sorry this has happened; you would not have been ill if I had not asked for the work to be done." He had always worked as a purifier hand since he had been in the Company's service. He believed there were about 120 purifying vessels; and the sulphur ones were the worst to clear out. August was a very hot month; and the 11th was one of the hottest days. The gang was paid by piecework. He began work soon after six o'clock that day; and it was about three in the afternoon that they were set to clear out the purifier in question. It was not unusual for a gang to say a purifier was too hot or too strong to clear out; but he would not say that this was because the men were tired, and did not want to do it. He did not know whether Mr. Goulden went to the purifier before he saw the men; but he admitted that Mr. Goulden, said, if he considered it dangerous, he would not ask the men to do the work. Barnes said something about risking lives; but he had never heard anybody say anything about risking lives before that day. Mr. Goulden said it was necessary the purifier should be cleared out; but he did not want them to run any risk. They might, he added, take out a shovelful at a time, and then run out and have a blow; and, for the extra time taken, he would see they did not lose anything. In this vessel the stuff was very wet. None of the other men suffered any inconvenience. It occasionally happened that a man was gassed; but never in his seventeen years' experience had he known of an accident such as his to happen. After the conversation with Mr. Goulden, he quite realized that the work he was going to do was dangerous.

Re-examined: They either had to do the work, or lose their bread. They were quite willing to do the work at first; and it was only after the conversation with Mr. Goulden that they went back. This was the strongest purifier he had ever been in.

H. J. Sawkins, who had worked in the purifying department at Becton for thirteen years, and was one of the gang set to clear out this purifier, said they found it in such a bad condition that they saw Mr. Reeson about it. He said the vessel was wanted; and they must try to get the material out. They tried for half an hour; but could not go on. He had never seen a purifier so bad as this one. He confirmed the statements as to what subsequently transpired between the men and Mr. Goulden. It was usually safer to clear out the purifiers after they had been open twenty-four hours.

Cross-examined: He could not say how many purifiers were not emptied immediately the lids were removed; there might be ten in the course of the year. He did not know whether Mr. Goulden went into the vessel before he asked the men to do the work. He (witness) was only in the vessel about two minutes on the second occasion; and he was working in the corner with Suckling and another man. He saw Suckling being dragged through the doorway after the accident.

Re-examined: Two men had hold of Suckling when he saw him.

Henry Priest, who had been in the Company's employ for 19 or 20 years, and worked in the same gang as plaintiff, said Mr. Goulden might have gone into the purifier; but he did not see him. He had never before seen a man so bad as Suckling was. The purifying men were sometimes temporarily blinded. He had known the blindness to last twenty-four hours; and no one could describe the pain. This particular purifier was in a worse condition than he had ever known one to be in; and he could only take out two or three shovelfuls at a time.

Cross-examined: Neither Mr. Berry nor Mr. Reeson inspected the purifier so far as he knew; and he did not see Mr. Goulden there. It was certainly a very hot day.



*Stephen Groves*, another purifier hand of 23 years' experience, corroborated the evidence of the previous witnesses.

*Dr. Pell*, assistant doctor to the Becton Gas-Works Sick Club, said that when he saw plaintiff, on Aug. 11, he was in a dazed and semi-conscious condition. He was breathing heavily, and covered with cold sweats. The pupils of his eyes were partly insensible; and his hands were cold. He came to the conclusion that plaintiff was suffering from poisoning by gas fumes. In his opinion, he was suffering from gas poisoning from Thursday (Aug. 11) until the following Monday. He had given him a large number of certificates; but the wording of the certificates was not changed after the first. They were merely to show that he was still in an unfit state to work. The plaintiff had had digestive troubles since; the poisoning by gas might have weakened him. The Company had asked him for a special report; and they had subpoenaed him. He had not been paid for the report; he supposed it would come in the club work. All the certificates up to the present time contained the words "suffering from the effects of poisoning by gas." He was afraid they were in the habit of giving certificates in this way.

Cross-examined: He was not there to mislead the jury.

*Mr. LOEHNIS* (to *Mr. Ruegg*): Do you suggest the Company have got at this man?

*Mr. RUEGG*: I do.

Cross-examination continued: He had examined plaintiff several times lately. There were some slight murmurs over the heart; the digestive system was thoroughly out of order; but he could not find anything else now, except weakness. He had never known a case of gas poisoning in which the effects had lasted so long as this.

By His Honour: The effects of the gas poisoning had passed off by the Monday following the accident; and after that the suffering was chiefly due to abdominal trouble. He believed this was quite an independent thing from the gas poisoning. They were asked to give the certificates in the way they did, so as not to confuse the Club Secretary.

Re-examined: Impaired digestion did not necessarily follow poisoning of this kind.

*Dr. W. M. Leslie*, Medical Examiner under the new Compensation Act for the City of London, said he had made a special study of poisoning by accidents. He saw the plaintiff on Thursday and Friday of the preceding week, and had gone exhaustively into the case from the time of the accident. The opinion he had formed was that Suckling's condition from Aug. 11 was due to the one cause—poisoning by gas fumes or gases. There were very few objective symptoms. Of course, being a considerable time after the accident, they must take a reasonable view of the history of the case. The plaintiff's heart was very weak in action; and there was an indistinct murmur at present. The digestive system was entirely wrong; he was troubled with flatulence; and he had vomited, and had retched for two months. These things began on Aug. 11, and not before; and they were symptoms that were likely to follow an accident of this kind. The plaintiff was suffering from poisoning by a mixture of gases. One of the effects of poisoning by gases was that a certain amount of irritation remained behind; and it was this irritation that caused the digestive troubles. From the symptoms and the report of *Dr. Pell*, he should say plaintiff was suffering from poisoning by several mixed gases; and he should say they were sulphuretted hydrogen, carbonic oxide, sulphide of carbon, and sulphide of ammonium. When direct symptoms of asphyxiation or gas poisoning passed away, as they undoubtedly did, if the gases were of a certain irritant nature, their effect would remain much longer. In the case of carbonic oxide poisoning, the effects remained for some time; and in the case of the ammonium gas, in addition to the asphyxiation action, the irritant action, which was very pungent, also remained. An irritation of the mucous membrane continued for some time. He had no doubt these noxious gases had been inhaled by plaintiff, and had got into his stomach.

Cross-examined: The fluttering of the heart was not the only objective symptom he found. One very strong objective symptom was the absolute debility of the whole system; and the muscular weakness was a most marked objective symptom. So far as he could tell, plaintiff's sight was all right; his knee-jerks were very nearly normal; but his breathing was laboured and quickened. The plaintiff might be able to return to work in one or two months' time. The symptoms he had described were not at all consistent with heat apoplexy, the symptoms of which generally affected the head. Counsel pointed out that there was a constant inhalation of the gases by a man employed on this work, and asked witness whether, taking that into account, the symptoms were not consistent with heat apoplexy. Witness replied in the negative. He did not see why heat apoplexy should cause the heart to be in the condition of plaintiff's; nor did he see how it could cause irritation of the digestive system.

Witnesses for the defence were then called.

*Dr. A. J. Pepper*, who also examined Suckling on the 18th inst., was first called. He stated that he found the plaintiff's urine in normal condition; and there was absolutely no murmur at the heart, though it was quite possible at times there might be. An occasional murmur was not an uncommon thing; and it merely showed a functional derangement. The tongue was clean; and there was nothing to indicate that plaintiff had any difficulty in swallowing. Plaintiff told him he had still pain at the top of the head, giddiness, could scarcely sleep more than an hour at a time, and occasionally he seemed dazed. He told him he had passed blood, and that was an objective sign. But he (*Dr. Pepper*) found that plaintiff had piles. There was not the slightest indication from the knee-jerks that there was any disturbance of the nervous system. The symptoms of which plaintiff complained were more consistent with sunstroke or heat apoplexy than gas poisoning. The man told him he was in perfect health on the morning of the alleged exposure to the fumes of gas. Asked whether if that was the case, it did not do away with the chronic effects on the nervous system of gaseous poisoning, witness said that, if plaintiff was exposed to gas, he would not be suffering from the nervous system some time afterwards; but he might be in the case of chronic exposure—after he had been repeatedly and gradually gassed. Irritant effects lasted a long time with sulphurous acid; but he did not think the same would occur here. He did not know a case of gas poisoning that would produce the effects complained of by plaintiff.

Cross-examined: The doctor who first attended Suckling would have to depend largely on the patient's statements. He attributed the symptoms described in *Dr. Pell's* report to some other cause than gas poisoning.

The patient would not have suffered from the abdominal symptoms all this time afterwards; they would have vanished in about a week. They were dependent very much upon the subjective symptoms—those which the patient described himself. Nine times out of ten, a patient could deceive a medical man if he chose; but he had no reason for thinking Suckling had not told him the truth.

Re-examined: In the case of a man who was getting worse day after day and month after month at his work, the effects would be more permanent than in a sudden attack of this kind. So far as he had been able to see, plaintiff was at present fit to go to work.

*Dr. George Hastings*, consulting surgeon and physician to The Gaslight and Coke Company for twenty years, said he had had a large experience of these gas poisoning cases. He had examined Suckling in every way; and he did not think that gas poisoning had any relation to his present weakness—in fact, he was unable to find any physical signs to account for the weakness of which he complained. He thought plaintiff had been suffering more from a heat stroke than anything else. In the case of gas poisoning, a man should, if he did not die, be perfectly well in twenty-four hours. Gas poisoning would produce abdominal pains; but they did not last so long as in this instance.

Cross-examined: If the man inhaled a great deal of the gas, it would for the time being affect the digestive organs; but the length of time would depend upon the man's general condition and the nature of the gas. Carbonic oxide was not very irritant, but deadly; nor was sulphuretted hydrogen very irritant.

*Dr. Beaumont*, who was the first doctor to see plaintiff after the accident, said he came to the conclusion that he was suffering from the heat. He had not had much experience of gas poisoning, as the men seemed to recover before a medical man could get to the works.

Cross-examined: He had never known a man to be unconscious through gas poisoning for twenty-four hours. Supposing plaintiff had inhaled a considerable quantity of sulphuretted hydrogen, carbonic oxide, and sulphide of ammonium, that would have been an irritant mixture, and might cause sickness.

*Mr. T. Goulden*, the Chief Engineer at Becton, said he had been in sole charge of the works during the last two years, and altogether had been on the works nearly fifteen years. For some years, he had the purifiers (of which there were fifteen sets of eights) under his entire control. The Company were under regulations as to the amount of sulphur the gas might contain as distributed. In summer it was 17 grains per 100 cubic feet of gas; and in winter, 22 grains. No. 5 purifier-house contained sets Nos. 7 and 8; and on Aug. 11, it was ascertained that No. 7 was passing 31 grains of sulphur. This indicated that the sulphur vessels in this particular set were no longer in a condition to do their work, and would have to be changed. These particular boxes were put into operation on June 21, and on Aug. 11 had been at work 1314 hours, which was rather below the average. On the afternoon of that day, he was informed by *Berry* that the men declined to discharge one of the sulphur purifiers in No. 7 set. He asked *Berry* whether the men considered they had had enough work to do that day; and he replied that he really thought that was the reason. He went down with *Berry* to see the vessel, stepped on to the top tier, and came to the conclusion that its condition was normal. He saw *Mr. Reeson*, who informed him that the men had previously that afternoon refused to empty the box. He (witness) then interviewed the men, who said the vessel was hot and dangerous; but, having seen it himself, he took it that was their method of telling him that they had done enough work for the day. He pointed out to them the urgency of the purifier being emptied, owing to the state of the sulphur, and also mentioned that he had seen it, and really could not detect anything dangerous in it. Then followed the so-called challenge from *Barnes*; and his (witness's) remark that he must, if necessary, get the mechanics and day workmen to do the job. He further informed the men that, if they considered the vessel dangerous, they could take out a shovelful of the material at a time, and have a blow in the fresh air; and he would see they did not lose anything by the longer time they took to do the work. One man volunteered to try; and the others followed his example. The day was very hot; the temperature being 10° higher than the day before. Some 232 sulphur vessels were cleared out in the past twelve months; and certainly not more than half a dozen were not emptied immediately the covers were removed. In his whole experience, this was the only instance he had come across of a man being overcome in purifying work. The sulphur vessels were unpleasant things to deal with; but the men were well paid. There was only about 4 to 5 per cent. of carbonic oxide in the coal gas they produced. He visited Suckling's house on three occasions. The first time Suckling was lying in an absolutely unconscious state; and he told his wife that he was sorry for her husband's accident. Knowing she had a large family, and in view of the fact that it was by his (witness's) personal urgent orders that Suckling entered the vessel and met with the accident, he asked to be allowed to give her some little assistance during his illness. He also said that, when Suckling got better, he would see what he could do towards sending him to the seaside. He did not say that the accident was entirely his (*Mr. Goulden's*) fault; he took every precaution he possibly could take. He considered an unwarrantable use had been made of what he intended to be a charitable action.

Cross-examined: He thought now, as he did on Aug. 11, that the vessel was in a fit state for the men to work in. When the men said the vessel was dangerous, he did not think they appreciated what they were saying. In his opinion, Suckling had had a hard day's work; and the work, combined with the heat of the day, proved too much for him. He did not suggest to the doctors that this was a case of sunstroke, and not gas poisoning. His experience was that men who had been gassed began to recover directly they were removed from the suffocating influence of the gas. He was not present when Suckling fell. Asked what he meant by saying that it was in consequence of a "direct order" given by him if it was a case of sunstroke, he said that, as a general rule, he did not give his orders personally. He did not say anything at Suckling's house about his opinion that it was a case of sunstroke or heat apoplexy, because he did not see any need for general discussion by him on the matter. The man was not fit for the job; but having sent him into the purifier, he felt a certain responsibility. He did not suggest to *Dr. Pell* that he was making a mistake in stating on the certificate that Suckling was suffering from the effects of gas poisoning. He still believed that, when the men said they were carrying their lives in their hands, they were playing a



part, and did not want to work. Suckling was a steady workman. He would not admit that it was because he thought the purifier dangerous that he suggested the men should go in and take out a shovelful at a time; but he told them they could do so if they considered it dangerous. It was unnecessary to take any special precautions to discover the state of the lime before the men entered the purifiers. This particular vessel measured 36 feet by 21 feet. It seemed to him that they would now, in consequence of the new Act, have the greatest difficulty in doing their purification work.

Re-examined: In a report which he made on Aug. 13, he stated that Suckling was overcome by heat. He had stood in a purifier twenty minutes after men had said it was not fit to put a dog in.

Mr. J. N. Reeson, the Assistant-Engineer, stated that he saw the vessel before the men went into it the second time, and entered it after the accident; and its condition was quite normal. There was nothing which indicated the presence of any dangerous or noxious fumes.

Cross-examined: After the accident, nothing more was done that day; but the box was emptied next morning. The men went to him directly the cover was removed, and asked if the work might be left until the following day. But he pointed out to them that it was urgently necessary the vessel should be refilled that day. To the best of his recollection, they did not say anything about the lime being in a dangerous condition.

Mr. Berry, the foreman, also asserted that he did not notice any difference between the condition of this vessel and others. He saw Mr. Goulden go into the purifier before his interview with the men; and after the accident, he (witness) spoke to Suckling who was then conscious. The men did not object when he ordered the purifier to be cleared; and, speaking generally, he had no fault to find with the gang. If a sulphur vessel was strong and hot, it would be his duty not to let the men go into it, but communicate with Mr. Goulden or Mr. Reeson.

Mr. Hamilton, a valveman, corroborated the last two witnesses' evidence as to the state of the purifier, having entered it after the accident.

Mr. Pendry was called by Mr. RUEGG; and he declared that on Aug. 22 he was at Suckling's house at the same time as Mr. Goulden, who made the remark that it was by his orders that Suckling went into the purifier, and, if he (Mr. Goulden) had known the state of the vessel before, he should not have sent him.

Cross-examined by Mr. LOEHNIS: He was the local Secretary of the Gas Workers' Union.

Mr. LOEHNIS: This is my friend's independent witness!

Mrs. Suckling, also examined by Mr. RUEGG, stated that on Aug. 22, Mr. Goulden said to her: "Mrs. Suckling, I am extremely sorry to see Mr. Suckling lying as he is. If there is anything in my power I can do for your family, I shall do it with the greatest pleasure. It was my own fault. The men complained about this vessel; and I really thought they were tired and wanted to leave it. But I was obstinate, and meant to have it done."

Mr. LOEHNIS, in addressing the jury, asked them to bear in mind that, as the law now stood, there was no necessity for juries to allow their judgment to be warped by a feeling of sympathy towards working men, because, by the Act of 1897, a plaintiff was entitled, whether there was negligence or not on the part of his employers, to obtain that compensation which the law said was fair for an accident occurring to him in the course of his employment. It was conceded by the defendants that there was compensation to which the plaintiff was entitled, whether there was evidence of negligence or not. According to Dr. Leslie, plaintiff would be able to return to work in two months' time, which made a total withdrawal of 21 weeks from work; and his wages for that period would be between £40 and £50. The Company were not there to discuss whether the man should have £40 or £50; but the action was being fought because it had pleased those who were instructing his learned friend to make an attack upon the system that was in force at the gas-works. The only course the Company could take was to come into Court and vindicate the judgment, care, and diligence of their officials. He maintained that there was no evidence of negligence on the part of Mr. Goulden or the other officials on that occasion. Of the twenty men who went into the purifier, only one was attacked; and, after the accident, both Mr. Reeson and Mr. Hamilton went into the box, and found nothing about it out of the normal. In the course of further remarks, he said that plaintiff was claiming £300.

Mr. RUEGG followed, contending that this was a very bad case of negligence on the part of the officials of the Company, which negligence was made much worse by the obstinacy with which it was persisted to the end that the view taken by Mr. Goulden (who was the sole cause of the plaintiff's injury) was a proper and fair one. At one time he acknowledged his mistake, and was anxious to do what he could to remedy it; but now the jury were asked to acquit him of negligence. He (the learned Counsel) said deliberately that the way the Company had defended the case did them little credit. The theory that the plaintiff was suffering from heat apoplexy was put forward by Mr. Goulden entirely for the purpose of excusing himself, notwithstanding Dr. Pell's certificate that Suckling was suffering from poisoning by gas. All risks of similar accidents could be avoided by the Company providing more purifiers. He asked the jury to accept Dr. Leslie's evidence, which was fair and reasonable.

His HONOUR, having summed up the evidence, put the following questions to the jury: (1) Was the vessel dangerous for the men to work in? If so (2), was Berry guilty of negligence; (3) was Reeson guilty of negligence; and (4) was Goulden guilty of negligence in ordering plaintiff to resume work? If so (5), was the accident caused by reason of negligence. (6) Did the plaintiff know and appreciate the risk of resuming work? (7) If he is entitled to compensation, state how much.

The jury retired for a short time to consider the questions. To the first five, they replied in the negative; and to the sixth in the affirmative. The seventh was answered by an award to plaintiff of £40.

His HONOUR: That is a verdict for the defendants.

## OTLEY PETTY SESSIONS COURT—Tuesday, Nov. 22.

(Before Mr. T. DUNCAN and other Magistrates.)

### The Assessment of the Shipley Gas Company's Mats.

This was an appeal by the Shipley Gas Company against an assessment made upon them by the Assessment Committee of the Wharfedale Poor-law Union in respect of certain property in the parish of Baildon.

Mr. BEVERLEY represented the appellants; Mr. J. J. WRIGHT appeared for the respondents.

Mr. BEVERLEY, in opening the case, said the rates for the current year for Baildon amounted to 7s. 4d.; being 2s. 4d. for poor-law purposes and 5s. for general district rating purposes. In respect of this rate, a demand was made upon the Company on an assessment basis of £405 per annum for the rating of the gas-mains in Baildon. The previous net annual rateable value fixed by the Assessment Committee was £313 4s.; and it had stood at this figure since 1889, so that there was an increase by the latest charge of little less than £100. Prior to 1890, the assessment had for a number of years been £225. For some time the Assessment Committee appeared to have adopted a rising scale without rhyme or reason. His clients had stood this until they could stand it no longer; and having regard to the circumstances, they determined to appeal. In May last the Company gave notice to the Assessment Committee that they would appeal on the ground that the assessment was in excess of the value, and had not been made upon a proper basis. The appellants came before the Committee on May 27; and the Committee agreed to reduce the net rateable value to £375. His clients were not satisfied. The Assessment Committee seemed to go upon a hypothetical notion that, as time went on, profits must increase; and therefore the rateable value ought to go up. The Overseers had not acted upon facts or figures; for no information whatever had been asked for by them or given to them. The reason why the appeal was made to this Court instead of to Quarter Sessions was that it was the cheaper Court of the two available to an appellant. After the Assessment Committee had reconsidered the matter, they were served with notice of appeal on the ground that the valuation was excessive, was not based upon any principle, and, as compared with other property of a similar character, could not possibly hold good. By the ordinary method of calculation, the net amount of the assessment should be £284.

Mr. Wheeler Smith, valuer, said he had gone carefully into the question of the apportionment of rateable value in the case of the Company; and, taking the published balance-sheets as accurate, he had worked out the figures on the recognized basis. Upon his calculation the net rateable value was £284.

Mr. T. G. Wilcock, Secretary and Manager of the Company, proved the accuracy of the figures which had been given to Mr. Smith.

Cross-examined: The receipts of the Company had increased from £15,747 in 1890 to £19,561 in 1897; and the profits had increased from £6410 in 1890 to £7405 in 1897. But he added that the expenditure and capital had both correspondingly increased.

Mr. William Glossop, called on behalf of the respondents, said in 1897 the net takings at Baildon were about £3250, which was 16 per cent. of the total amount. Having regard to the figures, his opinion was that, taking into consideration the increase in the turnover—some proportion of which must have come from Baildon—a fair assessment would be about £400.

Mr. John Waugh considered that, if £2512 net income in 1890 was liable to be charged £313, then £3251 net income in 1897 was clearly liable to a charge of £405. The expense of maintaining gas-mains was a very small matter.

Cross-examined: He believed he was entitled to regard the Baildon mains as a separate concern altogether; and there was no difficulty whatever in separating the Baildon distributing works from the Shipley productive works.

Mr. WRIGHT, on behalf of the respondents, held that if an occupier was putting more money into his pocket, the representatives of the public had unquestionably the right to have more in the way of rates. The true proportion of increase since the figures of 1889 was shown with absolute clearness by Mr. Waugh's calculation.

Mr. BEVERLEY contended that since 1847 the practice in making these assessments had been to take the whole value of an undertaking as the first figure. The point raised by Mr. Waugh was not a new one, but had been raised again and again, and had always been set aside. He thought that, on the evidence before them, the Magistrates could only come to the conclusion that the judgment of the Assessment Committee should not be upheld.

The Magistrates retired to consider their decision; and subsequently both witnesses and Counsel had a private consultation with them. On returning into Court,

Mr. BEVERLEY said that, on behalf of his clients, and with the consent of his friend Mr. Wright and his clients, he had to state that, after seeing the Magistrates privately, they had agreed to a compromise upon the suggestion of the Bench. They had determined that the present assessment should be reduced to £340; and the parties should pay their own costs of appeal—the respondents undertaking, as far as they could bind the Overseers, not to disturb the agreed assessment of £340 during the next three years.

### The Rossendale Union Gas Company's Assessment Appeal.

At the Preston Adjourned Quarter Sessions last Friday, the appeal of the Rossendale Union Gas Company against the rating of their works by the Assessment Committee of the Haslingden Union came before Mr. W. H. Worsley Taylor, Q.C., and other Magistrates. The amount of the assessment in question was originally £7871; but this was reduced by the Committee to £7477. The assessment of the Company down to the present year was upon a valuation made in 1888 on the Company's accounts for 1887; and the total brought out was £6359. The difference between this sum and the £7477, the subject of the appeal, was accounted for by the fact that in 1888 the township of Spotland was partly in the Rawtenstall and partly in the Haslingden Union, and that it has since been entirely included in the latter. Mr. Bradbury (who, with Mr. McKeand, appeared for the respondents) opened the case; and evidence was given by Mr. J. Cross, of Manchester, Mr. H. Edge, of Blackburn, and Mr. T. T. Wainwright, of Liverpool. On the following day, the last-named gentlemen were re-examined; and the respondents' case closed. Mr. Sutton (who, with Mr. Formby, represented the appellants) called Mr. T. Newbigging, who gave evidence at some length. He was followed by Mr. Corbet Woodall, at the close of whose examination the further hearing was adjourned until to-morrow. A complete report of the proceedings will appear next week.



## MISCELLANEOUS NEWS.

### OPENING OF NEW GAS-WORKS AT CARLUKE.

The thriving little Lanarkshire town of Carluke was the scene last Tuesday of a ceremony which is unique in places so small—in the inauguration of an entirely new gas-works, upon a fresh site. Such transfers of works have been common of late years, but always in bigger towns. The necessity for such movements is testimony to the fact that, in the early days of gas making, the dimensions which the industry would attain were not realized; and the circumstance that owners of gas-works are unhesitatingly removing them to places where they will have better facilities for working, and more room to extend, must be taken to indicate that the present day leaders in the gas world are fully persuaded of the continued advance of the industry.

For some time back, the Directors of the Carluke Gas Company, Limited, have experienced great difficulty in giving an adequate supply of gas, owing to the antiquated state and the cramped position of their old works. All the available ground under their existing lease was fully taken up; and being situated in a hollow, with the ground rising on either side, no suitable space could be obtained for future extensions. The Company was formed in 1834, with the modest capital of £600. Additions have been made from time to time, until at present the capital of the new Company stands at £5000. Since 1888, the consumption has increased about 120 per cent., which necessitated a radical change both in the manufacturing and distributing plant. About two years ago, the Directors asked Mr. Alex. Yuill, of Alloa, to give them a report on the position and future requirements of the works. After reviewing the whole circumstances of the case, Mr. Yuill strongly advised them to procure ground situated at Law Crossings, contiguous to both the Caledonian Railway and a branch communicating with the North British Railway. The Directors unanimously agreed to erect new works as recommended. The first sod was cut by Mr. Pillans, the Chairman of the Company, in the spring of this year; and the gas was turned on to the town from the new works last Tuesday by Mrs. Pillans, before a representative gathering of contractors and local gentlemen.

The retort-house is built wholly of brick, with panellings outside. It measures 59 feet by 56 feet, with accommodation for local storage. A branch line from the Caledonian Railway goes right through the retort-house, where the coal is deposited direct from the trucks. The retort-bench contains three ovens, in settings of six, four, and two retorts. The oven of four retorts is of such a size as will admit six retorts at any time when required. There is also space for other two ovens of six retorts, which, when complete, will give 26 retorts in all. The retorts are set on Mr. Yuill's principle of forced draught. The primary air pipes are placed between the exit-flues, whereby the primary air is heated by the products of combustion as it leaves the setting. The secondary air flues are so arranged as to have the benefit of the heat from the exit gas flues on both bottom and side, and also on the other side by the side walls of the producer itself. A Cornish boiler, measuring 14 feet by 4 ft. 6 in., is placed in the retort-house in line with the retort-bench, for the generation of steam both for the engines and for the retort settings. A square chimney, of decorated style, 70 feet high, is situated at the rear of the retort-house. The hydraulic main is of steel, and rests on stools and cross-girders connected to the front and back bench binders. The condensers are of the ordinary box and vertical pipe form, with bridge pipes at top. They are so arranged and controlled with valves, that the gas may be admitted at either end as may be desired. The deposited tar liquor is removed from the bottom of the box to a seal-box placed at one end, wherein also the tar and liquor deposited in the hydraulic main is collected, so as to prevent its finding its way into the condensers. The whole tar and liquor collected from the various apparatus is stored in an underground cast-iron tank, from which it is pumped by a Tangye's special pump into tank-waggons. The exhaustor is of Messrs. R. Laidlaw and Son's newest form, driven by their ordinary make of steam-engine, all on one bed-plate. The engine is controlled by the gas itself, and is so arranged as to increase or lessen speed according to the varying make of gas. The connections are fitted with the usual bye-pass and compensating valves. The scrubber is of Young's form, and is constructed of steel plates with six washing divisions of the ordinary form. The purifiers are four in number, measuring 10 feet square by 4 ft. 6 in. deep, and controlled by one of Weck's patent centre-valves. The lime-shed adjoins the purifier-shed, and is so arranged that the lime-shells are taken direct from the trucks. The spent lime may either be loaded direct into trucks or removed for storage. The station meter, by Messrs. James Milne and Son, Limited, is cylindrical, having a measuring capacity of 7500 cubic feet per hour. It is fitted with stop and bye-pass valves, gauges, and water overflow arrangements. The gasholder, erected by Messrs. Clayton, Son, and Co., Limited, measures 60 feet diameter by 20 feet deep. It is of 57,000 cubic feet capacity, and is constructed of mild steel throughout. The columns are of cast iron, with steel lattice girders. The gasholder tank is constructed of brick, grouted with cement mortar, and backed with puddle. The governor is one of Messrs. W. & B. Cowan's well-known type, with bye-pass valves. An 8-inch main had to be laid from the new works to the town, a distance of about 1700 yards; and other alterations were made on the existing pipes to improve the supply generally over the town. A new commodious residence, with office for the Manager (Mr. T. Peacock) has also been erected.

The company were shown over the new works by Mr. Yuill, after which the gas was turned on in the governor-house by Mrs. Pillans, the wife of the Chairman of the Company. Mr. Pillans subsequently entertained those present at dinner. After the loyal and patriotic toasts had been drunk, Mr. J. Hepworth, of Edinburgh, in the name of the Contractors, presented the Chairman with a set of cutlery, and with a gold bracelet, set with diamonds, for Mrs. Pillans. In proposing the health of the Engineer, the Chairman complimented Mr. Yuill on the successful conclusion of his work, which had been carried out without a hitch. Mr. H. O'Connor, of Edinburgh, acknowledged the toast of "The Contractors." In replying to the toast of "The Officials," the Secretary of the Company (Mr. J. J. Wilson) said that, while in other similar places the price of gas ranged from 3s. 9d. to 5s. 5d. per 1000 cubic feet, in Carluke it was only 3s. 4d. per 1000 cubic feet. Besides this, the Company supplied gas for the street-lamps free of charge.

### REIGATE CORPORATION AND THE GAS COMPANIES.

The many conflicting statements which recently appeared in the local papers on the question of the proposal of the Reigate Corporation to purchase the Reigate and Redhill Gas Companies had the effect—and naturally so—of raising considerable doubt among the ratepayers as to the wisdom of proceeding with the scheme. In order that he might get an independent judgment on the subject, the Mayor (Mr. F. E. Barnes) submitted to Messrs. Stevenson and Bursdal all the published statements; and they reported thereon in a letter dated the 11th inst. It appeared to Messrs. Stevenson and Bursdal that the whole gist of the opposition was that there was a probability of the Council not making a profit on the purchase. They noticed that at a Council meeting the Mayor spoke of the purchase-money as being probably £161,000 (*ante*, p. 981). They thought this was somewhat less than the value of the undertakings. They also said that at the public meeting of ratepayers, Mr. Viall considered it would be better to take the opinion of Mr. George Livesey, who, according to him, had put the purchase price as likely to be £217,000. Assuming this—and in so doing they were taking the worst aspect for the Council—it meant that, borrowing the money at 2½ per cent., the multiplier would be 0.0415 for each pound to pay the interest and repay the loan at the end of forty years. Then £217,000 multiplied by 0.0415 equalled £9005. Turning to the balance-sheets of the Companies ending, Redhill, December, 1897, and Reigate, June, 1897, Messrs. Stevenson and Bursdal found that the profit earned by them amounted to £8236. To this had to be added £750, being Directors' fees; making a total profit accruing to the two undertakings of £8986. This very nearly approximated to the amount the town would have to pay in interest and sinking fund. There was no doubt, however, that great economies could be effected if the amalgamation were carried out and improvements made in the manufacture of the gas, which should be apparent to everybody; and they estimated that these two matters would effect a further saving of at least £1000 a year, making a total of £9986 profit, without allowing for any increase in the business of the undertakings. This, therefore, showed a clear profit to the borough of £981 at once. This could be used either in the reduction of the rates of the town or in the reduction of the price of gas equal to 2d. per 1000 cubic feet all round. Any increase in the business (which was very great in the district) would be met by constructing works, the capital expenditure upon which would carry less interest under the Corporation than under the Companies, and would thus further tend to augment the profits to the borough. This report was communicated to a recent meeting of the Town Council; and the Mayor was authorized, by 10 votes to 7, to consult Messrs. Stevenson and Bursdal, and issue a statement, if he thought desirable, to the ratepayers before taking the poll, in order to show why the Corporation should be empowered to purchase the works.

### SALES OF STOCKS AND SHARES.

At the Mart, Tokenhouse Yard, last Wednesday, Mr. Alfred Richards offered for sale, in accordance with instructions received from the Directors, £15,000 of new stock, 1881, of the Brentford Gas Company. It ranked for a standard dividend of 7 per cent. per annum, subject to the sliding-scale; the last dividend on similar stock having been at the rate of 9 per cent. per annum. It was put up in 140 lots of £100 each; and 20 lots of £50 each. The first lot offered fetched £206 10s.—the highest price realized; the last selling at the rate of £206 per cent. The lowest figure was £200; the average was £201 6s. 1d.—yielding £4 9s. 5d. per cent. on the investment—the purchasers taking the dividend accruing from Jan. 1 next. The total amount realized by the sale was £30,195 7s. 6d. On the following day, Mr. John Hunter offered for sale by auction 300 £10 shares in the Hartlepool Gas and Water Company; being part of the gas capital authorized to be issued by the Company's Act of 1878. The prices realized ranged from £19 2s. 6d. to £20 each. An important sale of £25,000 of new stock of the Sunderland and South Shields Water Company took place on Wednesday, at the Queen's Hotel, Sunderland; the auctioneer being Mr. Atkinson Gibson. The highest price realized was £134, the lowest £126 10s. per £100 of stock. A few fully-paid £10 shares in the Altrincham Gas Company have lately changed hands, at a sale by auction, for £23 each. A small parcel of stock of the Plymouth and Stonehouse Gas Company was sold by auction last Thursday at the price of £150 per £100 of stock. A few additional shares in the same Company fetched from £23 15s. to £24 2s. per share. Messrs. Kidwell and Sons disposed last Tuesday of some fully paid £20 shares in the Sittingbourne and District Gas Company at £33 10s. each. Eleven new £20 shares, £10 paid, were offered at the same time; three realizing £17, and the remaining eight £16 15s. per share. On Friday several lots of £10 original shares in the Eastbourne Gas Company changed hands at prices ranging from £37 7s. 6d. to £36 15s. each. Two £10 "C" shares realized £37 2s. 6d.; and two lots of six and five £10 "B" shares were sold at the rate of £27 2s. 6d. and £27 15s. respectively.

**The Future Control of the Metropolitan Water Supply.**—The "Pall Mall Gazette" says the Battersea Vestry have provided a strong argument against control by the County Council of the water supply, and an equally strong one in favour of a Water Trust or other central authority. A circular sent out by the Vestry to the other Vestries and District Boards, inviting their views, has resulted in a practically unanimous affirmation of the suggestion that there should be a central authority; but on the question of what that authority should be, there is remarkable divergence of opinion. Ten Vestries and District Boards favour the Council as the controlling authority, but eighteen are in favour of an authority other than the Council. The ten represent a population of 1,472,623, a rateable value of £8,096,266, and an acreage of 15,467; whereas the eighteen represent a population of 1,555,483, a rateable value of £12,863,723, and an acreage of 28,301. Our contemporary points out that the balance of opinion is thus against the Council, even on this partial poll. As to the balance of fourteen Vestries and District Boards, it may be fairly assumed that they, too, would be against Spring Gardens. It is thought that "this ought to satisfy even Mr. Dickinson that the people will not stand a County Council water monopoly."



### THE TESTING OF GAS AT COVENTRY.

A discussion on the gas-testing arrangements of the city occupied a large part of the time of the Coventry City Council last Tuesday. It appeared that an application having been made by Mr. E. G. Clayton, the Gas Examiner, for an increase in his remuneration, the Watch Committee considered it a convenient opportunity to revise the present system, and to have future tests made at a point in the centre of the city. They accordingly recommended that Mr. Clayton be invited to resign his office at the termination of the current year of his engagement in May next, and that arrangements be made with Professor Belcher, the Principal of the Technical Institute, to carry out tests in his laboratory, which, in the opinion of the Committee, is favourably situated for the purpose. The adoption of the report was moved by Alderman Tomson, who explained that up to the present the gas had been tested at the works; but, as the consumers were not thoroughly satisfied, the Committee had come to the conclusion that tests should be made in the heart of the city. The motion having been seconded, Alderman Andrews, the Chairman of the Committee, moved the rejection of the report. He protested against the Master of the Technical Institute being placed in what would be nothing more nor less than the position of a referee or arbitrator of the quality of the gas. Their Acts prescribed that the gas should be tested at the works; so that the testing of it in the centre of the town would have no legal value. They had to supply gas of 15-candle power; but in order to ensure that the light should be of the proper standard, they made 17-candle gas. Supposing the illuminating power was found to be deficient at the Technical Institute, and a demand was made upon the Committee to increase it, it would cost between £2500 and £3000 a year to raise it from 17 to 18 candles, which would alone knock the bottom out of their surplus profits. Mr. Robinson remarked that, in suggesting that the proposed testing would increase the cost of manufacture, Alderman Andrews gave away his case; for, if the Committee were not supplying gas of the required quality, they ought to be. The Town Clerk, in answer to a question, said there was nothing in Gas Acts to prevent the testing of the gas in the centre of the city. In replying to a long discussion, Alderman Tomson said the Watch Committee quite believed the Gas Committee were giving gas of higher illuminating power than the statutory requirement; and there was no general dissatisfaction. The report was adopted by eighteen votes to nine.

### BIRMINGHAM CORPORATION GAS UNDERTAKING.

#### A Member of the Committee on Its Past and Present Position.

An intimate association with the Birmingham Corporation Gas Department, as a member of the Gas Committee of some years' standing, enabled Mr. STEVENS, in an address to his constituents of St. Thomas Ward last Tuesday, to give some figures which, as they strikingly illustrate the progress of the concern, are worth recording.

Mr. Stevens, in the course of his address, said the income of the Gas Department last year was nearly £665,000; and the expenditure was £610,000, of which £100,000 was interest on and repayment of capital. The amount paid over to the improvement rate was close on £55,000, including £4000 interest on the reserve fund, which had by statute to be so applied for so long as the reserve fund was not drawn on. In addition to this £55,000 in cash, the rates were relieved to the extent of an additional £11,500 in the lower prices charged for public lighting; and for court lighting further relief was given amounting to £2500. An additional £3500 went to the relief of rates in districts outside the city in which public lighting was also charged on the reduced scale; so that in round figures, the total amount contributed to the relief of rates and in aid of court lighting in and outside the city was £72,500. In the last three years the Gas Committee had provided nearly £125,000 in cash in aid of the rates, and had relieved the charges for public lighting in and outside the city to the extent of £50,000. Since the transfer of the undertakings to the Corporation, the total profit earned had been above £1,000,000. In that time £650,000 had been contributed in relief of the rates; a reserve fund of £100,000 had been formed; £230,000 had been applied, beyond the sum required to be set aside by the Act of Parliament, for repayment of capital; and nearly £40,000 had been expended on providing the Art Gallery building. Visitors to that gallery should always remember that it was only by the assistance of the Gas Committee in providing rent free the spacious galleries in which the art treasures of the city were stored, that it had been possible to take advantage of the munificence which had since furnished those galleries. During this period, the total relief given in reduced prices on public lighting had been no less than £180,000. From the transfer of the undertaking to the present time, the annual sale of gas had increased from 2300 million cubic feet to above 5000 millions; and the quantity of coal carbonized had advanced from 300,000 to more than 500,000 tons per annum. The price of gas had been reduced in the same period by 1s. per 1000 cubic feet; the reduction made in the present year being equal to £30,000 per annum. The capital expenditure at the date of the transfer was £2,000,000; it was now £2,200,000. The capital expended worked out in 1876 to £7 per ton of coal carbonized; while now it was less than £4 10s. per ton. The interest on capital (which, of course, formed a part of the charge made for gas) was equal to 9d. per 1000 cubic feet; last year, it was equal to 5d. per 1000 cubic feet. Moreover, there was more gas made per ton of coal carbonized now than in 1876. There was also less leakage from mains and service-pipes; and only one set of distributing mains was now required, as against two in the days of the Companies. There had also been great economies effected by the introduction of modern methods of manufacture and savings in management, such as in Directors' fees, cost of collection, bad debts, &c. Management expenses in 1876 equalled a charge of 1d. per 1000 cubic feet of gas sold. Now they represented less than ½d.; and this saving amounted on the total output of to-day to about £9000 a year. During the past three years, there had been a phenomenal increase in the output of the undertaking, due very largely to the rapid introduction of gas-engines for manufacturing purposes. This had led to the large extensions of the works now in progress, and on which some £400,000 was gradually to be spent. There was

another modern development of the gas industry which, if not so profitable, was likely to be productive of great benefit to the community—i.e., the introduction of gas to the dwelling of the artisan by means of prepayment meters. The Gas Committee had found that, with extreme care and good organization, they could make this system self-supporting, although they could not hope for many years that the profits on it would be sufficient to swell appreciably the aid to the rates. There were now nearly 5000 of these meters in use in Birmingham; and there were unexecuted orders on the books for about 1000 more. The great difficulty the Committee had met with was the impossibility of getting the help of enough fitters to keep up with this work in the winter; but the Committee were doing all they could by soliciting the help of outside gas-fitters to cope with the demand. These 5000 consumers represented an additional consumption of about 50 million cubic feet per annum, and 5000 additional tons of coal a year to be carbonized; while it involved a total capital expenditure for fittings of all kinds of about £25,000. Nearly the whole of this expenditure had gone to benefit Birmingham traders and their employees. In the great success that had attended the working of the gas undertaking, the cause of the workers had not been overlooked. At the time of the transfer, the men in the retort-houses worked twelve hours per day; they now work eight hours. When it was necessary for them to work on Sundays, they were paid at the rate of time-and-a-half. The men's wages all round had been advanced; while their hours had been reduced. The permanent men received a week's holiday during the year, and their wages as usual; the short-term men had holidays in proportion to the time worked. In addition to this, the conditions under which the men laboured had been much improved. It was estimated that the concessions made to them cost the department no less than £45,000 per annum. Mr. Stevens expressed his surprise that Birmingham manufacturers were so slow to avail themselves of their exceptional facilities for making gas meters and stoves. Birmingham supplied the parts to many outside makers of such apparatus; and it was curious that more local manufacturers did not occupy the field for themselves by turning out the complete article. Other municipal topics were also dealt with.

### THE FALMOUTH CORPORATION AND THE GAS AND WATER WORKS.

#### The Purchase Scheme Again Rejected.

A poll of the ratepayers of Falmouth was taken last week on the proposal of the Corporation to promote a Bill in the ensuing session of Parliament, empowering them to acquire the undertakings of the local Gas and Water Companies. The votes were counted on Thursday, when it was found that 873 had voted for the scheme and 1238 against it—being a majority of 365 against. Of 2671 papers sent out, 2227 were collected; and of these 361 were blank and 50 invalid. The number of good votes recorded was 211.

The taking of the poll was preceded by a public meeting held on Monday evening, the organizers of which were the opponents of the scheme, who were closed by the Mayor at the statutory meeting. Mr. E. Trerise presided, and contended that the purchase of the gas and water works would not benefit the ratepayers. It was misleading for the supporters of municipalization to say that in 208 places in the United Kingdom, where the gas-works were the property of the Local Authority, there were profits available for the relief of the rates. The other side of the story showed that in such places as Manchester, Salford, and Oldham, where there was a large profit, possession of the works was obtained thirty or forty years ago; they were near coalfields; the localities had grown enormously; and much of the original capital and interest had been paid off. If it was such a good thing as the promoters wished them to believe, why had not Plymouth, Devonport, Torquay, Exeter, Bristol, Bath, Taunton, and many other big towns, thought it wise to obtain possession of their gas-works? Even if there were a profit, the majority of the working men would not benefit, because a large proportion of them did not use gas. Should the scheme be carried at the poll, what guarantee had they that the management of the properties by the Corporation would produce successful results? Both the gas and water works were well managed, and he thought they had better leave them alone.

The next speaker was Mr. R. Fox, who suggested that the best friends of the shareholders of the Gas Company were those members of the Town Council who advocated buying up the undertaking. Since the scheme was introduced, the shares, which had before been standing at from £2 10s. to £2 14s., had sprung up to over £3. If the purchase scheme was defeated, the value of the shares would, he believed, decline. He was of opinion that the ratepayers would get no practical benefit from the purchase of the gas-works; while as to the water-works, even Mr. Silverthorne thought they would be a loss. There were things in connection with the water—such as the improvement of the works, the renewal of the mains, and the settlement of water rights—which would mean perhaps great expense. The time might come when it would be advisable to purchase the water-works; but before then an arrangement should be entered into with their neighbours at Penryn, so that the scheme might be a joint one.

Speaking as a shareholder in the Gas Company, Major Mead said the principle of the transfer of the gas-works was settled when the Company agreed to embody in their Act of Parliament a clause by which they were bound to sell their works any time within ten years. The Company were willing to leave the matter in the hands of valuers as provided by the Act; but shareholders were being led to suppose that they would be robbed of their own, and the ratepayers that they would get the works for something like half their value. On the basis of transfer schemes in other places, he was of opinion that the gas-works would cost the town £68,000; and at this price the result would be an annual loss of £941. Personally, he advised the Company to sell, because they would do so at an enormous profit. Another shareholder (Mr. F. J. Bowles) said there were advantages arising from the possession of the water supply; but were they prepared to pay for them? Assuming that it would cost over £100,000 to acquire the two undertakings, it was clear that the balance-sheet would show a loss to the town. He had no kind of confidence in the methods adopted, the intimidation aroused, and the thoroughly



un-English manner in which this affair had been rushed through, and attempts made to prevent councillors and ratepayers alike from getting to the bottom of it.

The Chairman of the Gas and Water Committee of the Corporation (Mr. J. Grose), after expressing regret that the only people on the platform were monopolists and men associated with the Gas Company, went on to say that in Falmouth all classes were convulsed, the monopolists were falling, and the death-rattle was heard in "the retorts of this abominable and atrocious water gas." They had not been told that the Gas Company were paying dividends of 13 per cent.

The next speaker urged that if the Corporation would only do their duty by insisting on the Water Company supplying filtered water, there would be no cause of complaint as to the supply. Then came a denial from Alderman Banks that he voted for Mr. Silverthorne's scheme. As a matter of fact, not a single member of the Corporation had voted for it, for the scheme had never been before that body. It was possible to show from Mr. Silverthorne's report itself that there could be no profit for the first ten years. If the promoters had put that before the town plainly, he would have voted for it; but as it was now placed before the ratepayers, he declined to support it.

A vote was then taken; the great majority being opposed to the purchase scheme.

At a meeting of the Town Council on Wednesday, Mr. Mackenzie said he had heard of voting-papers being collected and taken away in a man's pocket. The Town Clerk said he had received complaints from each side similar to that made by Mr. Mackenzie. Mr. Grose stated that a man had told him that he had collected 37 blank papers and taken them to the Gas Company's representatives, and had them filled up. Mr. Mackenzie said that in the case he had mentioned the circumstances were within his personal knowledge, and there could be no mistake. Mr. Grose said the man who collected the 37 papers was sent to him to know if he would buy them.

### GAS-WORKERS' WAGES AT LEEDS.

The Gas Committee in Conference with the Men.

Many of our readers may remember that some two months since an application was made on behalf of all classes of men engaged in the Leeds Corporation Gas-Works for an advance of 4d. per day; and at the same time the workpeople in the pipe-laying and meter departments asked for an eight-hours day. In view, however, of the approaching end of the municipal year, the Gas Committee resolved to defer consideration of the request till after the elections, and promised to name a date for an interview with the officials of the Gas-Workers' Union and a deputation of the men. This conference took place last Wednesday at the Municipal Buildings; and the points were discussed on both sides, the "Yorkshire Post" reports, in a friendly spirit. It was pointed out in the application that certain sections of the men had not received any advance for over 20 years—for instance, the stokers. Although the latter had obtained a reduction of hours, they had, it was said, to work at a far greater pressure than with a twelve-hours working day. The application concluded by reminding the Committee that they had often expressed their desire to pay as much wages as other places doing similar work, and added the opinion that if they made comparisons they would agree that the men were asking nothing unreasonable.

The Chairman of the Gas Committee (Alderman Lowden) presided over the conference; and at the outset, the application for an eight-hours day on behalf of the men employed in the meter department was withdrawn. The Chairman explained that it was not so much the intention of the Committee to discuss the matter with the deputation as to listen to their application and the statements upon which it was based. Of course, they might think it necessary to ask questions with regard to statements put forward; but they would not come to any decision without further investigation. The deputation then stated their case. It was urged that their work deserved greater remuneration; and in the case of the stokers, it was mentioned that in Liverpool, Birmingham, Sheffield, Newcastle, and South Shields the rate of payment was better than in Leeds. Again, in other towns the firemen had more wages.

At the termination of the interview, the Chairman said the question the Committee would have to consider was not only the amount of wages paid elsewhere, but also the amount of work done for the wages. The Committee would thoroughly investigate the cases to which attention had been drawn, and would probably visit some of the places named. Referring to the statement in the application, that the Committee had expressed their desire to pay as much wages as other places doing similar work, Alderman Lowden said they were anxious, and even determined, that this should be the case. The investigations of the Committee would probably take some time; and if the time appeared long, the deputation must not look upon it as being wasted. It was, he pointed out, most desirable that the statements put before them should be investigated; and they would acquaint the deputation with the result of their decision at the earliest opportunity.

The deputation expressed their gratification at the courteous way in which they had been treated.

Afterwards, the Committee had an interview with men representing the pipe-laying department. They based their application for an alteration in wages and conditions on the ground that their work was uncertain, and had to be performed in all sorts of weather, and that they were often called upon to turn out at night. The Committee promised to duly consider the application.

The machine-men at the New Wortley Gas-Works, numbering between 20 and 30, also applied for an advance; and it was arranged that the Chairman should meet a deputation from the hands on Friday afternoon.

**The Proposed Purchase of the Larne Gas-Works.**—A memorial containing the signatures of 800 ratepayers of Larne has lately been forwarded to the Local Government Board for Ireland, asking them to withhold their consent to the purchase of the gas-works by the Town Commissioners, as it is considered unwise for an expiring Board to plunge their successors into such a scheme. The Local Government Board have submitted the memorial to the Commissioners for their views thereon.

### ELECTRIC LIGHTING NOTES.

The Board of Trade have notified the Limerick Corporation that if the Provisional Order empowering the Local Authority to carry out an electric lighting scheme for the city is not put in force forthwith, the Order will be revoked. The Board have extended the time for the Order being put into force on several occasions; and the time last granted has lapsed long since.

Mr. W. A. Ducat, of the Local Government Board, held an inquiry at Whitehaven last Wednesday, with reference to an application by the Town Council for power to borrow £12,000 for purposes of electric lighting extensions. The Mayor (Mr. J. R. Musgrave) stated that additional plant was absolutely necessary to meet the great demand. There was no opposition.

Another interruption in the electric lighting took place at Tunbridge Wells last Thursday evening, owing to the failure of a fuse; and although the street lighting was not affected, the lights in the Town Hall, where a bazaar was in progress, the Technical Institute, where classes were being conducted, and the Swimming Baths, were out for about three-quarters of an hour, and oil-lamps had to be resorted to.

At the meeting of the Dublin Corporation yesterday week, Mr. Smyth moved the adoption of a report of the Electric Lighting Committee, which stated that the gross income for the year 1897 was £13,089; and the expenditure £8036. A surplus of £5052 had been carried to the net revenue account, out of which charges for interest and repayment of principal had been met; leaving a credit balance of £953 on account of the year. Mr. McCarthy referred to the condition of darkness in which the city was left on the previous Saturday, and asked for information as to what had been done by a Committee of the Whole House appointed at his request. Alderman Meade was understood to say that the Committee would have to come before the Council for their sanction to an application for a loan of £8000 for the renewal of the mains. Pending this they had confined their efforts to getting the existing system into as good order as possible. The High Sheriff agreed that the citizens were labouring under a terrible inconvenience in consequence of what was required not being supplied. The report was adopted.

The shareholders of the Yorkshire House-to-House Electricity Company yesterday week ratified the provisional agreement entered into between the Directors and the Leeds Corporation for the transfer of the undertaking. It was pointed out by the Chairman (Mr. Grosvenor Talbot) that these final steps were not being taken through any want of faith, either on the part of the Directors or the shareholders, in the Company, but under the inexorable terms of the Act and Provisional Order which called the Company into existence. He gave an account of the negotiations between the Directors and the Corporation; and with reference to the grant of a Provisional Order to the Corporation to issue 5 per cent. irredeemable stock, he said that this was a departure from the position the Board of Trade took in their decision of the Sheffield case a short time before. The Leeds Corporation were perfectly right to endeavour to do the best they could for the ratepayers; but it was, he could not but think, a grave reflection on a great Government department that they should reverse the decision made a few months previously on outside pressure being applied. The provisional agreement was adopted. Under clause 2, the Auditor of the Company (Alderman Gordon) and the City Accountant (Mr. Derry) have made a further investigation of the Company's books, and have agreed that the amount of expenditure on capital account to be allowed for by the Corporation is rather more than £217,000. To this, various amounts representing book debts, stock, and other items must be added, the total, it is understood, being somewhere near £250,000. Special efforts are being made by the Chairman of the Parliamentary Committee of the Corporation (Mr. Wilson) and all concerned to complete the transfer early next month.

The question of whether Stretford should have an independent electric light station or accept (at a price) a supply of current from Manchester, led to an animated meeting of Stretford ratepayers last Wednesday. Mr. R. P. Wilson, who had been consulted by the Urban District Council upon the question of the proposed erection of a central generating station, recommended that the Council should not accept the offer of Manchester, but should provide their own supply of electricity. On the report being presented, Mr. W. Wardale moved a resolution to the effect that Stretford should accept the offer of the Manchester City Council to put down and maintain at their own risk the necessary plant, mains, &c., for providing electricity in Stretford, on the condition that the charge to consumers in Stretford be the same as to consumers in the city, and the Council to have the option of purchase on equitable terms at the expiration of twelve years. Adversely criticizing the report of Mr. Wilson, Mr. Wardale said he was at one time in favour of Stretford doing the work, but when he saw the offer Manchester had made he came to the conclusion that he was wrong, and had come round to the opinion he now held—that the Council should accept the offer made to them. Mr. T. Johnstone, the Chairman of the Electric Lighting Committee, combated many of the statements made by Mr. Wardale. He urged that Stretford was favourably situated for the erection and working of an electric plant for the supply of the residents, and that there was every prospect of a remunerative business being done. Manchester had done nothing for Stretford in the past; and it would not be to the benefit of Stretford (who were opposed to amalgamation with the city) to allow Manchester to obtain vested interests in the township. In the course of the subsequent discussion Mr. Marshall Stevens said he should vote for the resolution, because he was opposed to the Stretford Council putting down works themselves. At the same time he did not feel that the hands of the Council should be tied in any particular point; and if they found that electricity could be supplied on even better terms than those offered by Manchester, why should they not consider the proposal? In answer to questions, the legal adviser to the Council explained that if the meeting passed the resolution they tied the Council to the principle of going to Manchester on equitable terms to obtain their supply of electricity; while if they decided against the resolution, it meant practically that the matter was referred back. Upon a division being taken, the resolution was carried by a large majority, whereupon the Chairman demanded a poll of the ratepayers on the question.

The purchase of the Electric Supply Company's undertaking was advanced another stage at a special meeting of the Birmingham City Council last Tuesday when the promotion of the Bill which is to authorize



the transaction was agreed to. The Lord Mayor (Alderman Beale), in explaining the measure, stated that, in addition to the clauses dealing with the purchase, the General Purposes Committee recommended that the Council should take power to supply not only the areas occupied by the Company, but the whole of the city. For the capital of the present undertaking, they asked that they should be allowed 42 years for repayment; and they based their plea for this extended period on the consideration that they were having to pay heavily for goodwill. This, however, could not apply in respect to any expenditure for lighting parts of the city over which the Company had no powers. The Council had pledged themselves to pay the Company £420,000. When they commenced negotiations, the latter had increased their capital powers; but, at the request of the Council, they forebore to add to their actual capital, and obtained from their bankers the amount immediately necessary for their requirements on capital account. About £30,000 would represent what the Company would have actually spent in this way until the Corporation came into possession of the concern. There might be other payments; and the Committee had put into the Bill £500,000 as the sum required for the existing concern, and which they sought 42 years as the time for repayment. For any further loans raised by permission of the Local Government Board, they would have to be content with such period as the Board would allow in the ordinary way. The only objecting member was Mr. Lane, who said he did not vote for the agreement to purchase on the ground that he did not think the Council were given sufficient time to consider the subject. He regarded the premium the Company were to receive as far too much. The Council might have taken in hand the unappropriated districts, and have run parallel with the Company. A little gentle competition in this way would have kept down the price of the shares to something nearer their intrinsic value. Out of respect to the Council, he would not vote against the resolution; but, out of respect to his own conscience and the interests of his constituents, he felt he could not vote for it. The Lord Mayor, in reply, said he had never contended that the price to be paid for the undertaking was based upon the actual value of the concern taken by valuation. He simply put it that it could not be obtained for less; and while the Corporation were in the field as buyers, there was no likelihood of the shares falling in price. Since the bargain was made, he had had the returns of the business taken out for the ten months of the present year. The sales had gone up by 428,990 units—an increase of 54·8 per cent. on the corresponding period of last year. The money equivalent of this was £6567, or an increase of 35 per cent. on last year. Upon the basis of these figures, the concern was worth a good deal more than when the Corporation commenced their negotiations. He thought there was now every indication that the works would come into their hands as a self-supporting undertaking, and that in a short time it would be a remunerative one. As already indicated, the Bill was agreed to.

#### THE STOCKPORT WATER-WORKS PURCHASE QUESTION.

A Special Meeting of the Stockport Town Council was held last Wednesday, to pass resolutions authorizing the promotion of Bills in the ensuing session of Parliament enabling the Corporation (*inter alia*) to purchase the undertaking of the Stockport District Water-Works Company. Alderman W. Lees, in introducing the subject, said the nominal capital of the Company was £344,570, to which there must be added £9209 for capital account overdrawn—making £353,779 as the total capital. The loans of the Company, £69,000, would be taken over as they stood. They were repayable at short periods; and the rate of interest on them meanwhile averaged about 3 per cent. The holders of the 5 per cent. preference stock, which amounted to £20,952, would receive annuities yielding the same dividends as before. The holders of the 4½ per cent. preference stock, amounting to £20,095, would likewise receive annuities producing the same dividends as before. The holders of the consolidated or ordinary stock, which amounted to £187,522, would receive annuities of £8 for every £100 of stock they held; and the holders of new ordinary stock, amounting to £47,000, would receive annuities of £7 10s. All the annuities would be redeemable at 33½ years' purchase at the end of 60 years. Then the Corporation would also pay over in cash to the Company the sum of £25,641 9s. 4d., and a further sum in cash (representing the amount overdrawn at the bank at the time of transfer) in respect of the capital expended, but for which they had not created stock—making a total cash payment of £34,851. This would appear, he said, a high price for the undertaking; but having regard to the prices paid in recent years for other water-works, the gentlemen who had been conducting the negotiations on behalf of the Corporation felt that they were paying a sum which was both fair to the Company and to the ratepayers. Calculations made by the Borough Treasurer, showed that, provided 60 years were allowed for the redemption of the cost, and the sinking fund contributions were suspended for the first seven years, and only the same annual increase of income as during the past seven years was maintained, a rate of 1½d. in the pound for a few years would be ample to meet any deficiency and the sinking fund contributions. Alderman F. R. Robinson stated that twelve years ago the Corporation could have purchased the works for £200,000 less than they would have to pay now. He believed the calculations mentioned by Alderman Lees were on the safe side—that the result of the purchase would be to ensure a better and more adequate supply of water for the town and district, and that the bargain effected would be a fair one for the Company and of lasting benefit for the people in the districts concerned. After some discussion on points of detail, the resolutions were adopted.

**Wallingford and Its Gas-Works.**—In the "JOURNAL" for Aug. 30, it was reported that the Directors of the Wallingford Gas Company had rejected an offer from the Town Council to purchase the gas-works for £7500. Negotiations have since taken place on the subject; and at the meeting of the Council on the 16th inst., the seal was affixed to an agreement for the purchase and carrying on of the gas undertaking at the price of £7500 (which had been fixed by an expert valuer) and £60 for the fixed meters. Application to the Local Government Board for a Provisional Order to acquire and work the property will be made in due course.

#### METROPOLITAN WATER SUPPLY COMMISSION.

Thirty-sixth Day—Tuesday, Nov. 22.

(Viscount LLANDAFF, Chairman, Sir JOHN E. DORINGTON, Bart., M.P., Sir G. B. BRUCE, M.Inst.C.E., Major-General A. DE COURCY SCOTT, R.E., Rt. Hon. J. W. MELLOR, Q.C., M.P., Mr. A. DE BOCK PORTER, C.B., and Mr. R. LEWIS.)

The Commission sat at the Guildhall, Westminster.

The following are the Counsel engaged: Mr. POPE, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., for the New River and the Southwark and Vauxhall Companies; Mr. LITTLE, Q.C., and Mr. LEWIS COWARD for the Kent Water Company; Mr. PEMBER, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. RICKARDS for the Chelsea Water Company; Lord ROBERT CECIL for the Hertfordshire County Council; Sir JOSEPH LEESE, Q.C., M.P., for the Kent County Council and Kent Local Authorities; Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN, Q.C., for the London County Council; Sir R. NICHOLSON for the Middlesex County Council; and Mr. GABRIEL P. GOLDNEY (Remembrancer) for the Corporation of the City of London.

Mr. POPE, in reply to the CHAIRMAN, said scheme No. 1 of intercommunication, to which reference had been made at the last few sittings, had no regard to a surplus from the Southwark and Vauxhall Company. Scheme No. 2 contemplated no supply coming directly from the Chelsea Company, though it had relation to this Company as a supplementary means of increasing the intercommunication.

Mr. FREEMAN pointed out that in scheme No. 1 there were three cases where the Southwark and Vauxhall Company were connected with other Companies—the Lambeth, Kent, and East London.

Mr. POPE said it was useless to connect, if there was no water to pass.

Mr. FREEMAN replied that they would hardly make the connection unless there was water to pass.

Mr. R. E. MIDDLETON, Joint Engineer with Mr. Walter Hunter for the Staines reservoirs scheme, who was under examination when the Commission adjourned in July last, was re-called and further examined by the CHAIRMAN. He said the effect of purchase of the undertakings would be loss to the consumers and still more to the ratepayers, if the condition as to revenue spoken of by a witness for the London County Council were carried out—viz., if the rates were reduced to one level (that of the West Middlesex Company) for all London. Several other things also, the cost of which the Companies had to bear at present, would fall upon the ratepayers—the damage caused by severe frost, for instance. Purchase, though no doubt it would prove remunerative in the future, would not be so at once. The liability to frost or drought was not an element which would be considered in fixing the price a public authority were to pay for the purchase of the concerns, because it was one to which the purchasing body would be just as much liable as the Companies. If a frost or drought occurred during the years the income of which was being taken as a basis, they would be considered; not otherwise. The average past effect of frost or accident would affect the price; but anything unforeseen or abnormal would not. Undoubtedly differential rates were fairer for such a place as London, where there were high-lying and low-lying districts, and where, therefore, the cost of pumping to the high parts was greater than to the lower ones. Even in the case of the Lambeth and an adjoining Company, though both drew their water from the Thames, the length of the Lambeth mains was greater, and the cost of the pumping more, than they were with the other Company; and it was fair therefore that the charge should be higher in the case of the former Company. He could not prove, but he had a strong impression, that for two houses, equally good, the landlord would get less for one in the Lambeth district, where the water rate was high, than for one in the Southwark and Vauxhall Company's area, where the rate was lower. Saving in maintenance and management was not likely to follow purchase. Municipal management did not as a rule effect economy. A Board who had existed for years, and were paid to do their duty, were much more likely to be economical than one of a fleeting character, and who were unpaid.

The CHAIRMAN: That observation would not apply to purchase by a Special Board of experts created *ad hoc*?

Witness: No; it would not.

In answer to further questions, witness said that a purchasing authority would contemplate employing fewer officials; but he did not believe, if the whole concerns were in one hand, there would be a saving in management. Probably there would have to be a larger staff than now. With regard to the collection of rates, if there were a municipal body already collecting other rates, saving might result by transferring the duty to this body. If purchase did occur, the price would have to be fixed by arbitration under the Lands Clauses Act; this having been the regular custom, and there being, so far as he knew, precedent for purchase in no other manner except by agreement. He saw no reason in the present case to depart from the custom. He certainly thought the shareholders were entitled to prospective value, if there were any; and, on the other hand, if there were prospective diminution of income, the purchaser would be entitled to the benefit of that. There was no prospect of increase in the Companies' income in respect of the 130 million gallons they were at present supplying, except perhaps that arising from the quinquennial valuation. There were, however, a number of items tending to decrease, rather than increase, the benefit of quinquennial valuations—the fact that the larger charges were made on railways and great business undertakings, and on the Water Companies themselves. The big undertakings were supplied by meter, so that the increase of their rateable value did not mean an addition to the Company's income. The eight Companies in 1871 paid together in rates £70,423; and in 1896, £235,630. In his calculations he had not considered the matter of the sinking fund in relation to the purchasing authority, nor of the sinking-fund clause in relation to the Companies.

Mr. DE BOCK PORTER said it would be impossible to overlook in any arbitration the fact that the sinking-fund clauses would make an enormous charge in the future.

Mr. PEMBER replied that it would only be enormous on the supposition that purchase was indefinitely postponed. But the sinking-fund clauses were based on the fact that purchase should not be postponed.



Further examined by the CHAIRMAN: Future expenditure upon storage reservoirs for the existing supply would be a cause for reduction of the purchase price, so far as it had not been already added in the account. On the other hand, the Companies' incomes would have to be regarded as progressive, because of the increase in valuation occurring from time to time in London, and of the increase of supply. Witness held there was no necessity for going to Wales for further water; but, if there was, the outlay would be a deduction from the cost of purchase. Under present conditions, the Companies having an adequate supply, the cost of going to Wales would fall upon the purchaser, in addition to the purchase money. Supposing the eight Companies were purchased by the London County Council, he did not think it would be convenient for them to supply the outlying counties in bulk. It would be an exceedingly expensive arrangement, necessitating a large amount of alteration to the present mains. The mains of the Companies had not been laid with the idea of supplying in bulk outside the given area; and they crossed the boundaries of the County of London in all directions. In many cases, the centres of supply were outside the County Council boundary when they supplied inside, and inside when they supplied outside. If the supply were to be given in bulk from the inside outwards, many mains would have to be relaid, and meters placed on all of them. In the East London district, there were 11 mains crossing the county boundary. The water travelled from outside to inside the County of London; and if the outside were to be supplied, it would have to be carried outside again. Most of the East London service reservoirs, pumping-stations, and filter-beds, were outside; and if the County Council were to supply Essex in bulk, they would have to bring the whole of their filtered water from outside inside, and then out again. Essex could do very well with the existing works; but London would need fresh service reservoirs. The matter would be exceedingly complicated and no engineer would arrange it in this way if he could avoid it. In the case of the New River Company, the main crossed and re-crossed the boundary between the County of London and the Outside Authority 38 times, besides which there were a large number of smaller service-pipes in cross-streets. The whole of these would have to be metered, unless they were drawn together in one, and the supply given to the Outside Authority at one point. There were several miles of boundary; and to give the supply in one, they would have to lay one main down the boundary on one side, and another down the boundary on the other, connecting all the 38. This would involve considerable expense, and be very complicated. In two cases—Hornsey Lane and Stroud Green Road—there were three mains in the same street. The boundary in each instance was in the centre of the road, and it would be therefore impossible to say to which Authority the mains would belong—especially if the boundary fell on (say) the middle pipe. The pumping-stations of the Company were entirely outside, but about half the service reservoirs were inside and half outside. The difficulty of making the reservoirs outside distribute the water supplied in bulk from the London County Council, lay in the fact that some of those inside supplied outside, and *vice versa*. The thing was not impracticable, but would be very expensive. It would cause a remodelling of the whole system. Witness

went on to detail difficulties of a similar character in connection with the other Companies. In the West Middlesex district, there were 20 main pipes crossing the boundary, besides 61 smaller service-mains, about half of which supplied streets inside, and half outside, the boundary. In the Grand Junction area, the boundary was crossed by four trunk mains delivering from inwards. The pumping-stations at Hampton and Kew, and the service reservoirs at Hanger Hill, containing 53 million gallons, were outside the county; while the Campden Hill service reservoirs, containing 18 million gallons, were within. As to the Chelsea Company, their works were almost entirely outside, while the supply was wholly inside, the County of London. This meant that, in order to make the Chelsea Company supply Surrey in bulk, new mains would have to be laid. There were no means at all now, except the mains to London, of supplying Surrey. South of the Thames there were three Companies—the Southwark and Vauxhall, the Lambeth, and the Kent—and their sources were chiefly outside the County of London. The service reservoirs of the Southwark Company were within the county, at Nunhead and Forest Hill; so that the difficulty arising in the other cases would not occur here to the same extent. There were no mains by which water could be supplied in bulk from these reservoirs to Surrey; the mains at present in existence in Surrey were used as supply mains both inside and outside. They would have to be cut off and reconnected to make them useful as supply mains for Surrey. The Lambeth Company's water was brought into London by three large mains from the works at Ditton to Brixton, crossing the county boundary at Merton. They had service reservoirs within and outside the county; and those outside supplied both inside and outside. Here, to enable a supply in bulk to be given outside, the system would have to be largely remodelled. The main supplying inside could be continued for its present use; but for the outside supply a new main would be required. The Kent Company derived their supply entirely from wells. The largest pumping-station was at Deptford; others being at Plumstead, Shortlands, Crayford, Farnborough, and Wilmington. Plumstead and Deptford were within the County of London, and all the others outside. Service reservoirs of 10,525,000 gallons were within, and others of 3,098,000 gallons were outside the County of London. In this case, the supply in bulk would be more easy. Witness had not estimated the cost of relaying these different systems, so as to enable the County of London, if it were the purchaser of the whole, to supply outside in bulk. It would mean an enormous amount of investigation, which he was not in a position to undertake. Roughly speaking, he said it would be going on for a million—certainly hundreds of thousands of pounds.

By Major-General SCOTT: He was not intimately acquainted with the system of supplying in bulk in some of the northern towns. The only difference between such towns and London, he thought, was that the London systems had not been laid out in view of the future supply to a population beyond an arbitrary line, like the county boundary; while most of the northern towns had been more or less modelled so as to supply directly outside through one, or at any rate only a few, mains.

By the CHAIRMAN: The expense of putting meters on the mains was not formidable, but when all these meters were fixed, it would be necessary

## GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1213.

| Issue.         | Share. | When ex. Dividend. | Dividend or Bonus. | NAME.                       | Closing Prices. | Rise or Fall in Wk. | Yield upon Invest. ment. | Issue.                          | Share. | When ex. Dividend. | Dividend or Bonus. | NAME.                            | Closing Prices. | Rise or Fall in Wk. | Yield upon Invest. ment. |
|----------------|--------|--------------------|--------------------|-----------------------------|-----------------|---------------------|--------------------------|---------------------------------|--------|--------------------|--------------------|----------------------------------|-----------------|---------------------|--------------------------|
| £              |        |                    | p. c.              |                             |                 |                     | £ s. d.                  | £                               |        |                    | p. c.              |                                  |                 |                     | £ s. d.                  |
| GAS COMPANIES. |        |                    |                    |                             |                 |                     |                          | GAS COMPANIES.                  |        |                    |                    |                                  |                 |                     |                          |
| 590,000        | 10     | Oct. 13            | 104                | Alliance & Dublin 10 p. c.  | 204-213         | ..                  | 4 17 8                   | 75,000                          | 5      | June 29            | 6                  | Malta & Medn., Ltd.              | 43-54           | ..                  | 5 14 3                   |
| 100,000        | 10     | "                  | 74                 | Do. 7 p. c.                 | 16-17           | ..                  | 4 8 3                    | 541,920                         | 20     | Nov. 11            | 5                  | Monte Video, Ltd.                | 13-14           | ..                  | 7 2 10                   |
| 900,000        | 100    | July 1             | 5                  | Australian 5 p. c. Db.      | 105-107         | ..                  | 4 13 6                   | 617,946                         | Stk.   | Aug. 31            | 9 1/2              | Newcastle & Gateshead Con.       | 230-240         | ..                  | 4 1 3                    |
| 200,000        | 5      | Nov. 11            | 6                  | Bombay, Ltd.                | 61-63           | ..                  | 4 2 11                   | 252,355                         | Stk.   | Jan. 3             | 3 1/2              | Do. 5 p. c. Db. Stk.             | 113-117         | ..                  | 2 19 10                  |
| 40,000         | 5      | "                  | 6                  | Do. New, £4 paid.           | 41-43           | ..                  | 5 1 1                    | 150,000                         | 5      | May 26             | 8                  | Oriental, Ltd.                   | 71-71 1/2       | ..                  | 5 3 3                    |
| 930,000        | Stk.   | Aug. 12            | 12                 | Brentford Consolidated      | 275-280         | ..                  | 4 5 9                    | 135,000                         | 5      | "                  | 8                  | Do. New, £4 10s. pd.             | 63-7            | ..                  | 5 2 11                   |
| 240,000        | "      | "                  | 11                 | Do. New                     | 210-215         | ..                  | 4 3 9                    | 15,000                          | 5      | "                  | 8                  | Do. do. 1879, £1 pd.             | 13-14           | ..                  | 4 11 5                   |
| 50,000         | "      | "                  | 5                  | Do. 5 p. c. Prf.            | 140-145         | ..                  | 3 9 0                    | 60,000                          | 5      | Sept. 29           | 7                  | Ottoman, Ltd.                    | 5-5 1/2         | ..                  | 6 6 2                    |
| 159,375        | "      | June 10            | 4                  | Do. 4 p. c. Db. Stk.        | 130-135         | ..                  | 2 19 3                   | 500,000                         | 100    | June 1             | 6                  | People's Gas & 2nd M. of Chicago | 103-108         | ..                  | 5 11 1                   |
| 220,000        | Stk.   | Sept. 15           | 11 1/2             | Brighton & Hove Orig.       | 263-268         | ..                  | 4 5 10                   | 848,070                         | 10     | Oct. 13            | 6                  | River Plate Ord.                 | 98-99           | ..                  | 6 3 1                    |
| 226,320        | "      | "                  | 8 1/2              | Do. A. Ord. Stk.            | 190-195         | ..                  | 4 7 2                    | 250,000                         | Stk.   | June 29            | 4                  | Do. 4 p. c. Db. Stk.             | 99-101          | ..                  | 3 19 3                   |
| 933,500        | Stk.   | Aug. 31            | 5                  | Bristol, 5 p. c. max.       | 125-130         | ..                  | 3 16 11                  | 250,000                         | 10     | Sept. 29           | 10                 | San Paulo, Ltd.                  | 143-154         | ..                  | 6 9 0                    |
| 420,000        | 20     | Sept. 29           | 10                 | British                     | 49-50           | ..                  | 4 0 0                    | 135,000                         | Stk.   | Sept. 15           | 10                 | Sheffield A.                     | 242-245         | ..                  | 4 1 8                    |
| 50,000         | 10     | Aug. 12            | 11 1/2             | Bromley, Ord. 10 p. c.      | 25-27           | ..                  | 4 5 2                    | 209,053                         | "      | "                  | 10                 | Do. B.                           | 242-245         | ..                  | 4 1 8                    |
| 75,000         | 10     | "                  | 8 1/2              | Do. 7 p. c.                 | 20-22           | ..                  | 3 17 3                   | 447,427                         | "      | "                  | 10                 | Do. C.                           | 242-245         | ..                  | 4 1 8                    |
| 500,000        | 10     | Oct. 13            | 6                  | Euenos Ayres (New) Ltd.     | 91-100          | ..                  | 6 0 0                    | 5,600,000                       | Stk.   | Aug. 12            | 5 1/2              | South Metrop., 4 p. c. Ord.      | 138-142         | ..                  | 3 15 1                   |
| 98,122         | Stk.   | June 29            | 4                  | Do. 4 p. c. Db. Stk.        | 98-100          | ..                  | 4 0 0                    | 1,460,000                       | Stk.   | July 14            | 3                  | Do. 3 p. c. Db. Stk.             | 102-105         | ..                  | 2 17 2                   |
| 150,000        | 20     | July 14            | 8 1/2              | Cagliari, Ltd.              | 29-30           | ..                  | 5 10 0                   | 60,000                          | Stk.   | Aug. 31            | 12                 | Tottenham and A.                 | 280-290         | ..                  | 4 2 9                    |
| 100,000        | 10     | Sept. 29           | 7                  | Cape Town & Dis., Ltd.      | 14-15           | ..                  | 4 13 4                   | 60,000                          | "      | "                  | 9                  | Edmonton B.                      | 200-210         | ..                  | 4 5 9                    |
| 50,000         | 50     | Nov. 2             | 6                  | Do. 6 p. c. 1st Mort.       | 67-69           | ..                  | 5 1 8                    | 182,380                         | 10     | June 10            | 7                  | Tuscan, Ltd.                     | 103-113         | ..                  | 6 1 9                    |
| 550,000        | Stk.   | Oct. 13            | 13 1/2             | Commercial Old Stock.       | 310-320         | ..                  | 4 4 5                    | 149,900                         | 10     | July 1             | 5                  | Do. 5 p. c. Dbs. Red.            | 100-103         | ..                  | 4 17 1                   |
| 200,750        | "      | "                  | 10 1/2             | Do. New do.                 | 247-252         | ..                  | 4 3 4                    | WATER COMPANIES.                |        |                    |                    |                                  |                 |                     |                          |
| 200,750        | "      | June 10            | 4 1/2              | Do. 4 1/2 p. c. Db. do.     | 147-152         | -1                  | 2 19 3                   | Chelsea, Ord.                   |        |                    |                    |                                  |                 |                     |                          |
| 800,000        | Stk.   | June 10            | 10 1/2             | Continental Union, Ltd.     | 205-210         | ..                  | 4 15 3                   | Do. 5 p. c. Prf.                |        |                    |                    |                                  |                 |                     |                          |
| 200,000        | "      | "                  | 7 1/2              | Do. 7 p. c. Prf.            | 190-195         | ..                  | 3 11 10                  | Do. 4 1/2 p. c. Prf. Stk., 1875 |        |                    |                    |                                  |                 |                     |                          |
| 51,600         | Stk.   | Aug. 31            | 14                 | Croydon A 10 p. c.          | 305-310         | ..                  | 4 10 4                   | Do. 4 1/2 p. c. Db. Stk.        |        |                    |                    |                                  |                 |                     |                          |
| 168,400        | "      | "                  | 11                 | Do. B 7 p. c.               | 255-265         | ..                  | 4 3 0                    | East London, Ord.               |        |                    |                    |                                  |                 |                     |                          |
| 555,000        | Stk.   | Aug. 12            | 5 1/2              | Crystal Palace Ord. 5 p. c. | 125-130         | ..                  | 4 0 9                    | Do. 4 1/2 p. c. Db. Stk.        |        |                    |                    |                                  |                 |                     |                          |
| 60,000         | "      | "                  | 5                  | Do. 5 p. c. Prf.            | 140-145         | ..                  | 3 9 0                    | Do. 3 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |
| 496,000        | 10     | July 28            | 11                 | European, Ltd.              | 23-24           | ..                  | 4 11 8                   | G'd Junction, 10 p. c. max.     |        |                    |                    |                                  |                 |                     |                          |
| 354,060        | 10     | "                  | 11                 | Do. £7 10s. paid.           | 47-48           | ..                  | 4 11 9                   | Do. 4 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |
| 5,922,230      | Stk.   | Aug. 12            | 12 1/2             | Gaslight & Coke, A. Ord.    | 282-287         | -1                  | 4 5 4                    | Do. 4 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |
| 100,000        | "      | "                  | 4                  | Do. B, 4 p. c. max.         | 120-125         | ..                  | 3 4 0                    | Do. 4 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |
| 665,000        | "      | "                  | 10                 | Do. C, D, E, 10 p. c. Prf.  | 308-313         | ..                  | 3 3 11                   | Do. 4 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |
| 30,000         | "      | "                  | 5 1/2              | Do. F, 5 p. c. Prf.         | 152-157         | ..                  | 3 3 8                    | Do. 4 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |
| 60,000         | "      | "                  | 7 1/2              | Do. G, 7 1/2 p. c. do.      | 233-238         | ..                  | 3 3 0                    | Do. 4 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |
| 1,300,000      | "      | "                  | 7                  | Do. H, 7 p. c. max.         | 195-200         | ..                  | 8 10 0                   | Do. 4 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |
| 463,000        | "      | "                  | 10                 | Do. J, 10 p. c. Prf.        | 308-313         | ..                  | 3 3 11                   | Do. 4 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |
| 476,000        | "      | "                  | 6                  | Do. K, 6 p. c. Prf.         | 183-190         | ..                  | 3 3 2                    | Do. 4 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |
| 1,061,150      | "      | June 10            | 4                  | Do. 4 p. c. Db. Stk.        | 131-133         | ..                  | 3 0 2                    | Do. 4 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |
| 294,850        | "      | "                  | 4 1/2              | Do. 4 1/2 p. c. do.         | 148-153         | ..                  | 2 18 10                  | Do. 4 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |
| 958,000        | "      | "                  | 6                  | Do. 6 p. c. do.             | 195-200         | ..                  | 3 0 0                    | Do. 4 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |
| 70,000         | 10     | Nov. 11            | 8                  | Hongkong & China, Ltd.      | 13-14           | ..                  | 5 14 4                   | Do. 4 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |
| 3,800,000      | Stk.   | "                  | 10                 | Imperial Continental        | 220-225 1/2     | +3                  | 4 11 3                   | Do. 4 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |
| 376,490        | 100    | Aug. 2             | 4                  | Do. 4 p. c. Dbs. Red.       | 98-101          | ..                  | 3 8 13                   | Do. 4 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |
| 473,600        | Stk.   | Aug. 12            | 5 1/2              | Do. 5 p. c. Db. Stk.        | 102-105         | ..                  | 3 6 8                    | Do. 4 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |
| 560,000        | 100    | Oct. 1             | 5                  | Met. of Mel. 5 p. c. Db.    | 110-112         | ..                  | 4 9 3                    | Do. 4 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |
| 250,000        | 100    | "                  | 4 1/2              | bourne 4 1/2 p. c. Db.      | 105-107         | ..                  | 4 4 1                    | Do. 4 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |
| Exdiv.         |        |                    |                    |                             |                 |                     |                          | Do. 4 p. c. Db. Stk.            |        |                    |                    |                                  |                 |                     |                          |

Next dividend will be at this rate.



to enlarge the mains. Meters meant an obstruction, and had to be watched. They increased the liability to error; and no engineer liked to have many on his system. There was another plan which had been discussed—viz., the severing not only of the system of distribution, but of the sources of supply between London and the outside counties. He had considered this question as regards the severance between the County of London and Surrey. He understood the proposal to be that Surrey should receive from London their present supply, *plus* 20 per cent.—a total of 8 million gallons a day—and that they were to look for no more water from the same source. This seemed to him to make the whole idea impracticable, because the source of supply was in Surrey, and either Surrey should have the means of supplying itself, or should expect to get its whole supply from London, and not be limited to 8 million gallons daily. The idea apparently was to hand over to Surrey part of the subsiding reservoir capacity of the Lambeth Company, with pumping power sufficient to fill these reservoirs from the Thames. The reservoirs, two in number, had a combined capacity of 125 million gallons, and there were four engines of 190-horse power collectively for pumping into them. There were also two trunk mains leading from the subsiding reservoirs at Molesey to Seething Wells—one a 54-inch brick culvert, and the other a 36-inch cast-iron pipe. It was proposed to hand over to Surrey part of the pumping machinery and a portion of the mains. The two reservoirs at Molesey had a wall between them, and could perhaps be divided; but it would be difficult. It would be more difficult to separate the engines, which were in the same house, and hand over one set to Surrey and keep the others; and still more difficult to separate the boiler power. Either the main or the culvert would have to be given to Surrey, so that each county would then only have one main and no stand-by. Practically this would involve, therefore, the laying of two new mains as stand-bys. The division of the filters would be even harder than the division of the reservoirs, besides which they would have the two sets of workmen side by side, who might not agree. The filters, which were merely separated by a wall along which the men walked, could not be fenced off from one another. Witness went on to describe in detail the means which would be adopted to distribute the water; showing how Surrey would have to pump the water allotted it by London from Seething Wells into London, and then out again, and, under present circumstances, giving supplies on the way to London, unless a fresh main were laid for the purpose. In the result, the Surrey County Council, to get their 8 million gallons, would have to purchase one of the subsiding reservoirs at Molesey; engines at five different stations with an aggregate horsepower of 653, although the total they required would be about 250; subsiding reservoirs at three stations with an aggregate capacity of about 100 million gallons; filter-beds at two stations with an area of about 8 acres, though about 6 acres would be sufficient; and service reservoirs at four stations with an aggregate capacity of 14½ million gallons, or 2½ million gallons more than their needs. They would necessarily have to come into London for two service reservoirs, and they would have to purchase mains very much larger than they required—33½ miles of main outside London, and 18 miles inside. The miles of main in the County of London would have to be duplicated by somebody in almost every case.

Witness considered the scheme he had just detailed as very roundabout; and he should have thought it would have been preferable to have purchased out and out an intake at Molesey, and laid another main. He was opposed to any scheme of severance. It would in any event increase the cost of management and maintenance, and consequently the cost of the water; and would cause complications with the independent Suburban Companies regarding the division of further available supplies. He disapproved of counties being Water Authorities; a Watershed Authority was much more to the point than a County Authority. All the districts in the same watershed should be amalgamated into one supply.

The CHAIRMAN: If there is severance, you could never get help from one county to another, could you?

Witness: No.

Mr. BALFOUR BROWNE pointed out that under the Public Health Act the Local Authorities had a right to supply their neighbours in bulk, if they liked.

Witness (continuing) said the idea with regard to the proposal to sever Middlesex and London was that the authorized works of the New River Company at Kempton Park, including two subsiding reservoirs to contain 219 million gallons, 12 filter-beds for a daily supply of 11½ million gallons or more, pumping machinery and a main to supply at least the same quantity of water to a service reservoir 110 feet higher at Cricklewood, and another reservoir at Fortis Green 260 feet above the Kempton Park works, should be used for Middlesex. These works were to be supplied from the Staines reservoirs by the large aqueduct now in course of construction, which would be the property of the London County Council. Thus Middlesex would have to take its water in bulk from London; there being no intake at present that could be handed over to them. To give Middlesex means of getting water direct from the Thames, would entail the abandonment of other mains and supplies, at present in full use, and waste of pumping and distributing power. The scheme of going to Wales, to which witness was entirely opposed, was another incident which might be regarded as connected with a possible scheme of purchase. The Companies' mains were not adapted to receive a supply from outside, except in the same manner as at present. Water derived from Wales could not serve the whole of London by gravitation. Only about 89 per cent. of the capacity of the existing service reservoirs north of the Thames could be supplied from Elstree by gravitation. The mains of the Companies radiated from pumping-stations and had a tendency to be broken up into smaller ones, with varying pressures at different levels. These mains, therefore, were ill adapted to receive a supply from outside inwards. To connect the Welsh supply with these mains would be very difficult. The mains from Elstree would thus have to be connected with the service reservoirs of the Companies. If the Welsh water were only to be used to supplement the Thames supply, there would be no abandoning of pumping or filtering area in connection with the London Companies. He believed the Thames basin was capable of yielding more than 300 million gallons daily; and an instalment, beyond the present authorized draft of 185½ million gallons, of 214½ million gallons (making 400 million gallons), would cost less than the Welsh water. The capital cost of applying the Staines reservoirs condition

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fully to the 185½ million gallons (under the circumstances of 1893), would be £1,311,900. This figure included the cost of reservoirs, aqueducts, and other works, but not pumping. The capacity of the reservoirs this would involve would be 4373 million gallons, beyond the existing capacity of 866 million gallons—a total of 5239 million gallons. The cost he put at £300 per million gallons, which was based on actual contracts, but this figure of £300 would decrease in future. It included nothing for the New River conduit from Kempton Park, the expense of which was part of the cost of distributing. Witness put in a table (intended to compare with a similar one put in by Sir A. Binnie) showing the cost of supplying 185½ million gallons daily from the Thames. The total storage required he put at 5239 million gallons—allowing nothing for cleansing, and 476 million gallons for bottom water and evaporation. As 866 million gallons storage already existed, 4373 million gallons would have to be provided, which, at £300 per million gallons, would equal £1,311,900. To pump into the reservoirs 4431 million gallons (average for sixteen years), at 7s. 6d. per million gallons, equalled £1661 12s., which for sixteen years came to £26,586. The cost of pumping to supply a quantity increasing from *nil* to 55½ million gallons per day during sixteen years, at £2 4s. per million gallons, equalled £320,178. These three figures, plus £181,980 for pumping machinery for distribution, made a total of £1,840,644. If the pumping charges were capitalized at 30 years' purchase, a sum of £307,524 should be added—increasing the total to £2,148,168. This had been done by Sir A. Binnie; but witness did not concur. This figure compared with £4,705,185, the amount of Sir A. Binnie's estimate. The above "average for sixteen years" referred to the sixteen years' experience derived from Thames gaugings.

The Commission adjourned.

The thirty-seventh sitting of the Commission was held yesterday, at the Guildhall, Westminster—Viscount Llandaff presiding. Mr. Reginald E. Middleton, who was under examination when the Commission adjourned at the previous sitting, was further questioned with regard to his estimates for procuring additional supplies of water from the Thames.

#### THE DERWENT WATER SCHEME OF THE LEICESTER CORPORATION.

A Special Meeting of the Leicester Town Council was held last Tuesday—the Mayor (Alderman Clifton) presiding—to consider the recommendation of the Water Committee that the Council should promote a Bill in Parliament to obtain a water supply from the Derwent Valley.

Alderman Wood, in proposing the adoption of the recommendation, showed the necessity for procuring an additional supply of water for the borough. He then proceeded to refer to the satisfactory character of the reports the Committee had received regarding the Derwent water; and, alluding to the competing schemes, he expressed the belief that before

the proposed Bill left the Parliamentary Committee room, an arrangement would have been arrived at with Derby. After describing the works designed by their Engineer (Mr. J. B. Everard), Alderman Wood said it was estimated that the cost of conveying 12 million gallons of water to Leicester, including the new reservoir and filter-beds in the Derwent Valley, would be £1,520,000. This sum included everything that would have to be provided for, with the exception of the workmen's dwellings. That it was a reasonable estimate, he thought the testimony of Mr. G. F. Deacon and Mr. R. E. Middleton showed; and he knew as a matter of fact that they were both of opinion that Mr. Everard had made a most liberal allowance, and that he would have been justified in stating a smaller sum. They proposed to take powers to fund the profits of the water undertaking from next year until the completion of the first section of the works. The net profit from the water undertaking for this year was a little over £7000; and it was estimated that by the year 1909 they would have accumulated in profits £178,515. It was intended to make up any deficiency that might occur on interest and sinking fund charges beyond the profit they acquired from the water undertaking in any one year. This fund would prevent them coming upon the rates till 1922; and they would have water to dispose of. Derby, no doubt, would come into this scheme. If Derby and Leicester did not work together in this matter, they could depend upon it that there would be a condition imposed upon them that they should give Derby water. If that condition existed, they would be paid for the water, and would derive a revenue from Derby and Derbyshire of no less than £14,846 a year. But the Committee were not relying on this, and had made their calculations to provide for the burden if they should have to bear it all themselves. In that case they would not have to come on the rates till 1922, and then only for a sum of about £30,000, which, it was estimated, a 5d. rate would produce. They felt that, as far as the rates were concerned, it was not a matter they need take seriously into account.

The speakers who followed were harmonious in supporting the scheme; and, on the vote being taken, every member voted in favour, except Mr. Billings, who remained neutral.

The statutory meeting of owners and ratepayers to consider the Bill was held on Friday; and consent was given to its promotion by a virtually unanimous vote.

**Exhibition of the Kitson Gas-Light at Ripon.**—According to the "Leeds Mercury," a special meeting of the members of the Ripon Corporation was called by the Mayor for last Wednesday evening to inspect the Kitson Gas-Light, which was shown for the first time in this country by the inventor, Mr. Arthur Kitson, of Philadelphia, son of Mr. Kitson, of Ripon. The basis of his discovery is lighting and heating with kerosene oil, by which it is claimed "the most brilliant artificial light ever produced can be obtained." The cost is said to be one-third that of incandescent lighting, and half that of ordinary gas. Mr. Kitson's process was described in the "JOURNAL" early in 1894 (Vol. LXIII., p. 110). The light is promoted in America by the Kitson Hydrocarbon Heating and Incandescent Company.

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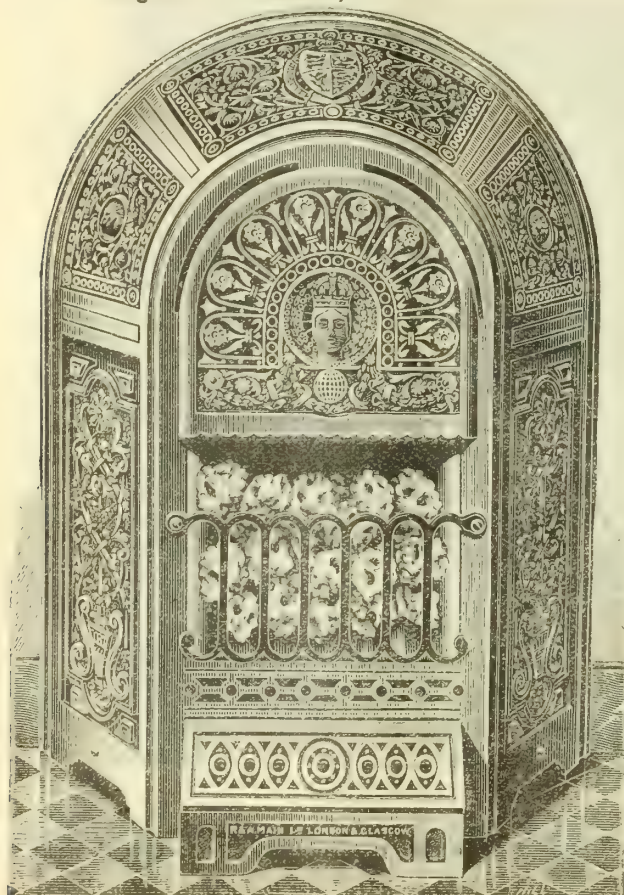
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## EDITORIAL NOTES.

## The Rossendale Assessment Appeal—An Approximate Rule of Valuation.

AN important assessment appeal case has just been disposed of by the Court of Quarter Sessions sitting at Preston, as reported in another column. The appellants were the Rossendale Union Gas Company; and the Court was composed of Mr. W. H. Worsley Taylor, Q.C., Chairman, and six other Magistrates. The respondents had to support a supplemental valuation of last April amounting to £7477; this being an increase of £1118 on the previous valuation based on the Company's accounts for 1887. It was argued that the property had become more valuable in the interval—a general proposition not to be gainsaid. There was, however, the usual difference of opinion on the point of the hypothetical tenant's requirements and allowances in the circumstances. Counsel fenced a little over the customary  $17\frac{1}{2}$  per cent. interest on the tenant's capital, which is surely superfluous at this time of day. The respondents had taken thought, and even improved upon the appraisement appealed from. How differently the same data may be handled by opposing interests appears in the valuations made by Mr. John Cross and Mr. Thomas Newbigging. The whole proceedings are a valuable lesson in the difficult art of which these gentlemen and the other expert witnesses called are acknowledged masters. A short way of expressing the fact is to say that the net rateable value consented to in 1888 was an amount equal to one-half of the net receipts of the Company for the year; and this is approximately the same ratio of valuation now confirmed by the Court. For the Company's appeal was dismissed, with costs to follow the decision arrived at. It would never do, of course, to accept without reserve the proposition that the rateable value of every gas undertaking is just half the balance of receipts over expenditure. But this is very nearly what the valuation has come to in the Rossendale example, after much head-shaking over such considerations as the charge for meter-taps and the fixing thereof. Is a main-cock part of the service-pipe or part of the meter? Incidentally, we should say that it is certainly a movable fitting, inasmuch as when the supply is permanently cut off from a house, the service is capped. To argue otherwise, because for the sake of convenience the Company leave the main-cock when there is a reasonable prospect of the supply being renewed, is to strain a voluntary act into a law, which is absurd. It may not be strict assessment practice to bye-pass all these details, so far as the monetary aspect of them is concerned, and get at the net rateable value by the short way already indicated; but the handy rule is at least useful for gas engineers to work by in "cubing up" their undertakings.

## The Questions of Professional Etiquette and of Expert Evidence.

AT the opening meeting for the "season of the Surveyors' Institute, the President (Mr. Robert Vigers) delivered an Inaugural Address which contained several points of much interest for professional men in general. In the speaker's profession, as in every other, there are men "who are in such haste to get business and extend their professional connection, that they are not over-fastidious as to the means they employ to achieve the end in view." This is a cry that resounds throughout the ages. The tout, the sycophant, the under-seller, the unfair rival in trade, has always existed; and it is pretty safe to say always will. "Some of these persons (such is their eagerness) openly advertise, and tout for the business which does not come to them as the natural reward of skill and knowledge; while some, even less to be admired, strive in various specious ways to discover and appropriate the connections of others." Too true; and there are those who, greatly daring, venture to question the utility of such organizations as the Surveyors' Institute and the Institution of Civil Engineers, when such notorious evils are allowed to pass unchecked by these bodies. Mr. Vigers justly observed that it is the first duty of members of an honourable profession to do everything in their power to discourage and defeat these practices. Offences of the kind, he went on to say, are generally (not always) committed by young men, who, as often as not, err through ignorance. To these the President would say that a stable business is rarely, if ever, built upon such foundations; and even in the few exceptional cases where this occurs, the result is achieved at an immense sacrifice of reputation and of



that self-respect which goes so far to brace and encourage a man in the troubles and vicissitudes of life. This is doubtless true; but all experience shows that men's interpretation of what is due to self-respect is a very shifting quantity. Many professional men, who might be suspected of honesty by those who have had no dealings with them, will do things "in the way of business" that would make a costermonger blush. These men are really no better than blackmailers; but they carry on their depredations shamelessly, knowing that it will be worth nobody's while to expose them, and burying their conscience in their bank balance. On the other hand, there is much excuse for the young expert, who sees the valuable appointments in his profession monopolized by men who are mere figureheads. How is he to break down the wall of privilege that appears to surround certain ponderous practitioners, who seem to be "in everything," while he cannot get an opening for showing how much more he knows about it?

Mr. Vigers went on to speak about the divergencies of expert evidence, particularly with regard to valuations, which are often made the butt of "foolish and unjust" jesters. His observations upon this subject were instinct with dignity. "He was free to admit that there was an 'occasional extravagance of the kind in one direction or another'—ahem! He hastened to point out that, as a matter of fact, it frequently happens that the difference between extreme valuations on the same side are just as great as between extreme valuations on the two sides. Does this mean that the whole business of valuation is guess-work? By no means. It is largely influenced by the 'personal equation'—that is all. Besides, the art of valuation is not an exact science, and will never be made so. It rests not only on fact, but also on opinion, 'and, 'what was more, on opinion founded to a large extent 'upon varying personal experience and an estimate of 'probabilities and contingencies, which might or might 'not arise, but which, if they did arise, largely influenced 'the result.' This is what makes a valuation so charmingly uncertain. Mr. Vigers very reasonably objected to the putting of expert witnesses on oath. He would much rather see the expert put up as a technical advocate for his own side, to stand his ground as well as he could against the attack of the other party. Nobody expects Counsel to speak "the truth, the whole truth, and 'nothing but the truth.'" Why should the disinterested expert be laid under any other obligation beyond that of expressing his honest opinion, for what it may be worth? How can any man swear that his own opinion of any matter of dispute is absolutely true? There is much to be said for Mr. Vigers's way of regarding expert evidence as being of necessity largely speculative, and consequently not fairly coming within the scope of the oath that may be rightly taken by a witness of fact.

#### London Municipal Reform.

It is a very great pity that Party politics so hopelessly divide the worthy gentlemen who, by their interest in, and devotion to, the arduous cause of London self-government, shame the heedless bulk of the Metropolitan population, who care for none of these things. The result of this division is that outside the London County Council the opposing Parties of this body still find themselves banded into conflicting voluntary organizations, committed to absolutely contrary ways of dealing with the problems of Metropolitan administration. One Party—so-called Progressives—appear to aim at getting all executive power in everything into the hands of the London County Council. The other Party—called "Moderates"—have "posted 'themselves,' as the French say, on the side of further devolution of powers to the more decentralized local governing bodies which actually do in London the work of municipal authorities. The voluntary organization identified with the Moderate Party in Metropolitan politics is the London Municipal Society, which held its fifth annual meeting last week, under the presidency of Lord Farquhar. We have nothing to do here with the Party politics of the members of this or any other association; but with the prospects of Municipalism in London we certainly are very much concerned. It cannot be truly said that the present order of Metropolitan government is satisfactory. The attitude of the chief administrative body—the London County Council—towards the great private Corporations which have hitherto supplied the Metropolis with the most important and necessary public services, is

not such as to encourage these interests to wish for a large extension of the powers of the Council. On the other hand, the local government authorities among whom the Metropolitan area is subdivided are not in general equal in dignity, repute, and efficiency to the enormous responsibilities of their position. It is impossible, as it would be ungrateful to the worthy men who do the work, to deny that, on the whole, London is the best-governed city of anything like its own class in the world. We English are prone to abuse our own Government; and we are always complaining of the shortcomings of our town administrations—especially the Metropolitan. But still we know all the time that, for honest and fair government, healthiness, good services of all kinds, cheapness and convenience for living and working, there is no capital city like London.

But, of course, we should not be Englishmen if we were satisfied to leave well alone. It is therefore understood that something must be done to improve the government of London. To the question of how this is to be done, there are conflicting replies. So far as can be gathered from published utterances, the Progressive remedy for all complaints is stereotyped in the formula, "Leave everything 'to the London County Council!'" This short and easy way, however, fails to commend itself to the general public. With all its good intentions, the County Council has unhappily received a bias in a particular direction which often causes grief to its own well-wishers. It cannot be trusted to do the sensible, straight, and prudent thing where so-called "popular" interests, even though patently factitious, are in question. It will bow to the clamour of costermongers with votes, when it will try to ride rough-shod over a Water Company with only law and justice on their side. And so long as the London County Council continues to lie under this suspicion, so long will there be extant a strong reluctance to entrust it with greater powers. Besides, there are limits to the capacity and time even of a Progressive London County Councillor; and, not to labour the point, it is felt that, as the good work done by municipal bodies in England is a natural product of the local patriotism and local interest of their members, so, if London is to exhibit the same spectacle of sound, adequate municipal work, the same conditions must be applied. The local administrations should be in the hands, not of clever "carpet-baggers" from the Temple and Fleet Street, nor wholly in those of enterprising local builders, auctioneers, and small shopkeepers, but be manned by a truly representative selection of all worthy orders in the community.

It is reported to be the intention of the Government to introduce in the ensuing session of Parliament a measure for elevating the District Local Authorities of the Metropolis to the rank of Municipalities, with Mayors and Corporations to take the place of the existing Vestries. It will be objected by the Progressives that this is the wrong way to attack the difficulty of dignifying Metropolitan politics; but the point is debateable. Whatever is done in the matter, it will be impossible to give to London a homogeneous municipal government like that, say, of Glasgow. The water supply, the gas, the electric lighting—all these, and many more public services, will remain outside the scope of the London Municipalities. But these bodies will have much to do, all the same; and there will be work upon them for the best intellects and highest characters to be found among the resident inhabitants of the neighbourhoods involved in this important scheme of reform.

#### The Character of the Liverpool Gas Supply.

WHEN the cobbler sticks to his last, he is a shining light in a world full of people overmuch given to meddling with things which they do not understand; but when the worthy tradesman undertakes to settle the affairs of the universe from his own stool, he, too, becomes a futility. Mr. Oliver J. Lodge, whose work in various departments of physical science has made his name known far and wide, would be one of the last men to talk at large and in vague language about the points of one of his own specialities as inquirer or teacher. Yet writing as a Liverpool householder, "with 'an amateur's knowledge of chemistry,'" Mr. Lodge informs the readers of a Liverpool newspaper that the city is being supplied with "adulterated coal gas." He then proceeds to traduce the character of the "stuff from Garston," without, however, offering anything besides his own opinion to prove that the commodity is deserving of condemnation



He admits that the Liverpool gas supply "is carburetted" so as to be reasonably luminous; but he declares that "it gives a poor light unless burners specially adapted to" it are employed. It clogs ordinary burners; it is not so "good as natural coal gas for gas-fires; and whenever "it escapes unburnt it is poisonous." Mr. Lodge must perceive that no question of chemistry is raised by this indictment. With the exception of the last point, which must be dealt with separately, all these allegations are matters susceptible of experimental physical demonstration. What special burners are now required to consume Liverpool gas? Where are the ordinary burners clogged by this gas? How and where has it failed the users of gas-fires? Mr. Lodge may take our assurance that these are questions which gas engineers would like to have resolved for their guidance. In default of evidence, such complaints amount to no more than the familiar grumble that "the gas is bad," which nobody takes into serious consideration. With regard to the "poisonous" quality of the unburnt gas, this is a consideration that has no natural connection with the behaviour of the same gas when burnt. No intelligent person needs to be told that carbonic oxide gas is a good deal worse to breathe than "bad air;" but do Liverpool people habitually use their gas supply for this purpose? The Liverpool Gas Company have what they regard as good and sufficient reasons for fulfilling their statutory obligations in the manner actually adopted. If they were an electric lighting company, they would probably exercise their own discretion, in a similar spirit, as to the voltage of the current sent into their distributing mains. Would Mr. Lodge argue that a supply company should have no discretion of the kind? The concern of the public with the contents of the Gas Company's pipes is of the same character as their interest in the condition of an electric conductor—at least, it is so for the purpose of the present argument.

#### Mr. Richmond's "Slot Cooker" Articles.

WE complete to-day the series of articles on "Slot Cookers" and "All About Them," which Mr. E. W. T. Richmond has during the past few weeks contributed to our columns; and we think those who have perused them will acknowledge that they have furnished matter of very considerable interest. When, four years ago, Mr. Nasmith told us that the coin-in-the-slot system was the invention of Hero of Alexandria, the question put by the Preacher of old: "Is there anything whereof it may be said, See, this is new?" came at once into one's mind. And we now learn with respect to this so-called modern production, that "it hath been already of old time." Mr. Richmond has shown us that an arrangement of the kind was in use in the Eastern temples many years (even centuries) before Hero. But he has also shown—and this is of much more importance to our readers—how wonderfully the automatic system of supply has extended the use of gas. We have seen how, by its aid, the cleanliest of all fuels has found wider application in the houses of the lower middle classes, and made its way into the humbler dwellings of the artisan and the toiler—lightening the labour of the housewife, and adding to the comfort of those under her care. Whoever may be called upon to write the history of the gas industry during the eventful century now fast drawing to its close, will be an unfaithful historian if the important development which has been here dealt with does not receive full justice; and we venture to think that when he reaches this stage of his work he will find much useful material ready to his hand in the articles now concluded.

#### Further Correspondence on the Smoke Nuisance.

LAST week's contributions to "The Times" correspondence on the smoke nuisance do not advance the solution of the practical problem. Mr. R. Reynolds writes from Leeds to give the results of ten years' sunshine observations carried on in the city and one of its suburbs under the auspices of the Leeds Philosophical and Literary Society. Since 1887, the Society has kept a photographic record of the daily amount of sunshine at three stations. From this it appears that the recorded sunshine in Central Leeds averaged over the period named 26.7 per cent. less than the amount registered at Adel, some four miles away, and 330 feet higher. On Sundays, the relative deficiency was only 16.8 per cent.—"Here is a new reason for naming the "first day of the week Sunday!" The question of what to do with domestic smoke naturally arises out of these

statistics. What have the Leeds Corporation Gas Department been doing to help in keeping down the smokiness of their city atmosphere? Another correspondent of "The Times" flatly says that there will be no hope for any town outside the adoption of anthracite fuel for domestic heating purposes. He is a coalowner, and ships "hundreds" of thousands of tons yearly to foreign countries; the "anthracite, prepared for domestic use, being bought" chiefly for large Continental cities, notably Paris and "Berlin." Good business! Doubtless the writer is correct in stating that smoke prevention is a question of the use of smokeless fuel; but how is this to be brought about, save by the slow, patient application of gas to the purpose? One has heard all about anthracite before; but, for very obvious reasons, it has never been taken to kindly by the householders of any part of the country out South Wales.

#### The Workmen's Compensation Act—Quick Adjudication.

THOSE all-important "prepositions" of the Workmen's Compensation Act are certain to give a good deal of trouble yet, before all their possible bearings are legally defined. The Appeal Court has had to deal with the instructive case in which a builder's carman suffered from an accident that happened in the street outside his employers' premises. We last mentioned this case in the "JOURNAL" for the 8th ult., and already we have to record the astounding fact that the matter has gone to the Appeal Court, been decided, and everything settled in less than a month! Why, the professional jokers will have to leave off poking their fun at the law's delays, if this pace is kept up. Already it appears that ordinary litigants are beginning to complain of their business being pushed aside for these new appeal cases under the Workmen's Compensation Act; but it is more to the point to cite this procedure as a shining example of what that "Old Father Antic, the Law," can do if he likes. The whole drift of the Workmen's Compensation Act was meant to disestablish the lawyers from their usurped right of delaying and complicating all litigation for the sake of piling up costs. Of course, the respectable family or commercial practitioner would swear that such a thing was never done in his office; but everybody who has ever had the ill-fortune "to sue or be sued" knows how it is. The Workmen's Compensation Act, with its attendant rules, has changed all this. If the parties can agree at first hand, well and good. If not, the County Court will "see fair" in the shortest possible time. Is anybody still dissatisfied? The Appeal Court is "over the way," so to speak; and Mr. Justice A. L. Smith will define the law "while you wait." In the case in point, the only question was as to the meaning of the word "about," in connection with a factory. A cart standing in the street outside the gate is clearly neither on nor in the factory, but is "about" it. How far the term might be held to extend—what is its range, that is to say—was not the question. It is not the way of English law to lay down general definitions. Sufficient for the tribunal are the facts of the case. As we have already remarked, factory owners may as well reconcile themselves to the conclusion that these statutory prepositions go a very long way.

#### THE "ROBERT HUNTER FUND."

##### FOURTH LIST OF CONTRIBUTIONS.

WE acknowledge below the contributions to hand for this fund up to yesterday; making a total of £235 17s.

| Amount already acknowledged                | £190 3 0 |
|--------------------------------------------|----------|
| A Friend, per H. V.                        | 1 1 0    |
| Batt, Mr. William, Eccles                  | 1 1 0    |
| Colson, Mr. Alfred, Leicester              | 2 2 0    |
| Dougall, Mr. Andrew, Tunbridge Wells       | 2 2 0    |
| Green, Mr. Benjamin, Mitcham               | 1 1 0    |
| Harman, Mr. Edward A., Huddersfield        | 1 1 0    |
| Hepworth, Mr. Joseph, Edinburgh            | 2 2 0    |
| King, Mr. William, Liverpool               | 1 1 0    |
| Llewellyn Jones and T. B. Younger, Messrs. | 1 1 0    |
| "Mack"                                     | 2 2 0    |
| Mackay, Mr. Alex., Edinburgh               | 10 10 0  |
| M'Gilchrist, Mr. James, Dumbarton          | 1 1 0    |
| North, Mr. Fred J., Stourbridge            | 1 1 0    |
| Pye, Mr. James, Chester                    | 2 2 0    |
| Scott, Mr. J. W., Newton Heath, Manchester | 1 1 0    |
| Smith, Mr. B. W., Smethwick                | 1 1 0    |
| S. R.                                      | 1 1 0    |
| Valon, Mr. W. A., Ramsgate                 | 3 3 0    |
| X.Y.Z.                                     | 10 0 0   |

£235 17 0



## WATER AND SANITARY AFFAIRS.

VISCOUNT L. LANDAUF last week expressed his surprise at hearing from Mr. Reginald Middleton, when the latter was giving evidence before the Royal Commission, that the proposed supply of Welsh water would require to be filtered. He thought it was to be "pure nectar;" and he was asking whether it would not be cheaper to get pure and good water from Wales by gravitation than to take flood water from the Thames that would have to be pumped and filtered. That Welsh water required filtration was a fact previously unknown to the Chairman of the Commission. But if the Parliamentary Notice for the County Council Bill on the subject is put in as evidence, it will be seen that the projected works include filter-beds near Edgware and Hendon, in the county of Middlesex. The vision of "pure nectar" thus vanishes. In respect to the quantity of water available from present sources of supply, Mr. Middleton went far beyond the calculation of Lord Balfour's Commission. The report of 1893 reckoned on a daily supply of 300 million gallons from the Thames, 52½ millions from the Lea, 40 millions from wells and springs in the chalk of the Lea Valley, and 27½ millions from wells in the chalk area in the district of the Kent Company; making a total of 420 million gallons per day. Mr. Middleton raises the Thames supply to 400 million gallons per day, and brings in a supply of 123 million gallons from "other wells in Kent," besides 2 million gallons from the Southwark and Vauxhall well. Adopting the same figures as the Balfour Commission in respect to the Lea, the wells in the Lea Valley, and wells in the Kent Company's district, he gets a total of 645 million gallons per day in place of the 420 million gallons in Lord Balfour's report. But the calculation does not end at this point, for Mr. Middleton reckons on a further supply of 190 million gallons from wells sunk in the chalk. This last item may be supposed to have reference to the opinion expressed by the Balfour Commission that a large supply of water might be obtained from the chalk area east of the Kent Company's district, in the basin of the Medway, and in the district farther east. Thus Mr. Middleton obtains his total of 835 million gallons per day, or within a trifle of twice the quantity reckoned upon in the former inquiry. In this way a population exceeding 20 millions would be provided for, in place of the 12 millions mentioned in the Balfour report. As the latter number was supposed to represent the utmost population of Greater London in the year 1931, the larger number of 20 millions will, of course, carry the period on to a yet remoter date. Mr. Middleton might very well say that there was enough water in the Thames watershed to supply 18 millions of people. If no margin is allowed, the total quantity of 835 million gallons per day, at 35 gallons per head, is equal to a population of more than 23 millions. In respect to cost, Mr. Middleton expressed his belief that the Welsh scheme would result in a deficit up as far as the year 1948. He estimated that by the time the Welsh supply equalled 215 million gallons per day, it would cost fully £33,000,000. For 123½ million gallons per day it would cost about £21,000,000; while the Thames storage reservoirs would furnish the same at a cost of little more than £6,600,000, including £1,155,000 for additional mains. No doubt Mr. Middleton's figures will be fiercely attacked; but there is every reason to believe that he knows what he is talking about.

Further light is thrown upon this subject by Lord Onslow's address to the members of the Junior Constitutional Club last Thursday night. His Lordship grieved very much to find many of his friends on the County Council sharing in a panic owing to the state of affairs in East London, and consenting to the introduction of the Purchase Bill with its unjust arbitration clause. But he believed Parliament would insist upon waiting for the report of the Royal Commission before giving its vote on the second reading. As for the settlement of the water question, he avowed his conviction that it could only be disposed of by the acquisition, by some public authority, of the undertakings of the Water Companies. Then followed the question as to the cost; and on this point Lord Onslow presented some formidable figures. He quoted various estimates, and finally took a medium price—that of £35,000,000—though he remarked that the Stock Exchange value was about £39,000,000. But, at the medium rate, the annual charge, after duly providing for a

sinking fund, would be £1,167,000. The present income of the Water Companies he took at £990,000. We may observe that this is under the mark. But here there at once appeared to be a heavy drawback, supposing Lord Onslow to be correct in saying that it would be obligatory on any public authority to bring down the charge for the supply to the level of the lowest rate which was now paid. On the top of all this there would come an expenditure of £16,500,000 in order to bring a supply from Wales. In this particular Lord Onslow might very properly raise his estimate, if we are to judge by the standards of Manchester, Liverpool, and Birmingham. But taking even this insufficient amount, the total annual charge becomes £1,717,000; leaving London to bear a loss of £727,000 per annum—equal to a rate of nearly 5d. in the pound. Considering what will be sacrificed by bringing down the charge to the consumer to the lowest level, it will be seen that the burden on the general rate will be more likely to exceed 5d. in the pound than to fall below it. As for the authority that should possess the supply, Lord Onslow did not consider it wise to entrust the administration of one of the first necessities of life "to a body which was swayed entirely by political considerations." One awkward question remains. Supposing a Trust to be created, are we sure that it would be any better than the County Council? Does the London ratepayer think it worth while to pay an extra 5d. in the pound in order to oust the Water Companies and make a doubtful experiment?

Last week we gave a list of the Water Bills to be promoted in Parliament in the coming session. Among them were five from the London County Council; the Welsh project being split into two Bills—one for the construction of reservoirs in Wales, and the other for an aqueduct to London with the necessary terminal works. A third Bill provides for the purchase of the London Water Companies; and a fourth for the raising of the money required to carry out the different proposals. The fifth Bill is, strictly speaking, only indirectly connected with the water question; being a General Powers Bill relating to a variety of subjects, but including clauses affecting the Lea Conservancy and the New River and East London Water Companies. Concerning the Welsh project, it appears that the Parliamentary Committee of the Council are behind time with the plans and books of reference required in connection with the Aqueducts Bill, and will have to apply for a suspension of the Standing Orders. The application is to be made in due course; and the belated work is being proceeded with as rapidly as possible. The two Bills to be brought forward by the East London Company, as well as that by the West Middlesex Company, and the intercommunication Bill of the eight Companies, provide for carrying on the present water supply in an efficient manner. We may here allude to the fact that yesterday the constant supply was resumed in a great part of the East London district, and will shortly cover the whole area.

With respect to the Bills of which notice has been given relative to the Provincial Water Supply, it will be observed that the River Derwent and its tributaries are rendered somewhat conspicuous. The Corporation of Leicester have an extensive scheme for the construction of storage reservoirs and other works; and seek authority to appropriate the waters of the Rivers Derwent and Ashop, and all their tributary streams above a certain point. The creation of a Joint Board is intended, composed of the Corporations of Leicester and Derby. The Corporation of Derby, on their part, give notice of a Bill enabling them to carry out a scheme of water supply from the Derwent, in conjunction with other Corporations, as well as with County Councils and Local Authorities or bodies. The Derbyshire County Council are prominent in the Bill. But Sheffield comes into the field with a Bill of its own, proposing to take water from the Derwent and Ashop Rivers, and threatens opposition to the Leicester and Derby Bills. A Joint Committee is to be formed, to consist of members of the Rotherham and Doncaster Corporations; but the water-works are to constitute part of the undertaking of the Sheffield Corporation. In reference to a very different watershed, we find the Bill of the South Hants Water Company proposing to extend the limits of supply, so as to include a goodly number of places in the county of Southampton. But the Bill is specially remarkable as resembling that of the East London Company, by seeking to make it compulsory on owners of property to provide



cisterns—the Company prescribing the size, and making regulations respecting these appliances. Many of the Water Bills are locally important, though not presenting an aspect of magnitude. But, taken in the aggregate, the water supply of the country is undergoing, from year to year, an extraordinary development.

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1312.)

BUSINESS on the Stock Exchange last week was certainly more active on the whole, though the animation was not strong enough to last right through to the close. The tendency at first was quite favourable; and things were going along quite nicely, when a smart demand for gold in mid-week administered a sharp check, and showed how sensitive the market is. But the recovery came as quickly as the fall, when it was seen there was no ground for apprehension; and the week finished off very quiet and rather apathetic. In the result, prices are not uniformly higher; but the advances largely predominate over the retrogressions. The settlement was light; and it went through with complete ease. In the Money Market, outside the gold incident already mentioned, temporary accommodation was abundantly met; and the demands for settlement purposes made no impression on the plethora. Business in the Gas Market was more animated than it has been for many a week, thanks to the remarkable liveliness of Gaslight "A," over which there was a little struggle in view of the sale of stock at the Mart which is taking place to-day. The opposition prevailed at the opening; and a special parcel was done as low as 282. Then the supporters came in; and on Tuesday 286 was marked. On Wednesday and Thursday, there was animated dealing. But the stock held on tight; and after a little quieter business on Friday and Saturday, it marked 287½—the best price of the week—at the close. The secured issues meanwhile were not idle; but they did not change price. South Metropolitan was moderately dealt in; the price showing no disposition to rise. Nothing was marked in Commercial; business being all in the new allotments. Quotations are now "ex new;" but they have not been put down the full value, which is about 8½ per cent. Nothing special was done in the Suburban and Provincial; and the only change is that Newcastle is quoted closer. Business in the Continental Companies was only moderate. The tendency generally was steady; and Imperial just at the close scored a point in advance. Among the rest, Hongkong and San Paulo had a rise; and Oriental and Chicago gained on "ex div." variation. Water was rather quiet, and mostly unchanged; but Southwark, after much shifting about of the quotation, closed at a fair advance.

The daily operations were: Gas stocks were quiet on Monday; and quotations did not move. Tuesday's business also was decidedly limited. But Gaslight "A" advanced 1; and Hongkong, ½. In Water, Southwark ordinary rose 2. On Wednesday, dealings in Gaslight "A" were in full swing, hardly anything else being noticed. Quotations did not vary. Southwark Water rose 1 more. On Thursday, the great activity in Gaslight "A" continued; and South Metropolitan was rather busy too. Again quotations closed unchanged. In Water, Southwark "D" rose 2. On Friday, there was a great lull in Gas stocks. Saturday was fairly quiet also; but there were more changes. Imperial improved 1; and San Paulo, ½.

### ELECTRIC LIGHTING MEMORANDA.

An Electrical Supplement of the "Engineer"—Systems of Electricity Supply—The Vindication of Deptford—A Case of Traction.

THE fact of the "Engineer" having come out with an electrical engineering supplement to its issue for the 25th ult., is worth noticing as a sign of the times. It is not a very wonderful contribution to the technical literature of the subject, this supplement; a good deal of the matter looking as if it really originated in the advertisement rather than in the editorial department. But perhaps it is none the worse for this. Mr. W. H. Preece contributes an article on "Ethereic Telegraphy," which describes what has been done in this interesting field. The writer concludes that etheric telegraphy is practical, but thinks its applications will be limited, "except if it be made practical between ship and ship and between ship and shore." Another article discusses the subject of "Transformers in Practice," and lays down the principle that low-tension continuous current distribution has had its best day, and declares that this system is "being relegated to the uses for which it is best adapted." We should have thought this a sign of progress rather than of decadence. Surely, to ascertain what anything is good for, and thereafter to keep it to that purpose, is good work in the world? This writer kindly concedes that small towns, in which the radius of supply is severely limited, and a central position for a generating station can be obtained, will continue to favour the low-pressure system; and the ease of its application will still render it the more economical and simple plan for use in isolated lighting

plants. "Its advantages also cover the efficient charging of secondary batteries or accumulators; and it gives a more satisfactory account of itself in the running of motors, and in the efficiency of the light supplied from its arc lamps." Well, well! So long as all this can be said to the credit of the low-pressure continuous current system, it seems rather inconsequential to describe it as having seen its best day. Rather, one would think, its many advantages place the *onus* of proving their case upon those who would supplant it by another system.

The question of systems has always been a reason for the withholding of confidence in the recommendations in this regard of all but the very highest authorities in electrical science. We are not going to "name names," for obvious considerations; but the country is full of examples to show that where the smaller fry of experts have been allowed their own way, the selection of the system of supply has been determined by individual preference rather than on merits. If it happened to be an alternating current man who had the ear of the local people, then the locality was provided with a high-pressure alternating current system, notwithstanding the fact that the whole thing might be covered by a table-cloth. It must be admitted, of course, that the high-pressure alternating current has its peculiar advantages, which should be recognized and utilized when considerations of expediency dictate this course. It is unfortunate, all the same, that the known drawbacks of the system should have been imposed upon so many districts unnecessarily, while at the same time its chief recommendation—the possibility of removing the source of energy to a distance from the centre of consumption—has not been realized. In this way, the system has gained a questionable repute, which would have been avoided if the public had always been kept aware of the real and sufficient reasons for the selection of the high-pressure alternating current for particular localities.

So far as the case of London is concerned, the vindication of the high-pressure alternating current principle of electrical distribution is capable of being summed up in the one word—"Deptford." It is abundantly evident that the advantages, such as they are, of the low-pressure continuous supply, are heavily discounted by the necessity of having the generating station close at hand. We have the satisfaction of reflecting that, through all the time of trouble that too quickly overtook the inauguration of Mr. Ferranti's great conception at Deptford, we have in this column consistently upheld Mr. Ferranti's cause. He was a little in advance of his time, perhaps; but not much. A whole chapter of sad accidents came upon the unhappy London Electric Supply Corporation, and diverted business from them to their rivals. The latter were "on the spot." The generating station was "just round the corner," or "over the way," and users of electric light did not care to depend upon a service which came from afar, and was liable to fail with startling pyrotechnic effects. But now the whirligig of Time is bringing about his revenges. All the London Electricity Supply Companies are either moving, or reluctantly coming to see the expediency of going, out of town; and Deptford will soon be no exception to the rule of locality. Of course, who says alternating high-pressure current must also say transformers; and the "Engineer" supplement is very informing on this matter.

It is quite possible that electricians may endeavour to make capital out of the recent history of the Ipswich Tramways Company. Certainly, as the story has recently been told by the Chairman of the Company, the British Gas Traction Company are made to lie under an imputation of unbusinesslike conduct. It appears that the Ipswich Tramways Company have one of those unfortunate undertakings that do not earn a dividend, and have no prospects of doing so. The capital expenditure on the tramway amounts to about £32,000; and the receipts run to about £3,000 a year. The net profit for last year was £281. In the circumstances, the Directors are naturally not averse to contemplating the sale of the property; and a year ago it is alleged that the Gas Traction Company were not unwilling to buy. The price was agreed upon, the consent of the Board of Trade obtained, the agreement was prepared—and then the Gas Traction Company went no further with the business, for some unknown reason. The Tramway Company's Chairman was pushing the sale; but the other party were not equally eager. So he turned from gas traction in disgust, and fell into the arms of an electric traction syndicate who are reported to be willing to pay £20,000 for the property, if the Corporation will consent to let them come in. The Chairman admitted, on being pressed, that electric traction meant the trolley-wire system. He did not say, however, that it would also entail the relaying of the metals over the whole system. If the cost of doing all this new line work, and providing the generating station and electric car equipments, is added to the £20,000, it does not appear that the electric traction syndicate will have very much of a bargain at Ipswich. That, of course, is their affair. We can only hope that the British Gas Traction Company are concentrating their energies upon making a better proof of their cause than could be secured at Ipswich.

**British Association of Water-Works Engineers.**—At the general meeting of this Association to be held next Saturday, a paper will be read by Mr. H. Bertram Nichols on "Water Supply from the Lower Greensand, and Constructional Works connected therewith, at Leighton Buzzard."



## THE LAW AND PRACTICE OF SMOKE PREVENTION.

A PECULIAR aspect of English life is exhibited by the recent outburst of Sir W. B. Richmond against the smoke nuisance, as experienced by himself at Hammersmith. That traditional critic of our national ways and institutions, "the intelligent foreigner," hailing, it might be presumed, from one of the highly-governed countries of Europe, would experience a considerable amount of difficulty in understanding this business. There is the smoke, and there also is the law for preventing it. Yet the people of London go on enduring the one and ignoring the other, until somebody stirs the newspapers up; and then somebody else proceeds to explain matters, and perhaps to do something. The motive power in this instance is the mysterious force called public opinion, the existence of which appears to be peculiar to these Islands. At any rate, no Frenchmen or German ever writes to his newspaper to obtain the removal of a public nuisance—to say nothing of getting a law put into operation. That is entirely an affair of the Government, or of the Police. The foreigner at home gets along without that common action through the "Correspondence" columns of the newspapers, or by public meeting, which is part of the public life of England. With us, it is only for some prominent man to strike the match, and the flames of public controversy burst forth. Our own columns contain many remarks showing how the strike of Welsh coal miners in the spring of the year, by stopping the customary supply of smokeless steam coal to the Metropolis, was bringing the smoke plague down upon London even as it weighs upon Manchester. Time and again we have recorded and commented upon Police Court proceedings initiated by Metropolitan Local Authorities against offenders—chiefly electric lighting stations—under the Smoke Prevention Acts. The electrical journals, for their part, have devoted columns to the discussion of the decisions of the Magistrates in these cases. Yet, to judge from the correspondence in "The Times" and the articles in other newspapers that followed the publication of Sir W. B. Richmond's letter, the great body of the London population did not know that anybody else had done, or was doing, anything in this matter of smoke prevention!

It is not to be wondered at that the Metropolitan Vestries, and the London County Council—and also, for that matter, the London factory owners, and the Gas Companies—should experience a slight feeling of impatience with this one-eyed public opinion, which only sees what some self-appointed showman points out to it. The Gas Companies have been quietly effecting a revolution in the domestic warming and cooking habits of the town populations of England—London included; and hardly anybody notices what is going on, until some sharp reporter on the look out for attractive "copy," artfully writes up a case where a chimney-sweep accuses the penny-in-the-slot gas-meter of depriving him of his means of earning a livelihood. Factory owners, in many instances, do their best to avoid giving offence by their chimneys; only to be abused by every "smoke abatement" amateur who knows nothing whatever about the subject of his enthusiasms. The public complain, when their attention is drawn to it, of the remissness of the Vestries as regards the enforcement of the law; but nobody helps consciously in bringing about the desired object of a smokeless sky.

Sir W. B. Richmond does well to stir up his Vestry to a sense of their duty; but, like all the other would-be curers of the smoke nuisance, his zeal outruns his knowledge. In the course of an "interview" reported in the "Daily News," he was asked whether it is really possible for "a chimney to consume its own smoke;" and his answer was—"Most decidedly, and at a profit, after the initial expense. There are no end of appliances for doing so." This is the old delusion that vitiated the programme of the Smoke Abatement Society of twenty years ago. Then the exciter of public opinion was the late Dr. Carpenter, of Croydon; and his following was composed of a handful of sanitary science people, together with a few "fashionables" in search of a hobby. Now it is the artists' turn. But both start from the same erroneous supposition. The object of the agitation is admirable; but there is no short way to it through the manufacturers' pockets. This truth should be realized. For most of the transit and industrial work of such a town as London, situated as it is with relation to the coal-fields, smokeless coal, or gas coke, will answer the steam raising purpose as well as any other description of fuel. Indeed, in all cases of a single boiler, or a pair, there is no reason why the owner should not be compelled, if necessary, by persevering prosecution, to burn smokeless fuel. It may cost a trifle more than a smoky coal; but he should not be allowed to poison the atmosphere for acres round, in order to save a few shillings a week.

It is to be remarked, however, that the chief of the modern offenders against the Smoke Prevention Acts are the town electric light stations, public and private. The unexpected truth is that in welcoming the electric light as they did, in the supposed interest of public health and the cleanliness of the town, our Metropolitan Local Authorities committed a huge mistake. We have always protested that the central electric lighting station was bound to be as great a nuisance, in its degree, as the old town gas-works, which had to be removed on this very account. Yet when the various Electric Lighting Companies began to carve up the City and West-End of London at their own sweet will—the Vestries looking on approvingly—nobody ever

thought of inquiring what would happen to the neighbourhoods when the generating stations grew big. The magic of the electricians was over the public and the Local Authorities; and accordingly huge steam power factories were allowed to obtrude themselves into localities where no other kind of factory would have been admitted on any pretence. Steam power stations are the same, no matter what the application of the power may be. Engines thump and shake the ground, boiler chimneys pour out smoke, coal-carts rumble through the streets, ashes have to be carted away, and, in fine, a "nuisance" is the immediate product of every electric lighting station situated in a residential neighbourhood or fashionable quarter. The reason why the complaints of smoke are most bitter as against these establishments, is because of the magnitude of their steam-raising operations. The smallest electric lighting station in London is bigger than the biggest engine-house previously existing in the Metropolis, out of the East-End. Hundreds of horse power have to be generated in the heart of a quiet quarter; and in such a case the cost of fuel becomes a very important consideration. All the station managers are competing with one another in keeping down the works costs—a laudable aim enough; but unfortunately not capable of complete reconciliation with the purpose of the Smoke Abatement Acts. For as mechanical engineers know full well, and as Sir W. B. Richmond does not know, there is no saving in smokeless boiler firing, so far as the principle is involved.

An afternoon spent in an electric lighting station in the company of one of the amiable and accomplished gentlemen who are usually to be found at the post of duty in these establishments, would teach Sir W. B. Richmond more about the economics of steam-boiler firing than he will ever learn from disgusted observations of the Hammersmith chimneys from outside. That he should have allowed the "Daily News" interviewer to talk, without a check, about "chimneys consuming their own smoke," shows how little he has penetrated into the hard, stubborn facts. Smoke is an incidental result of the burning of a useful kind of coal in the particular way that the steam raiser for electric generating machinery often requires. He wants to get up steam quickly, and in large quantity; and boilers and fuel are adapted to answer the purpose. The coal burns with a long flame, which means smoke; but that is how the engineer wants it to burn. The smoke entails a loss of carbon at the rate of a few pounds weight per ton; but this is an inconsiderable trifle, from the steam raiser's point of view. It means a good deal, however, to the public outside; but that is their affair. The two interests are not reconcilable upon an economic basis.

This may appear a deplorable conclusion for the smoke abatement enthusiasts; but it is worse than useless to blink the truth. Recently, in Paris, the Municipality received the report of a Technical Commission appointed to investigate this very subject. Paris threatens to become almost as smoky a city as London, which would be a very dreadful circumstance. In the face of this eventuality, the Municipality decided to have the matter looked into. The question is the more urgent, since by reason of the complicity of the Municipality in the economical crime of keeping coal gas unnaturally dear, there is no prospect of the Paris Gas Company being able to do as much with prepayment meters as the London Gas Companies. Science and logic are strong points with the French; and it was quite in accordance with the national spirit that the question of the smoke nuisance in Paris should be referred to a Technical Commission, with instructions to find a remedy. The Commission began by offering prizes for the best smoke-preventing furnaces, for which there were 110 entries. Seven only of these belonged to the category of "gas producers and gas firing." All the furnaces were tried upon one and the same boiler, which was of the "elephant" type commonly used in France; and the same fuel—Anzin briquettes—was employed in every case. Every device was also tried by slow and by forced firing; and every test was made twice over—once by a stoker supplied by the manufacturer, and once by a man employed by the Commission. The tests included the determination of the quantity of fuel burnt per unit of grate area, the evaporation duty, and the observation of the smoke effect produced.

The latter proceeding is not an easy one to conduct upon a basis permitting of rigorous comparison of results. The Commission adopted for this purpose an ingenious method which was at least fair to all the devices tested. A smoke scale of five grades of intensity was decided upon; and charts prepared accordingly were mounted upon a drum driven by clockwork. The observer watched the chimney top, and pressed a pencil upon the moving paper at the degree, and during the period corresponding to the character of the smoke produced. The result was a diagram of which one dimension recorded smoke, and the other time. The area enclosed was measured by a planimeter, and its content taken as a measure of the smoke production of the particular furnace under observation. As the result of all the devices submitted for examination, representatives of three general types came out with a fair degree of credit. These were the Donnelly furnace (coking), the Proctor (mechanical stoker), and the Hawley (down-draught). Honourable mention was accorded to a steam-jet arrangement. This seems to register the high-water mark of the smokeless combustion, in a boiler furnace, of a naturally smoky fuel.

Experiments made for the purpose of furnishing a basis of



comparison, proved that the ordinary boiler furnace, with hand-firing, could not be worked without smoke, even with the most careful stoking. The next point to be established was that smoke prevention and fuel economy do not necessarily go together. The blackest of smoke represents an insignificant amount of fuel; and the tests demonstrated that the devices which produced the least smoke were not the most economical. Hence, the prevention of smoke must be paid for. The Commission reported that smoke may always be prevented by the use of coke for fuel; but they recognized the undesirability of legislating upon this narrow basis. They recommended the employment of other devices competent, with proper usage, to produce the minimum of smoke by depending upon the true principle, not of consuming smoke, but of preventing its production. Smoke once produced, as Sir Frederick Bramwell observed a long time ago, is unconsumable, incurable, and unmanageable in every way.

So the matter stands at this hour. No amount of enthusiasm engendered by the artistic temperament of Sir W. B. Richmond will eliminate the facts from the problem of smoke prevention. If a factory owner can afford the best Welsh smokeless steam coal, or has conveniences for burning coke or breeze, he can snap his fingers at the Smoke Inspector. Again, if his need of steam is fairly regular throughout the day, mechanical stoking will avail to burn a cheap, smoky coal for him without giving much cause for offence. But if he never knows from one minute to the next how much steam he will want; if at any moment he may require to stoke up "like mad" to overtake a sudden load—then flaming coal and a reeking chimney will be his only resource. And if the neighbours object overmuch, he will have to go elsewhere, for the necessity is imperative.

#### THE RUSSIAN MINERAL OIL SUPPLY.

THOSE who are interested in the market supply of mineral oil, may be recommended to procure the "Board of Trade Journal" for September, which contains a summary of a special report on the Russian petroleum industry by Mr. P. Stephens, H.M. Consul at Baku. It is one of the pressing practical and commercial questions of the day, as to what will be the effect upon the petroleum market of prospective legislation affecting the flash-point of burning oil. The mutual bearings of the American and Russian departments of the mineral oil trade will eventually determine this question. Nobody seems to know for certain the exact degree in which the Russian and American oil-fields will be able to compete with, or to assist each other. The difficulty of arriving at reliable information in this regard is aggravated by the circumstance that the standard unit universally adopted in the Russian oil trade is a weight—namely, the Russian pood of 36 English pounds—whereas in American oil statistics only volume or measurement is taken into account. It is a matter of impossibility to fix an absolutely constant ratio, or establish an exact equivalent between these two data, weight and volume, in the case of the mineral oil supply. This consideration may be commended to the notice of the enthusiasts who plead for the general adoption of the metric system as a complete means of facilitating international trade.

The first thing that strikes one in perusing Mr. Stephens's report is the differences of character and quality that exist in the products of various Russian oil-fields. This variety presents a formidable obstacle to the determination of the value of the different oil-fields. Thus, while there is some petroleum got at Iliski, and more at Grosni, neither field is likely to compete seriously with that of Baku for some time to come, by reason of inherent defects of quality. As regards the Baku yield, it is difficult to assign any limit to it. There is any amount of oil at Baku; and the operations of the refineries are entirely regulated by commercial conditions and the relative market prices of kerosene, crude oil, and residuum. When the price of kerosene rules high, the output of this product is increased; whereas when the residuum (astatki) is valuable, the refineries do not separate so much kerosene from the crude oil. It is remarked as worthy of notice that the residuums of the Baku crude oil, whether after taking only an insignificant quantity of illuminating oil, or even only of benzine or gasoline, as well as after taking the maximum quantity of light and heavy kerosene, are in all instances suitable for fuel purposes. In the former case their flash-point is from 140° to 176° Fahr., and the specific gravity is below 0.900; while in the second, the flash-point may be from 316° to 366° Fahr., and the specific gravity about 0.915. Both grades are equally safe. Similarly, Baku crude oil yields good fuel oil without any refining at all; it being sufficient to allow it to stand a few days in open reservoirs for the benzine and gasoline to evaporate. This merely means the loss of from 5 to 10 per cent. of bulk.

The production of crude oil in the Baku district amounted last year to 55,375,000 barrels; this being a substantial increase upon previous years. The number of wells at work has grown very fast; but the stocks of raw material are at the present time very heavy, which points to a decline in the selling value of crude oil. This is an important matter. Mr. Stephens's judgment rests upon the fact that the stocks of crude are larger than they have ever been before; while the manufacturing centres of Russia are giving up the use of liquid oil fuel, and

reverting to coal. It seems to be the quality of this oil fuel to figure as the stop-gap for coal. Some two or three years ago, Russian crude oil was to be had for a very low price; and all over the empire it was taken to in place of coal. Latterly, however, the value of crude oil has been steadily rising; so that it has already in many localities surpassed the relative value of coal. The capacity of the local storage receptacles is not great—being but 1 million barrels or so at the wells, and little over 3 million barrels at the refineries. This is not one month's production of crude oil. The pipe-lines which connect the oil territories with the refineries are of ample capacity. The local refineries do not appear to do a great business. Their number is diminishing, "because, notwithstanding the high price of residuum, the low price obtainable for illuminating oil makes refining unprofitable when taken in conjunction with existing prices of crude." Evidently, the carburetted water-gas interest must be adjusted to the situation.

#### PERSONAL.

On the occasion of the opening of the new retort-house at the Spalding Gas-Works, noticed in the "JOURNAL" last week, the Gas Manager to the District Council (Mr. J. G. Hawkins), who planned the extension and superintended its carrying out, presented Alderman MILLS (the Chairman of the Gas Committee) with a miniature set of stokers' tools in a case, as a memento of the occasion. They included a barrow, shovel, and rake, in silver; and the case bore a suitable inscription. Alderman Mills, in acknowledging the gift, said he should always associate it with a day when they gave a new impulse to one of the most successful undertakings in that part of the country.

On the occasion of his marriage, Mr. F. P. TARRAT, Manager at the Darlington Corporation Gas-Works, has been presented by the employees with a case of fish-carvers and a handsome leather dressing-case for his wife. The gifts were handed to Mr. Tarrat last Tuesday in the presence of a number of the subscribers. In the course of a little speech-making, it was mentioned that this was the first time a Manager of the works had been married while holding that position; and it was also shown that the utmost goodwill exists between the men and Mr. Tarrat. This gentleman acknowledged with gratitude the cordial manner in which the employees had testified to their regard; and he expressed the earnest hope that in the future the whole of the men would co-operate with him to secure successful working.

**The Value of the Calorie.**—Replying to the question on the above subject recently put by a correspondent of "Engineering" (*ante*, p. 1230), M. Sauvage says the two calories referred to are sometimes called *grande calorie* and *petite calorie*. For engineering purposes, the former only is used; and the name "calorie" alone is employed.

**Professor Lewes on Acetylene.**—At the Society of Arts last night, Professor Lewes delivered his third Cantor lecture on "Acetylene." On the preceding occasion, as will be seen by the report which appears elsewhere, he dealt with the production of calcium carbide. Last night he discoursed upon the commercial production of acetylene; describing the types of generators in use for the purpose, the actions taking place therein, and their effect upon the resulting gas. The lecture closed with some remarks upon the purification of acetylene for domestic consumption. At the last lecture, to be delivered next Monday evening, Professor Lewes will deal with the combustion of acetylene, and its use for heating and motive power.

**The Bacterial Treatment of Sewage.**—At the meeting of the Society of Engineers last night, the paper read was by Mr. G. Thudichum, F.C.S.; his subject being "The Bacterial Treatment of Sewage." After describing the special uses of different processes, under varying local conditions of fall, and the nature of soil and sewage, the author gave in detail the method adopted at Worcester Park, where the Cheam and Cuddington sewage is received, to convert a process of precipitation and irrigation into one of bacteria-bed treatment and irrigation when desired—showing how the necessary beds were constructed by excavation, and filled with burnt ballast produced on the farm, at a total cost of about £325. The quantity of sewage to be dealt with amounts to about 80,000 gallons daily in dry weather. The conversion of the Sutton sewage works was also alluded to; the cost there having been something less than £2000 for a daily flow of 500,000 gallons of sewage, while the saving in working expenses was £500 per annum. The author also dealt with the problem of sewage treatment as applied to hospitals, schools, country houses, and other small communities. Alternative methods were described, and some particulars were given concerning a recent installation at a large public school. In conclusion, he pointed out that all the statements made on the occasion of his paper read in 1896 before the Society of Engineers still remained good; that knowledge had greatly increased during the past two years, but without altering—only extending—the ideas entertained at the date of his paper, as a result principally of the Barking experiments; and that the correctness of the particular method of working, by alternate filling and emptying, was confirmed by all later experiments.



## NOTES.

## The Lighting of Class-Rooms.

The deleterious effects of badly-lighted class-rooms on the eyesight of students has been pretty generally acknowledged; and it is not going too far to say that to this cause is attributable much of the myopia existing among young people at the present day. Mr. Brudenell Carter—probably the greatest authority on children's eyesight in this country—dealt with this matter fully in a paper he read before the Society of Arts some months ago; and the question has forced itself upon superintendents of educational establishments at home and abroad. About two years since, Dr. Dargelos, Chief Medical Officer at the Lycée at Aix, placed on record the opinion that the eye troubles, headaches, and general discomfort experienced by the scholars, especially when studying in the evening, were attributable to bad—that is to say, to badly distributed—lights. The remedy was found in the adoption of diffused lighting by means of well-placed incandescent gas-lights, whitened walls and ceilings, and reversed shades. At the Lycée at Troyes, where an installation has been carried out by M. Laurain, the Manager of the gas-works, a saving of about 18 cubic feet of gas per hour per study has been effected. The results have recently been published of some trials carried out at the College and in the Municipal Drawing School at Fontainebleau, by M. Vallée, the Superintending Architect of the town. At the College, seven Bengel burners, each consuming 12 cubic feet of gas per hour, were replaced by four Welsbach burners (No. 2), passing only 4 cubic feet each. In the Drawing School, 13 gas-burners, each consuming more than 14 cubic feet per hour, were replaced by seven Welsbach burners (No. 3), each using 5 cubic feet only. In both cases the light has been at least doubled by the change, no shadows are thrown, and the illumination is perfectly satisfactory to the scholars. The lamps are lighted by electricity, which somewhat increased the expense of first establishment; but this method need not necessarily be adopted.

## The Use of Water Gas in Metallurgy.

Mention has been made in the "JOURNAL" of the remarkable experiments of Dr. Ludwig Mond on the action of carbonic oxide gas upon nickel. These showed that, whereas carbonic oxide is not completely dissociated by heat alone even at the high temperature of 1690° C., in the presence of nickel the removal of carbon from the gas begins at 350° C. The gas carried forward portions of the metal, and in consequence burnt with a luminous flame. Nickel carbonyl was then isolated in a liquid state, and was produced with facility in any desired quantity. No other metals investigated showed indications of combining directly with carbonic oxide gas, except iron. The fact that iron would do so, had already been demonstrated in an unpleasant manner in connection with the working of carburetted water-gas plant. The subject of the iron and nickel carbonyls has been further investigated by Dr. Mond; and a paper on the subject was recently read by Professor Roberts-Austen before the Institution of Civil Engineers. It revealed the possibilities of water-gas plant in metallurgy. Water gas has been used for this purpose at Smethwick since 1892. The process is the production of metallic nickel from "Bessemerized matte." Incidentally, the hydrogen of the water gas is used to reduce some of the copper of the matter to the metallic state, which is effected in towers maintained at a temperature not exceeding 300° C. From this tower, the mineral passes to another, at a temperature of 100° C., where the carbonic oxide of the water gas takes up part of the nickel in the form of the compound nickel carbonyl. This gaseous product is carried on to a retort heated to 180° C., where the metallic nickel is thrown down. The carbonic oxide returns to take up a fresh charge of nickel. Thus when the operation is in full swing, the gaseous carbon monoxide and the partially reduced oxide of nickel and copper continuously revolve in opposite directions, in two separate circuits, which join and cross each other in the volatilizer. This is up to the present time the only industrial application of water gas other than for lighting purposes.

## Engineers and Architects.

Speaking in Birmingham to the members of the Municipal Technical School Engineering Society, the President, Mr. G. Fuhrmann Clarke, dwelt upon the much-debated question of the desirability of engineering works being decorated by what are intended to be beautifying details. He strongly advised engineers to cut themselves free from all preconceived notions of architectural effect; pointing out that engineering designs, and most engineering materials, are not to be improved by the sticking on of architectural adornment. He denied the assertion of an eminent architect that the practical training through which engineers pass in foundries and workshops is chargeable with the destruction of any powers of perception of the beautiful which they might otherwise have possessed. As a matter of fact, three of the most beautiful monumental engineering works in England—the Menai Suspension Bridge, and the Waterloo and London Bridges—are works of men who rose from the ranks of labour. In allusion to the Forth Bridge, which he characterized as the finest example of modern bridge design, Mr. Clarke pointed out that this result was due to the entire freedom of the work from architectural embellishment. The same eminent architectural opinion already alluded to has condemned

the appearance of the Forth Bridge; but this judgment Mr. Clarke dismisses as due to the same want of perception which engineers are blamed for not possessing. It is to be remarked upon this subject that the modern practice of abandoning, in respect of such structures as gasholders, those attempts at architectural adornments to which gas engineers of the last generation were so much addicted, should be counted to the younger constructors for righteousness. East Greenwich and New Beckton are to be set off in this respect against Fulham. If, however, gas engineers cease to vex the souls of architects in regard to "ornamenting" their gasholders, the architects ought to acknowledge the obligation by not leaving street lamp-posts to the foundry pattern maker, and interior house-fittings to the piece-work brass finisher.

## Wind Velocity and Rainfall in the Barbados Hurricane.

Most of our readers will doubtless remember the accounts that reached this country of the hurricane which visited Barbados on the 10th of September last. By the courtesy of the Observer of the United States Weather Bureau on the island (Mr. P. M'Donough), some extracts from the journal entries for the three days during which the hurricane prevailed were furnished to Mr. J. Harger Pye, the Engineer and Manager of the Barbados Gas-Works, who has forwarded copies to us. Interesting particulars are given in regard to the rainfall; but, unfortunately, there is no record of the intensity of the wind pressure—the weather vane used only registering the average velocity during certain short intervals of time, and not that of the heavy gusts which did so much damage. Rain began to fall at 1.15 p.m. on the 10th. During the afternoon, the wind was generally north, but without any decided increase of force. At 6.10 p.m., however, it changed to north-east, with increased velocity; and half-an-hour later it was blowing a gale which grew stronger every minute. At 10.18 p.m. it had attained such velocity that it blew down the wind-vane and the anemometer support. During the storm there were terrific instantaneous gusts, the velocities of which must have been very great. At 5 p.m., the wind was going at the rate of 13 miles an hour, or equal to 0.96 lb. per square foot; at 6 p.m., 17 miles, or 1.60 lbs.; at 7 p.m., 31 miles, or 4.92 lbs.; at 8 p.m., 36 miles, or 6.48 lbs.; at 9 p.m., 43 miles, or 9.30 lbs.; at 10 p.m., 54 miles, or 15.65 lbs. The greatest velocity in five minutes (10.1 to 10.6 p.m.) was 62 miles per hour, or equal to 19.80 lbs. per square foot—the direction of the wind being north-east; and the highest for one minute was 75 miles per hour, or 28.51 lbs. per square foot. The velocity was much greater between 10.18 p.m. and midnight than at any previous time, and must have attained from 90 to 100 miles an hour; 95 miles being equal to 45 lbs. per square foot. The wind abated considerably after midnight, but a strong gale blew until after the morning observations were taken on the 11th. The fluctuation in the pressure of gas upon the delivery mains was about 7-10ths. Mr. Pye thinks that the fluctuation on the outlet from the holder must have been much more; but this was not noted at the time. The total rainfall from 6 p.m. on the 10th to 10.30 a.m. on the 12th was 11.42 inches; reaching, it is reported, as much as 22 inches in the country districts.

## COMMUNICATED ARTICLE.

## SLOT COOKERS AND ALL ABOUT THEM.

By E. W. T. RICHMOND.

## CONCLUDING ARTICLE.

"Let me have time and counsel for my cause."

—"Henry VIII.," iii., 1.

1898.

We are now close upon the heels of passing events; and it is gratifying to note the progress that "slot cookers" have made this year.

"I will tell you everything right as it fell out."

I have referred previously to the prominent position occupied by the Brentford Gas Company as pioneers in fixing slot cookers. Their prepayment consumers grumbled (and rightly too) at having to pay a higher rate for gas and also a stove rental; and the Board, advised by Mr. Husband, wisely abolished them. They are now reaping their reward, as witnessed by the addresses of the Chairman Mr. H. C. Ward) in February and August of this year. "The sale of gas through the prepayment meters had been extraordinary." "1897 showed a growth over 1896 of 40 per cent.—8157 being in use in 1896, and 11,421 in 1897." It is worth while to pause and compare this sanguine statement with the regrets expressed at Manchester, Edinburgh, Scarborough, &c., as to low consumptions—Brentford with cookers fixed free gets more than double the average consumption of Scarborough, and treble the average automatic consumptions of Edinburgh and Manchester. Surely the advantage of free cookers is too manifest to be longer disregarded. Brentford depreciates drastically—automatic meters, 15 per cent. per annum; stoves, 12½ per cent. per annum; fittings, 15 per cent. per annum. The effect of this is seen in that, although the last ten years the Company's capital



has grown 35 per cent., its business has increased 70 per cent. Mr. Ward says, under date Oct. 21, 1898, after a cordial reference to the articles: "I fully believe the slot meter system has opened to gas companies a large source of business and revenue that laid dormant before the introduction of the 'slot.' Our experience at Brentford is quite in their favour. I see you talk of our (Brentford) dealing with the depreciation being 'drastic.' I am glad to see the remark." I am sure of the wisdom of writing off depreciation from meters, 'slots,' and stoves very liberally. It will put the companies who do so in a strong position in the future."

Mr. R. Beynon, of Torquay, finds room, in his original and practical Presidential Address to the Southern District Association

in February, to record the result of one year's working as averaging 9000 cubic feet per annum—not enough; and wisely he has at once remedied the defect, and added a 12-inch oven cooker at, however, unfortunately, a small rental, which with 1s. 2d. per 1000 cubic feet extra one considers rather heavy. Doubtless, having gone so far, Mr. Beynon will induce his Board to complete the journey, and abolish rentals.

This year witnesses the abolition of rentals of all stoves up to and including 6d. per quarter by the Leicester Corporation.

The remarkable results obtained by Mr. MR. ALFRED COLSON, ALFRED COLSON throughout his management at Leicester are perhaps best known to the general public by his efforts, commencing fifteen years ago, and continued ever since—in season and out of season—to promote gas cooking, and resulting in more than 10,000 cookers being supplied to 30,000 ordinary consumers (the balance of 5000 consumers being works, shops, and duplicate meters). We all remember his little standard pamphlet, "Economy and other Advantages of Cooking by Gas," and the hundreds of thousands of copies printed and circulated in various parts of the country and abroad. It is certainly promising and gratifying to find Mr. Colson coming into the "free fold," if only as far as 6d. a quarter for cookers, which are fixed with slot meters. (Prepayment meters were introduced here in 1893.) I remarked to Mr. Colson "this will prove the thin end of the wedge, and result in your fixing all slot cookers free." This is what he anticipates without fear or regret. The necessity of abolishing rentals as regards slot cookers was evident, as, although there were 8000 slot meters in use in Leicester, only one in ten had cookers up to June, 1898—since October, 1898 (three months) increased to one in five. This concession will certainly bring slot cookers up to the same proportion as ordinary consumers—viz., one stove to three consumers—and should easily reach three stoves to four consumers, especially as the extra charge is only 5d. per 1000 cubic feet—30 cubic feet being supplied for 1d. Writing on the 24th ult., Mr. Colson informed me that he was connecting 80 cookers weekly.

One gladly welcomes from Warrington the most complete table of provincial automatic results yet published. It is given in Mr. W. S. Haddock's Inaugural Address to the Manchester District Institution of Gas Engineers last February. The table is a mine of information which I have analyzed, and extracted therefrom the following figures and inferences. I am not able to name the towns, as they are referred to by numbers.\* Out of 80 Provincial Gas Departments tabulated, two do not

reply as to what they supply free besides meter-fixing; but out of the remaining 78, 69 confirm my contention that "liberality pays." The remaining nine are divided into groups of ones and twos of differing customs, from which no reliable data can be obtained. There are 27 departments fixing meters and giving services free. Their consumption averages 7174 cubic feet per annum. There are six departments fixing meters and giving services, pipes, and fittings free. Their consumption averages 7745 cubic feet. Finally, we have 29 departments fixing meters and giving services, pipes, fittings, and boiling-burners. They average 8711 cubic feet. (None are shown as fixing cookers free as yet; but I note that three departments give from 2 to 4 cubic feet extra per penny for gas-cooking.)

The lesson to be drawn from this table is invaluable. The average consumption with meter-fixing and services free is 7174 cubic feet; but with fittings and a boiling-burner added they increase 1537 cubic feet, besides obtaining by this means a much larger proportion of consumers. Is it not fair to assume that cookers fitted free would increase this total at least another 6000 to 8000 cubic feet, as several companies get 12,000 cubic feet from stoves alone?

Another very interesting set of deductions may be made—as to the extra amount charged, and the effect of price on consumption. The average extra charge of the 80 departments is 73d. per 1000 cubic feet; varying from 2d. (in three cases) to 13d. (in two cases). As regards the number of feet for 1d., they vary from 15 cubic feet (one case), with a consumption of 6500 feet, to 33 cubic feet, with a consumption of 8500 feet (one case—Widnes, I believe—since increased to 36 feet).

Twenty-three works (nearly one-third of the total table) give 25 cubic feet for 1d., with an average consumption of 8296 cubic feet. The next in importance are those giving 20 cubic feet for

1d. (twelve cases), with an average of 6062 cubic feet. Then we have seven departments giving 22 cubic feet for 1d., averaging 9288 cubic feet; and six departments giving 28 cubic feet, averaging 9510 cubic feet. The remainder are two, three, and four series of cases, with consumptions of 9114 cubic feet at 30 feet for 1d. to 6100 cubic feet with 17 feet for 1d.; from which it would be unwise to deduce any definite ideas. The safest bases are the 25 and 20 cubic feet for 1d. results, as these two account for one-half the table. Here we have 25 feet for 1d. consumers averaging 8296 cubic feet, against the 6062 cubic feet average of the 20 feet for 1d. users.

These figures are gathered chiefly from the works under the control of members of the Manchester District Institution. It would be interesting to obtain comprehensive figures throughout the country, and analyze them. There can be little doubt, however, as to their showing much the same results, viz.—

#### THE MORAL.

1.—The cheaper the gas, the more is burned.

2.—The greater facilities offered for using gas, particularly with free stoves, the greater the consumption.

The appetite grows with what it feeds upon; and, in spite of the already enormous quantity of slot cookers lent free by The Gaslight and Coke Company, Colonel Makins speaks of 12,000 additional automatic cookers fixed during the last six months of 1897.

Free grillers were at this date decided upon for Salford and Blackpool. A typical Town Council discussion followed the Gas Committee's proposal at the latter place. "Ironmongers and plumbers would be injured by it," said one gentleman; but he only found one supporter. The majority, looking upon

"the greatest good for the greatest number" as their corporate aim, suggested that cookers too might follow. If the profits to be thus derived were only duly appreciated by the Council, they speedily would be so supplied.

Huddersfield, in harmony with Hull, Leeds, and the other go-ahead towns, on the advice of the Gas Committee and the approval of the Council, decided from April, 1898, to supply cookers free with slot meters, since which time automatic applications and consumptions have greatly increased. Huddersfield gives 30 cubic feet of gas for a penny.

Let us now for a brief moment glance again at the progress made in the United States. Ordinary cooking stoves, it is estimated, are being fixed at the rate of 100,000 per annum—more, I should estimate, than England is doing; but in automatic meters, with or without cookers attached, it is woefully behind. One company has 30,000 out; and the rest are simply nowhere—15,000 among the remaining fourteen gas companies who have adopted the system, being the estimated grand total up to Midsummer, 1898.

In New York, the landlords are applying for them on account of the increased applications from tenants for houses thus supplied. A similar experience was related to the writer by Mr. G. F. L. Foulger, who found, during The Gaslight and Coke Company's partial suspension of the system in 1895 (owing to non-deliveries of meters) that landlords were charging 3d. and 6d. per week extra for houses fitted up with the automatic installation.

Mr. Andrew Wilson, of Perth, who read his father's paper in 1897 at the North British Association meeting, this year gives his own experiences; and, as would be expected from one of the younger generation, he considers excessive his department's charge of 1s. per 1000 cubic feet extra, and desires to see a griller fixed free with every meter. When a Gas Department gets thus far, there is reason to hope they will be moved by their own interest and their customers' needs to supply a really useful cooker. The discussion on the paper, in which Mr. R. S. Carlow, Mr. T. W. Ward, Mr. J. Ballantyne, and the President (Mr. T. Wilson) took part, became, as usual now, a chorus of praise; but there was no mention of anything beyond a boiling-ring as an auxiliary to the night and winter consumption.

In August, the North of Ireland Association, after seven

years, again give prominence to prepayment meters through a paper read by Mr. R. Ross, of Dungannon, who has in just over nine months fixed more than

120. This is a very good showing for a small works (7½ millions), and possibly the best results, for its size, in Ireland; and deservedly so, as Mr. Ross has dared to do what some American Engineers have recommended, but no English Engineer I know of has yet attempted—viz., given half a cubic foot more per 100 feet to prepayment meters than to ordinary ones, besides fitting up brackets and piping to the value of 30s., as well as fitters' time. The writer would urge the consideration of a similar proceeding on small companies whose charge for gas is 4s. or more per 1000 cubic feet. In Mr. Ross's case, it was 5s. 10d.; and he gave 15 cubic feet for 1d. The cost of fittings might be placed to a suspense account, and liquidated out of general profits at a liberal rate.

\* The table referred to will be found in the "JOURNAL" for March 1, 1898, p. 470.



Mr. G. R. Love, Dundalk.

Mr. G. R. Love, of Dundalk, dealt very severely with Mr. Ross's generosity. He approves of slot meters, but not free accessories; but the best proof of the soundness of this plan is the fact that the latter gentleman, with a much smaller town—the population being 4000, against 14,308 in Dundalk—has got out more than 100 meters in nine months, while Mr. Love has been three years getting out the same number. Mr. Love supplies cookers with separate prepayment services, and makes a reduction of 7½d.; so that he succeeds so far as he is liberal.

I have dealt thus in detail with these smaller companies, believing that the field as yet unexplored by them is even larger proportionately than is the case with the larger towns with cheap cottage property already fitted up with gas, and consequently having many two and three light meter consumers.

The discussion on Mr. Ross's paper elicited the fact that Mr. Whimster, of Armagh, has not yet decided to supply either lights or stove, and consequently had not done so much as he felt to be possible, and that Messrs. T. Frizelle (Holywood), E. Stears (Lisburn), and A. Gibb (Newry) all agreed as to their satisfactory experiences of the system; but, not having cookers attached, they had small consumptions.

Once again, and this for the last time, we are face to face with the remarkable figures of The Gaslight and Coke and South Metropolitan Companies. Their respective figures to June 30, 1898, are:—

|                       | Automatic Meters. | Stoves. | Approximate Annual Value of Cooker Consumption. |
|-----------------------|-------------------|---------|-------------------------------------------------|
| Gaslight and Coke . . | 90,000            | 72,000  | £90,000                                         |
| South Metropolitan. . | 72,300            | 57,000  | 71,250                                          |

This is reckoned at the rate of £1 5s. per stove. The Brentford Gas Company have to the same date reached the highly satisfactory figures of 13,300 automatic meters and 11,280 cookers.

HOUSES SUPPLIED WITH SLOT COOKERS BY THE LEICESTER CORPORATION GAS DEPARTMENT.

NUMBER OF SLOT COOKERS FIXED BY THE DEPARTMENT IN USE ON NOV. 24, OVER 2000.



BETTER-CLASS HOUSES, AVON STREET, LEICESTER.

|                                                                    |               |
|--------------------------------------------------------------------|---------------|
| Average rentals per week . . . . .                                 | 7s. 6d.       |
| Number of cubic feet of gas for 1d. . . . .                        | 30            |
| Extra charge per 1000 cubic feet to prepayment consumers . . . . . | 5d.           |
| Average annual consumption . . . . .                               | 10,000 c. ft. |



CHEAPER-CLASS HOUSES, EASTBOURNE ROAD, LEICESTER.

|                                      |             |
|--------------------------------------|-------------|
| Average rentals per week . . . . .   | 5s. 6d.     |
| Average annual consumption . . . . . | 5000 c. ft. |

HOUSES SUPPLIED WITH SLOT COOKERS BY THE DORKING GAS COMPANY.

NUMBER OF SLOT COOKERS FIXED BY THE COMPANY, 100.



BETTER-CLASS HOUSES, WATHEN ROAD, DORKING.

|                                                                    |      |
|--------------------------------------------------------------------|------|
| Rentals per week . . . . .                                         | 10s. |
| Number of cubic feet of gas for 1d. . . . .                        | 20   |
| Extra charge per 1000 cubic feet to prepayment consumers . . . . . | 8d.  |



CHEAPER-CLASS HOUSES, ANSELL ROAD, DORKING.

|                            |         |
|----------------------------|---------|
| Rentals per week . . . . . | 5s. 6d. |
|----------------------------|---------|

Mr. G. F. L. Foulger, who has, from the first, agreed with the necessity of supplying a slot cooker with every installation, tells me that 82 per cent. of their slot consumers are now using cookers, and that the cooker doubles the consumption. The few consumers who have only fittings (wisely provided with 4 and 5 cubic feet governor burners) and a boiling-burner use but half the gas of those supplied with a cooking-stove in addition. We must not lose sight of the fact that this testimony is of the very highest value, based upon the most extensive use of cookers in this country; and it means that the deductions drawn from the figures I extracted from Mr. Haddock's table (giving an average of 8711 cubic feet for those companies who supplied a meter, service piping, fittings, and boiling-burner free) may now be regarded as convincingly proved. The 8000 cubic feet increased consumption claimed throughout this paper as the result of a good-sized cooker (not less than 12 inches square) is, therefore, well within the mark.

TOTTENHAM TOTALS.

Mr. Corbet Woodall stated at the Tottenham and Edmonton bi-annual meeting (September, 1898) that there had been an increase of 30 per cent. over 1897 totals (see Article No. 2, ante, p. 1162). "The Directors were completely satisfied with the working of the system. Those who discontinued it were very few indeed; and this might be taken as a proof that the users highly appreciated it. The Directors would do their utmost to extend the use of the slot meter in the district; and it was in their favour that the houses to be so dealt with were numerous—a comparatively large field yet remained uncovered."

By a coincidence, my own town of Romford witnesses my final public reference. I refer to the admirable address of Mr. W. D. Child to the Eastern Counties Gas Association on the 15th of September last. No comprehensive survey of the present prospects of the gas industry could now be complete without reference to the prepayment system. Mr. Child is, as usual, most careful to feel his way; and at present he has only



got as far as a free boiling-burner or griller. In addition, however, cookers are supplied on a rental, with a charge for fitting. The best proof that this lack of liberality does not pay, is the acknowledgment that only a few consumers—162—are supplied after two years. With cookers free, I believe Romford, and all companies adopting similar conservative lines, might *double their automatic consumers*, and increase the consumption of those already supplied, by fixing cookers with every meter. Ample justification for this statement may be found in these articles.

PLYMOUTH, BOURNEMOUTH, AND CAMBRIDGE.  
The Plymouth, Bournemouth, and Cambridge Gas Companies have within the last few weeks decided to fix cookers free; and indeed will not put in the installation without a stove; and the example of Swindon, following Mr. S. Glover's successful lead at St. Helens, to whom I must "give the benefit of seniority," ought not to be overlooked—500 cookers, the smallest 12 inches square, and the largest 14 inches, being fixed during the last twelve months. Mr. J. J. Jervis, after carefully considering the advantages of an increased cooker consumption, decided to advise his Board to supply boiling-burners free, and to reduce cooker rents to 2d. and 4d. per month. He wisely recommends a good-sized one, of the best grade, too—the oven preferably 13 inch by 13 inch—with three boiling-burners and a griller; and he assures me that the results are all he could desire, and are more than he expected from the classes supplied. The Swindon slot meters are cleared monthly; and, indeed, I may remark in passing, during the last five years

HOUSES SUPPLIED WITH SLOT COOKERS BY THE PLYMOUTH AND STONEHOUSE GAS COMPANY.

NUMBER OF SLOT COOKERS FITTED, OVER 1100.



BETTER-CLASS HOUSES, FLORENCE VILLAS, CATTEDOWN ROAD, PLYMOUTH.

[TENEMENT HOUSES.]

|                                             |     |
|---------------------------------------------|-----|
| Rentals average per week about . . . . .    | 5s. |
| Number of cubic feet of gas for 1d. . . . . | 25  |



CHEAPER-CLASS HOUSES, EDGE CUMBE PLACE, WEST HOE ROAD, PLYMOUTH.

Weekly rentals per tenement. . . . . 3s. 6d.

the ordinary meters also have been read and accounts collected monthly. Truly—

"Must poor matters point to rich ends."

Thus we might trace, in town after town, the fact that the slot meter has opened up a marvellous field for day *equally with night* consumption. We may justly say:

"Upon my life, it will do wondrous well."

The Folkestone Gas Company have decided that cookers are a necessary part of an automatic installation, and are adopting them. Mr. W. Medhurst has hit upon a very happy idea for interesting his consumers in keeping their cookers clean. He purposes giving prizes every Christmas for the best-kept stove—one prize to every 50 cookers. The prizes will be of an average value of 10s., to be invested in joints, grocery, &c.,—an admirable plan, and one which is worthy of emulation.

These articles would not be complete without a reference to the strides made by Cheltenham. They commenced fixing coin meters in 1896; and besides putting in piping, two pendants, and two brackets, they gave a boiling-ring attached with flexible tube. By the end of 1896, they had fixed 457 meters. An inquiry or two for a small cooker came to Mr. Paterson's knowledge early in 1897; and before the end of the year, they had 446 cookers out on hire at 1d. per week. They have now abolished this hiring charge altogether, and fix the cooker free as part of the coin-meter fittings. In the concluding part of a letter from Mr. Paterson under date Dec. 2, 1898, he says: "The thing is not half done if a cooker is not supplied to every house."

The years from 1888 to 1898 have, I venture to say, been the most eventful of this completed century of gas manufacture. They have witnessed a transformation in the very foundation of our friendly flame. Water gas is but beginning its career; and what coal is carbonized will be shot instead of shovelled. The twin fairies of Science and Invention have indeed dwelt among us. The



BOURNEMOUTH GAS AND WATER COMPANY'S AUTOMATIC INSTALLATION WORKSHOP AND CONTRACTORS' STAFF AT DINNER HOUR.

HOUSES FITTED WITH SLOT COOKERS BY THE BOURNEMOUTH GAS AND WATER COMPANY.



BETTER-CLASS HOUSES, WINDSOR ROAD, BOURNEMOUTH.

|                                                             |            |
|-------------------------------------------------------------|------------|
| Rentals per annum . . . . .                                 | £25 to £30 |
| Number of cubic feet of gas for 1d. . . . .                 | 20         |
| Extra charge per 1000 feet to prepayment consumers. . . . . | 8d.        |



Welsbach incandescent light bids fair to stem the tide of electric electricity; and when we get burners at 1s. each, as on the Continent, instead of 5s., and mantles at 3d., it may be introduced into every house. Then the electric tide will slowly ebb. But surely no breakwater was ever so well erected as our last gift from the gods—the popular slot system. Introduced without parade, at first flouted, but finally fostered, it has almost imperceptibly grown into the life-blood of our distributing departments.

**MAKING HISTORY.** When the social history of the nineteenth century comes to be written, gas for lighting, and latterly for heating, cooking, and motive power must bulk largely in it. But it has remained unto these latter days, with its supply from the works to the burner and the stove at an inclusive charge, to number our working classes among its clients, and thus crown the efforts of those who have gone before.

**ASSISTANCE**  
**ACKNOWLEDGMENTS.** This survey of the initiation and development of this important departure, as revealed in published references, from particulars supplied by various professional friends (most of them mentioned in the text) is complete. My sincere thanks and acknowledgments are due to these gentlemen for the assistance rendered; and if my humble efforts should result in inducing some Gas Departments to keep their extra charges below 10d. per 1000 cubic feet, and where less than 20 cubic feet for 1d. are given to charge little if any extra, and develop their consumption by fixing good-sized cookers absolutely free, I shall be well repaid, and they will not regret following me to this

"Last scene of all,  
That ends this strange eventful history."  
"As You Like It," Act ii., Sc. 7.

**Private Bills in Parliament.**—Last Wednesday the time expired for depositing at the Private Bill Office, Westminster, and elsewhere, plans and other documents in connection with Private Bills to be proceeded with during the ensuing session. The plans deposited numbered 363, made up as follows: Railways, 58; Tramways, 14; Miscellaneous, 102; General Provisional Orders, 75; and Electric Lighting Orders, 114. The deposits on the corresponding day of last year for the session of 1898 were: Railways, 61; Tramways, 15; Miscellaneous, 86; General Provisional Orders, 85; Electric Lighting Orders, 85—total, 332.

**Acetylene Gas for Railway Carriage Lighting.**—The use of acetylene gas for lighting trains on the Cape Government railways does not appear to have been attended with success. An experimental plant was fitted to a composite bogie saloon, running on the Eastern system of the railways; but, after a trial, it was removed. The all-pervading odour of the gas was objected to; and the tendency to clog the burners was found to be a serious difficulty. There would seem, nevertheless, to be an opening for an improved means of lighting the railway trains in South Africa. The lighting of those on the main line, we are told, "leaves everything to be desired."

**Large Water-Meters.**—Three large water-meters have been ordered by the Street and Water Commissioners of Jersey City, U.S.A., to measure the supply purchased by the city from the East Jersey Water Company. One is a 20-inch size, and two are for 36-inch pipes. They are provided with spigot ends on both inlet and outlet pipes, so that either bell-end valves or the regular water-mains can be connected at each end, as may be desired. When in place, they form part of the mains, and the shells need not be disturbed to remove the working parts. The latter are made of bronze, and consist of a cylinder in which there is a propeller rotated by the flow of water, and the train of gears to transmit the motion to the register. The propeller has Tobin bronze blades, and is carried on a ball bearing. An extra large screen is provided, and has a flanged opening for a gate-valve, through which the intercepted sediment and *débbris* may be blown out.

**Mineral Resources of the Philippines.**—The American papers publish a report forwarded to the United States Geological Survey by Mr. G. F. Becker, who has visited the Philippine Islands to ascertain their mineral resources. So far as is definitely known, he says the coal of the Philippine Islands is all of the tertiary age, and might better be characterized as a highly carbonized lignite. It is analogous to the Japanese coal and to that of Washington, but not to the Welsh or Pennsylvania coal. Such lignites usually contain considerable combined water (8 to 18 per cent.), and bear transportation badly. Coal exists in various provinces of the Island of Luzon; and a number of concessions for mining have been granted. Many of the other islands contain coal, and in the great island of Mindanao it is known to occur at eight different localities. In the island of Cebu, petroleum has been found associated with coal at Toledo, on the west coast, where a concession has been granted. It is also reported from Asturias, to the north of Toledo on the same coast, and from Alegria, to the south. Natural gas is said to exist in the Cebu coalfields. On Panay, too, oil is reported at Janinay, in the province of Iloilo; and gas is reported from the same island. Petroleum highly charged with paraffin is also found on Leyte, at a point about four miles from Villaba, a town on the west coast.

## TECHNICAL RECORD.

### ACETYLENE.

By VIVIAN B. LEWES, F.I.C., F.C.S.,

Chief Superintending Gas Examiner to the Corporation of London,  
Professor of Chemistry at the Royal Naval College, Greenwich.

[The Second of a Course of Cantor Lectures at the Society of Arts, delivered Nov. 28, 1898.]

In my last lecture, I pointed out that Edmund Davy first made acetylene from a compound produced during the manufacture of potassium from potassic tartrate and charcoal, which, under certain circumstances, yielded a black compound decomposed by water with considerable violence and the evolution of acetylene gas. This compound was afterwards fully investigated by Berzelius, who showed it to be carbide of potassium, and who also made the corresponding sodium compound, and showed that it evolved the same gas; while in 1862 Woehler first made carbide of calcium, and found that water decomposed it into lime and acetylene.

During the past few years, a wordy war has raged as to whether the discovery of the processes by which calcic carbide is now produced is due to the French chemist Moissan or the Canadian experimentalist Willson; and many still seem to imagine that it is the discovery of calcic carbide and acetylene that is in question. In point of fact, our knowledge has advanced but little, save in details, since the labours of Davy, Woehler, and Berthelot clearly defined the preparation and properties of this beautiful illuminant; and the only question in dispute is, who translated the manufacture of carbide and the preparation of acetylene from the ranks of a laboratory experiment (of mere scientific interest) to a commercial success. Carron, in 1860, obtained an alloy of calcium and zinc by heating lime and zinc to a high temperature; and Woehler made his calcic carbide by heating to a very high temperature a mixture of lime, zinc, and carbon, which first formed the calcium zinc alloy, and then carbide; the zinc being volatilized. The compound which he obtained was impure, and very unlike the beautiful crystalline substance obtained at the present time.

It was Sir Humphrey Davy who first demonstrated the heat and light of the electric arc; and it was late in the seventies that Sir William Siemens inaugurated an entirely new era in experimental and metallurgical work, by patenting his electric furnace, in which the electrical energy could be converted into heat, thus yielding a temperature which had never been before available, and which has been estimated by Violle as approximating to 3500° C. As gradually the utility of the electrical furnace came to be recognized, other patents began to be taken out. Bradley patented a furnace in 1883; while Cowles took out his patent in 1885, and in 1886 patented a lining of lime and carbon for the furnace, as being more refractory. Although these furnaces were used for making aluminium, large quantities of carbide of calcium were accidentally formed by the action of the heat on the furnace lining; and during 1886 and 1887 the lads employed in the works used often to amuse themselves in the dinner hour by putting water on the old crucible linings, and igniting the gas which was set free. Even before that date it was recognized and published that in the Cowles electric furnace the oxides, not only of the alkaline metals, but of calcium, magnesium, aluminium, silicon, and boron could be reduced in the presence of carbon, and could be made to form alloys with other metals present, while with aluminium and other metals the crystalline compound made with carbon could be obtained; and further that silicon and the compound of silicon with carbon could be produced. It is clear, therefore, that as early as 1886 calcic carbide was made in the electric furnace; but its formation was merely accidental, and no commercial importance was attached to it.

Soon after this date, Willson conceived the idea of reducing aluminium in the presence of copper to make aluminium bronze; and he employed practically the same method as that used by Cowles. But as his attempts to make the bronze were not successful, and as he was unable to make aluminium owing to the Cowles patents, he endeavoured to reduce magnesium and calcium to the metallic state. It was in the spring of 1892 that he attempted to reduce lime by carbon; and he found that he obtained by this means a fused bath, the boiling of which caused the short circuiting of the electric arc. In order to prevent this spitting of the liquid, and the unequal loading of the dynamo which interfered seriously with the working of the machinery and water turbines, he added to it carbon, which prevented the splashing of the liquid against the sides of the electrode; the only portion of the surface exposed being in the immediate path of the arc.

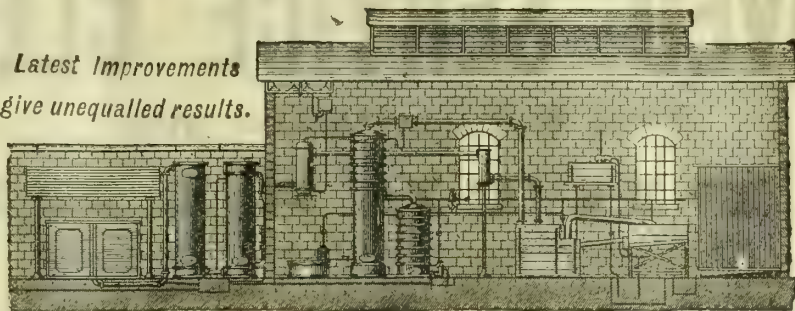
It was in May of 1892 that carbide was obtained by Willson in quantity, and samples were forwarded by him to various scientific friends in America; and it was on Sept. 16 of that year that he privately sent specimens of his carbide to Lord Kelvin, with a letter—a copy of which I have seen in Willson's letter-book, and which amply proves that he was perfectly aware of the importance of the product. This was acknowledged by Lord Kelvin in a letter dated Oct. 3, 1892. About this time, M. Moissan was conducting his classical researches on chemical actions at high temperatures, using for his experimental work an electrical furnace almost identical with the one patented by



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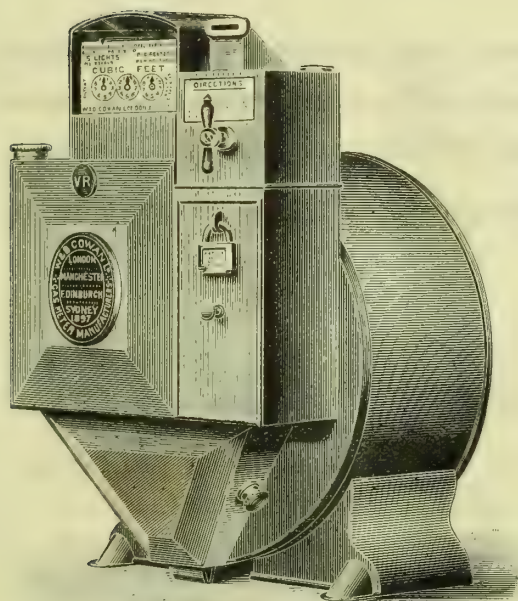
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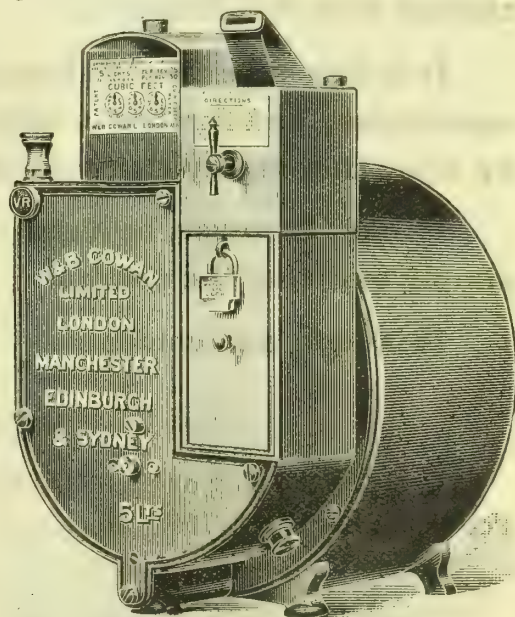
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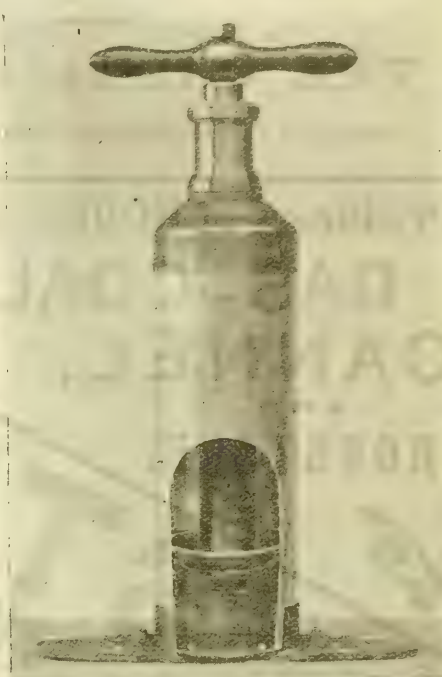
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Siemens in 1879; and while experimenting with calcium, he found that the vapours of the metal acted upon the carbon electrodes, forming calcic carbide in small quantities—a fact which he incidentally mentioned in a paper read before the Academie des Sciences on Dec. 12, 1892. This, however, contained no more of the germs of a commercially possible manufacture than had the discovery of calcic carbide by Woehler, or the attempts of Borchers to make calcic carbide in his experimental furnace which had extended from 1885 to 1891, and who had succeeded in making this body though he had no idea of the importance of his investigations, which certainly were not of a practical kind. The history of the manufacture of the carbides was also added to in this year by Mr. L. Maquenne, who showed on Oct. 17, 1892, that barium carbide could be made by heating barium carbonate with magnesium in the state of powder and charcoal; while Mr. Travers, on Feb. 6, 1893, published his method of making carbide of calcium by heating a mixture of chloride of calcium with metallic sodium and carbon.

It is quite clear that, up to the end of 1892, it was Willson, and Willson only, who had made calcic carbide on anything like a large scale. Nothing would ever have been heard of this material on a commercial scale had it not been that he, in attempting to get capital invested in his process, came across several men of sound practical knowledge whose business instincts led them to grasp the possibilities of carbide and acetylene; and no sooner had these commercial possibilities been noised abroad, than others began to try and make capital from them. In France, in 1894, Bullier took out a patent for the preparation of the carbides of the alkaline earths based on Moissan's researches. M. Moissan himself has never claimed priority in the manufacture of commercial carbide; and, indeed, while lecturing before the New York Section of the Society of Chemical Industry, on Oct. 26, 1896, he distinctly stated that the credit of the first production of calcic carbide on a commercial scale, and the industrial utilization of acetylene, belonged to the Americans. I must say it seems to me that, when this is shown on Moissan's own evidence, further comment is needless.

Willson continued his experiments on the manufacture of carbide on a commercial scale through 1892 and 1893; and having formed a Company, of which Major Morehead was the President, the manufacture was continued at the works at Spray, in North Carolina, in which a dynamo worked by water power, and generating a current of 2000 amperes at 25 volts was employed. By this time the manufacture of carbide was well launched. The first English plant for its production was erected at Leeds; while later on a large installation driven by water power was erected at Foyers, and has been working ever since. This is the source from which nearly all the self-titled manufacturers of calcic carbide in this country obtain their supplies.

On the Continent large numbers of works have been already erected, while others are in progress; and the rapid demand for carbide which has arisen, owing to the introduction of acetylene for railway carriage lighting and the illumination of small towns, has outstripped the supply. From time to time carbide famines are threatened; while the price of the material fluctuates considerably. Practically the same condition exists in America, though the output amounts to between 10,000 and 12,000 tons per annum. So that, though the manufacturers of generators in this country are fond of grumbling at their orders not being filled as rapidly as they wish, they may console themselves with the fact that they are far better off than people in most parts of the world. Even in Germany, which claims pre-eminence in the various branches of chemical manufacture, they obtain up to the present by far the largest portion of the supply of carbide from Switzerland, where the works at Neuhausen turn the carbide out at a lower price than could be competed with by the Bitterfeld works in Prussian Saxony, which had used steam instead of water power. The latter Company have now, however, removed their plant to Neuhausen, where it will be re-opened with water power for the generators; and they are erecting works capable of turning out a very large yield.

The reports of Mr. Frank H. Mason, the American Consul-General at Frankfurt, which constitute perhaps the most valuable contribution to our knowledge of Continental industries, owing to his great practical knowledge and the accuracy of his information, point out that the whole of the carbide industry, so far as Central Europe is concerned, is now in a transition stage, and the conditions of supply and price are likely to be greatly modified by the enormous increase of production which is now being arranged for. Not only have the factories in Germany, Austria, and Switzerland, at work and in course of construction, arranged for the utilization of 35,000-horse power to be devoted to this purpose, but another important accession will come through the operations of a big combination headed by the Schückert Electrical Manufacturing Company, of Nuremberg, who expect to have in operation during the course of next year works in various parts of Europe where water power can be obtained cheaply, to the amount of about 18,000-horse power, capable of producing some 20,000 tons of carbide per annum. There are also ten factories at present at work in France; while four others are in course of construction.

In the manufacture of calcic carbide in the electric furnace, lime and hard metallurgical coke of the highest possible degree of purity are employed; and a good working mixture of these materials may be taken as being 100 parts by weight of lime

with 68 parts by weight of carbonaceous material. About 1·8 lbs. of this is used up for each pound of carbide produced. It must not be forgotten, in computing the cost of carbide, that lime of sufficient purity for the purpose is not only costly but difficult to obtain in large quantities. It is found that, as the ingot of calcic carbide is formed in the furnace, though the ingot itself consists of pure crystalline calcic carbide, it is nearly always surrounded by a crust in which the carbide contains a certain proportion of imperfectly converted constituents, which therefore give a lower yield of acetylene than the carbide itself; and in breaking up and sending out the carbide for commercial work, packed in air-tight drums, the worst of the crust is as far as possible picked out and rejected. It is perhaps misleading to state the amount made per electrical horse power, as a certain amount of loss is of necessity entailed during the breaking and packing. For instance, in practical working I have found that, while the furnace return was 0·504 lb. per kilowatt hour, this amount has been brought down to 0·406 lb. per kilowatt hour when the material has been broken up, sorted, and packed in air-tight drums.

It will be sufficient for practical purposes to state that the cost of the material, labour, and wear and tear of plant, independent of the power used in the electric furnace, but inclusive of packing, for making a ton of packed carbide will amount to from £3 to £4, according to locality, which, of course, entirely governs the cost of the material used; while the cost of the electrical horse power necessary for the conversion of the material will entirely depend on whether it is obtained from steam, gas-engines, or water power—the latter, where obtainable, being the cheapest, and in this country costing nearly £4 per electrical horse power per year.

The two principal processes utilized in making calcic carbide by electrical power are the ingot process and the tapping process. In the ingot process the coke and lime are finely ground and carefully mixed in the right proportions to suit the chemical actions involved. The arc is struck in a crucible, and the powdered mixture allowed to flow in and partially fill the crucible. An ingot gradually builds up from the bottom of the crucible; the carbon electrode being raised from time to time automatically or by hand, to suit the diminution of resistance due to the shortening of the arc by the rising ingot. The crucible is of metal, and considerably larger than the ingot; the latter being surrounded by a mass of unreduced material which protects the crucible from the intense heat. When the ingot has been made and the crucible is full, the latter is withdrawn and another substituted. The process is not continuous; but a change of crucibles only takes two or three minutes under the best conditions, and only occurs once in every ten to fifteen hours. The essence of this process is that the coke and lime are only heated to the point of combination, and are not "boiled" after being formed.

In the tapping process a fixed crucible is used, lined with carbon. The electrode is nearly as big as the crucible; and a much higher current density is used. Fine grinding is unnecessary, as combination probably only takes place after fusion of the raw materials, which mix more or less as liquids. The carbide is heated to complete liquefaction, and tapped at short intervals. There is no unreduced material; and the process is considerably simplified, while less expensive plant is required. But, on the other hand, the output in carbide per electric horse power per day is considerably less than in the ingot process; and it is only more economical when power is comparatively cheap.

Many attempts have been made to economize the amount of current necessary in making the carbide, by heating a mixture of lime and carbonaceous material before exposing it to the action of the arc; but it has never been clearly demonstrated that anything has been gained by doing this. When the manufacture of calcic carbide was in its infancy, the idea of preheating the constituents, to save in the current, was a favourite one with inventors; and a large number of patents were taken out for electric furnaces working on this principle. But with extended practice, the fallacy of this economy became apparent.

The best carbide is made when a finely powdered and intimate mixture of pure lime and coke of very low ash is presented to the action of the arc for just sufficient time to fuse it and convert it into carbide. If, however, attempts are made to preheat this mixture by exterior heating, some of the carbon is burnt away, and the proportion of carbon to lime altered; while if interior heating be attempted, the rush of hot gases carries away the lighter particles, and destroys the homogeneous nature of the mixture in that way as well as by burning off carbon. If attempts be then made to overcome these evils by using a coarsely ground mixture of the ingredients, a bad carbide is produced, owing to the interaction between the carbon and lime never being properly completed; and in attempting to overcome this last trouble, the material is often kept too long in the arc, thereby lowering the quality of the carbide still further by overheating. M. Nicolai has shown that overheating leads to dissociation of some of the carbide; and the result of this is well indicated by remelting a sample of carbide of known composition, after which it develops about 12 per cent. less gas than before, while a second remelting more than doubles the loss. Another grave disadvantage of overheating also is that metallic calcium is produced, which during the decomposition of the carbide by water gives rise to hydrogen. In one class of furnace, the raw



coke and lime are heated before entering the furnace crucible by being placed in a metal bin subjected to the action of the hot furnace gases, and sometimes heated by a fire from underneath.

Pictet places a mixture of comparatively large pieces of lime and coke, with a considerable excess of the latter, in a refractory crucible which has a hole at the bottom, below which a horizontal arc furnace is situated. A row of tuyeres round the upper part of the crucible supplies a hot blast of air, which consumes some of the coke which has been previously ignited, and thereby heats the descending charge. A second row of tuyeres lower down in the crucible supplies water gas and hot air simultaneously, and heats the mixture to a still higher temperature. The mixture then passes out between the carbon poles; and the carbide is said to be made. Here, again, it is very doubtful whether the economy claimed for this process is borne out in practice, as the gain from the prior heating of the material (if any) is more than counterbalanced by the difficulty of reducing the large lumps; while the expense of the water gas and air blast would be no small item, and the quality of the carbide in all probability would not be of the best.

There is a rotating furnace which is used in one large works in the United States; and there are modifications of this which I believe are being tested by Mr. Willson. A rotating drum of cast iron is fitted round its periphery with a number of removable iron plates, thus forming an annular space on the outside. The carbon electrodes are placed in a hopper made of refractory material at one side of the drum; the electrodes being parallel to two opposite sides of the hopper; and meeting (with the formation of an arc) just over the annular space in the drum. Only one-half or two-thirds of this annular space is closed at a time; the closed part extending from just below the hopper downwards to the other side. A mixture of powdered coke and lime is fed into the hopper, some falling between the electrodes, which are then drawn apart as carbide is formed, until a block of carbide 4 or 5 inches thick is built up between the electrodes, while an arc plays on both sides of the block between the electrodes. The electrodes are now clamped down; and as the ingot tends to short-circuit the arcs, the drum is rotated a little by worm gearing, thereby drawing a little of the ingot and mixture into the annular space, and introducing more raw material to the arc. This process goes on continuously, until the carbon poles are exhausted. The carbide forms round the drum, and is broken off in pieces on the other side by removing the periphery plates as they come round.

I have had the good fortune to be able to secure photographs of some of the most interesting machinery connected with the carbide manufacture; and you will see that the plant used at nearly all the large factories may be looked upon as developments of Willson's original plant as used at Spray, the photograph of which I think is of exceptional interest.

During the past year the air has been full of reports as to various processes for making carbide without the aid of electricity; and it is said that this has been successfully accomplished. But I confess that until I have the evidence of my own senses to go upon, I shall remain sceptical as to the carbide being produced more economically by such means than by electricity, even if produced at all on a large scale. In 1894 and 1895, I made many experiments in this direction, built up a small experimental plant, and used every method for generating high temperatures that was available; and I succeeded in fusing practically everything save the mixture of lime and carbon. It was an easy matter to run down the lining of the furnace—indeed, to melt the whole furnace itself—but the direct combination of the carbon with the lime was not to be obtained in this way. It then seemed probable that the result might be secured by highly heating lime in the presence of decomposing hydrocarbons, so that the nascent carbon might combine with the lime at the moment of its liberation. But this was tried in many different ways without any very encouraging results, though it is possible, by decomposing such organic compounds as calcic tartrate by heat and raising the temperature of the mass, to get traces produced. The price of the organic compounds, however, under these conditions would be prohibitive.

Another point which always seemed to be against the direct formation of calcic carbide by heat is that the temperature needed for its formation is  $2700^{\circ}\text{C}$ ., and if you take calcic carbide and attempt to fuse it at any obtainable temperature short of the electric arc, you fail to do so; while if the oxy-hydrogen blow-pipe be used for this purpose, not only do you fail to fuse the carbide, but you decompose that which you already have, and the lump which is left behind consists mainly of carbon, carbonate of lime, and lime. It is possible, however, that by using carbon burning in oxygen a sufficient temperature could be reached to fuse the mixture, or at any rate induce the combination of the mixture of lime and carbon with the formation of carbide; but the temperature which would do this would prove fatal to the furnace itself. There is not the slightest doubt that the next year will see very many experiments with gaseous mixtures rich in oxygen, made at a remarkably cheap rate by methods such as the Linde process for liquefying air and allowing the nitrogen to boil off; and some of these may be successful in overcoming the existing difficulty. It is reported that Dr. Borchers has succeeded in making carbide by some method akin to this; but there are many considerations which lead to the belief that, even if this feat has been accomplished, its practical value will be but little. Given water gas, regenerative settings, and cheap

oxygen, an enormously high temperature can be attained; but the material of which to build a crucible or furnace that will stand it, has yet to be discovered.

In using the electric furnace, the intense heat of the electric arc is generated in the centre of the mass to be fused by it, and so the wear and tear to the furnace is avoided. But this would be practically impossible, even if the requisite temperature could be reached, by a combustion process; and the result would be that the electrical heating would probably be less expensive than the other. It is perfectly well known that if a temperature commercially practicable is to be used, some metal with a strong affinity for oxygen must be employed to reduce the lime to calcium before combination with the carbon will take place. But such metals as will do this—potassium, sodium, and magnesium, or even zinc—are costly; and if a process were devised in which the vapours of such metals were liberated by reduction from their salts, and were made to interact with carbon and lime at a high temperature, it could only be made commercially possible either by a large demand being created for the bye-product, or by its being capable of being cheaply worked up and used over again. In either case the probabilities are that the cost would exceed that of making carbide by electricity generated by water power.

Another point of a purely unscientific character is that during the past few months very large amounts of capital have been subscribed for the erection of factories for making carbide by water power on the Continent; and practically little or none can be traced for processes for making carbide without electricity—which shows no great amount of confidence in the many schemes suggested. There is a Company in Liepzig, having works at Cassel, who are supposed to make carbide without electricity, by smelting the constituents by acetylene blow-pipes working under considerable pressure; but it does not appear possible that this could be made to compete economically with the ordinary electrical method.

One of the schemes for the manufacture of carbide is for producing it from blast-furnace slag, which contains a certain amount of lime, together with all the impurities derived from the fuel, ore, and limestone used in the furnace. According to the inventor, this mixture is to be run into Bessemer converters, impregnated with coke powder blown into it through the converter trunnions, and is then poured out between a series of carbon electrodes between which a powerful current is flowing. In twenty minutes this converts the slag into a material named by the inventor "carbolite," and which is supposed on contact with water to yield 5 cubic feet of gas per pound. Such a substance might contain 40 per cent. of carbide of calcium; but the impurities would be so pronounced that it would be practically useless for generating acetylene for indoor lighting.

Carbide of calcium as formed in the electric furnace is a beautiful crystalline semi-metallic looking solid, having a density of 2.22, and showing a fracture which is often shot with iridescent colours. It can be kept unaltered in dry air; but the smallest trace of moisture in the atmosphere leads to the evolution of minute quantities of acetylene, and gives it a distinctive odour. It is infusible at temperatures up to  $2000^{\circ}\text{C}$ ., but can be fused in the electric arc. When heated to a temperature of  $245^{\circ}\text{C}$ ., in a stream of chlorine gas, it becomes incandescent—forming calcic chloride, and liberating carbon; and it can also be made to burn in oxygen at a dull red heat, leaving behind a residue of calcic carbonate. Under the same conditions, it becomes incandescent in the vapour of sulphur—yielding calcic sulphide and carbon disulphide; while the vapour of phosphorus will also unite with it at a red heat. It is composed of: Calcium, 62.5 per cent.; carbon, 37.5.

Acted upon by water, calcic carbide is at once decomposed, yielding acetylene and calcic hydrate. Pure crystalline calcic carbide yields from 5.5 to 5.8 cubic feet of acetylene per pound at ordinary temperatures; but the carbide as sold commercially is a mixture of the pure crystalline material with the crust which in the electric furnace surrounds the ingot, and which, of course, yields less gas; the two being blended together to yield an average of 5 cubic feet of gas per pound of carbide under proper conditions of generation. But, as we shall see later, the volume of acetylene to be obtained from the carbide depends very largely upon the form of apparatus used; and while some will give the full 5 cubic feet, other apparatus will only yield with the same carbide  $3\frac{1}{2}$  cubic feet.

The purity of the carbide entirely depends upon the purity of the materials used in its manufacture; and before this fact had been fully grasped by the manufacturers of carbide, and only the purest material obtainable employed, the carbide contained notable quantities of compounds which during its decomposition by water yielded a somewhat high proportion of impurities in the acetylene generated from it. And although at the present time a marvellous improvement has taken place all round in the quality of the carbide produced, the acetylene nearly always contains minute traces of hydrogen, ammonia, sulphuretted hydrogen, phosphuretted hydrogen, siliciuretted hydrogen, nitrogen, and oxygen, and sometimes minute traces of carbon monoxide and dioxide.

The formation of hydrogen is caused by small traces of metallic calcium occasionally found free in the carbide; and cases have been known where this was present in such quantities that the evolved gas contained nearly 20 per cent. of hydrogen. This takes place when, in the manufacture of the carbide,



the material is kept too long in contact with the arc, as this overheating causes the dissociation of some of the calcic carbide and the solution of metallic calcium in the remainder. The presence of free hydrogen is nearly always accompanied by siliciuretted hydrogen, which is formed by the combination of the nascent hydrogen with silicon in the carbide. It has usually been stated that this siliciuretted hydrogen has been formed by the decomposition of silicides present in the carbide; but in spite of a long series of experiments which I have made, I have never yet been able to form a metallic silicide which will decompose with water with the evolution of this gas, and the silicides which analyses prove to be present in the carbide are certainly not decomposed in this way.

The ammonia found in the acetylene is due to the presence of magnesium nitride in the carbide; and this is formed by the metallic magnesium in the molten condition in the ingot taking up nitrogen from the air. When this comes to be decomposed by water, ammonia is produced by the action of steam or of nascent hydrogen on the nitride; the quantity formed, however, depending very largely upon the temperature at which the carbide is decomposed. The formation of nitrides by actions of this kind, and their easy conversion into ammonia, will probably at some no very distant date prove to be a useful method of fixing the nitrogen of the atmosphere and rendering it available for manurial purposes, though it could never compete in price with ammonia formed in the distillation of coal for coal gas.

Sulphuretted hydrogen, which is invariably present in commercial acetylene, is formed by the decomposition of aluminium sulphide; and it has been shown by Murlot that aluminium sulphide, zinc sulphide, and cadmium sulphide are the only sulphur compounds which can resist the heat of the electric furnace without decomposition or volatilization. Of these, aluminium sulphide is the only one which is decomposed by water, with the evolution of sulphuretted hydrogen. In the early samples of carbide, this compound used to be present in considerable quantity; but now it has been reduced to so small a limit that one rarely finds more than one-tenth per cent. of sulphuretted hydrogen in the acetylene generated from commercial carbide.

Phosphuretted hydrogen, which is one of the most important impurities, and which has been blamed for the haze formed by the combustion of acetylene under certain conditions, is produced by the action of water upon traces of calcic phosphide found in carbide; and though at first it was no uncommon thing to find a half per cent. of phosphuretted hydrogen present in the acetylene, this has now been so reduced by the use of pure materials that the average quantity is rarely above one-fifteenth hundredth of a per cent., and often not one-fifth of that.

I have made many experiments on the effect of the impurities in calcic carbide upon the safety of the material, and have come to the conclusion that such impurities as are now found in the commercial carbide may be looked upon as practically innocuous. With proper care and supervision in the selection of the materials for making the carbide, all trouble on this score may be disregarded, as spontaneous ignition due to the liberation of phosphuretted hydrogen which would be the chief risk dependent on the use of impure material is now practically impossible.

In the earlier days of carbide manufacture, several cases of the spontaneous ignition of the gas occurred; and though the analysis of many different brands of carbide from all countries of the world show that in the carbide itself there is not sufficient impurity to bring about this result, it seemed possible that the concentration of the phosphorus compounds might take place in the outer crust formed around the ingot during manufacture. Experiments were made therefore to see if this were so. By the courtesy of the Acetylene Illuminating Company, a portion of an ingot with its crust intact was obtained; the crystalline material of the ingot containing 96.7 per cent. of true carbide, while the crust, though varying very much in composition according to its distance from the ingot, contained an average of 51.9 per cent. of carbide. A second sample of ingot and crust gave even better results; the ingot containing 99 per cent. of carbide, and the crust 77 per cent. Analyses were made of the acetylene from these samples; but the results showed no indication of the poorer material being richer in phosphorus compounds than the ingot itself.

On breaking up some ingots of calcic carbide, metallic nodules manifestly differing from the pure carbide are observed, and are far more abundant in specimens of foreign manufacture than in English-made carbide. These nodules are generally found in a spherical or oval shape, and have evidently separated from the molten mass on the crystallizing of the true carbide. From this it seemed highly probable that a concentration of the impurities might take place, and that the presence of these nodules might be an active source of danger.

In order to verify this point, calcic carbide was obtained in bulk; and both English and foreign makes were represented. This carbide was then carefully broken up; and the nodules and anything which appeared to differ from true carbide were collected. The nodules differed somewhat in appearance; two distinct varieties being clearly noticeable: (a) Grey nodules, not attracted by the magnet, and not oxidized when exposed to the air or heated as a solid lump in the blow-pipe flame. Specific gravity, 3.5 to 5.8. In a fine powder some had a very faint garlic-like odour, gained 5 per cent. when heated for half an hour, and attacked platinum when heated on it for some time. These

nodules gave no gas when acted upon by water. (b) Steel-like nodules, which were strongly magnetic, and became coated with iron rust when exposed to moisture and air for some time, and which gave no gas when acted on by water. Specific gravity, 6.3 to 6.8.

Analysis showed that the foreign matter present in the carbide consisted of carborundum or silicide of carbon; metallic silicides; iron, occasionally metallic calcium, magnesium, aluminium, and traces of nitrides; phosphorus and sulphur compounds. One of the nodules on analysis yielded—

|                     |        |
|---------------------|--------|
| Silicon . . . . .   | 30.76  |
| Iron . . . . .      | 58.06  |
| Calcium . . . . .   | 2.65   |
| Aluminium . . . . . | 3.01   |
| Magnesium . . . . . | 0.64   |
| Carbon, &c. . . . . | 4.89   |
|                     | 100.00 |

None of these substances gave spontaneously inflammable gases when acted upon by water; but in a few instances a nodule was found which evidently contained magnesium silicide, and which, when powdered and acted upon by hydrochloric acid, gave a few bubbles of spontaneously inflammable gas.

M. Gerard, Chief of the Municipal Laboratory at the Prefecture of Police, Paris, has also analyzed some of these nodules, with the following results:—

|                                   |         |         |
|-----------------------------------|---------|---------|
| Iron . . . . .                    | 55.027  | 53.250  |
| Silicon . . . . .                 | 33.172  | 31.800  |
| Aluminium . . . . .               | 5.579   | 8.910   |
| Calcium . . . . .                 | 2.764   | 4.120   |
| Not determined and loss . . . . . | 3.458   | 1.920   |
|                                   | 100.000 | 100.000 |

M. Gerard found that these alloys, pulverized and treated with concentrated acid, gave off siliciuretted hydrogen. In some cases, it was discovered that the carbon deposited by holding a cold surface in an acetylene flame contained traces of silica; and this seems to support the idea that siliciuretted hydrogen may occur in the acetylene. But if it does, the amount is so small as certainly to give no danger of spontaneous ignition. A sample of gas which appeared to give a considerable quantity of silica was burnt under such conditions as to allow of the silica being collected; and on estimating the quantity formed, it was found to correspond to 0.01 per cent. of siliciuretted hydrogen in the original gas.

M. Gerard also carried out a number of extremely interesting experiments upon the products found in the residues left after treating the calcic carbide with water; and he succeeded in extracting from them minute diamonds. The residues were, as far as possible, dissolved in hydrochloric acid, and the insoluble portion separated by filtration and washing with water; the metallic portions being separated by sieving. The finer portions were collected on a filter paper, washed, and dried, and were then heated with potash in a silver capsule, and the insoluble portion treated with aqua regia. After repeating this drastic treatment two or three times, the residue was put into a separating funnel containing a saturated solution of the double iodide of mercury and potassium (which has a density of 2.9), in which silicide of carbon will float, while graphite sinks. This silicide of carbon is then purified by being treated several times with concentrated hydrofluoric acid, and after washing is dried; while the graphitic bodies are treated and separated with iodide of methylene, which has a density of 3.29.

The separation of diamondiferous bodies from the silicide of carbon is effected by a saturated solution of cadmium bromotungstate or iodide of barium and mercury. Microscopic slides of these various bye-products were sent by M. Gerard to Mr. Worth, of the Acetylene Illuminating Company, who from the first has kept in touch with all the leading chemists in Europe, and has supplied them with any samples of English carbide that they needed; and it is through the courtesy of Mr. Worth that I am able to show you these fine slides prepared from the bodies extracted by M. Gerard. The labour entailed in the separation of this diamond-containing powder may be estimated when it is stated that it was necessary to treat no less than between 700 and 900 lbs. of carbide in order to obtain 154 grain of this material. The evidence upon which M. Gerard bases his assumption that these minute crystals are in reality diamonds formed at the intense temperature of the arc, is that when they are burnt in oxygen they yield nearly the theoretical volume of carbon dioxide. M. Moissan has failed to find diamonds in the specimens of carbide he has examined; but this is probably due to the quantities worked with being far smaller than those treated by M. Gerard.

There is no more risk in the storage of calcic carbide than there is in storing any other inert material, provided it is packed dry and warm in hermetically sealed drums, so as to render it impossible for it to come in contact with water or moist air. The real risk is in the removal or redistribution of the material. After opening a drum it may not be again properly closed; and if the drum be left in this condition in the moist air of an ill-ventilated cellar, it is quite possible for a slow generation of gas to take place, and for an explosive mixture to be formed by its accumulation. All carbide stores should be thoroughly well ventilated and above ground; and when this is the case, all danger is practically done away with.

For the carriage of carbide, it is important not only that



the drums should be air-tight, but that they should be of sufficient strength to resist the rough usage incidental to the handling of a heavy product; and where tins are used, they should always be protected by an exterior wood case.

### AMERICAN GASLIGHT ASSOCIATION.

The Twenty-Sixth Annual Meeting at Niagara Falls, N.Y.

(Continued from p. 1164.)

A paper on "The Loss of Illuminating Power of 25 to 30 Candle Gas when Mixed with Air," was read by Dr. E. G. Love, of New York. The author commenced by referring to a table showing the results of experiments in this direction, as published by Audouin and Berard in 1862, Aitken in 1878, Smith in 1885, and Schilling and Ries in 1891. These results varied so much that they could not be accepted as conclusive; but they showed in a general way that gas of low quality suffered more by admixture with air than a high-candle gas, and that in either case the injurious effect was greater with flat flames than with argand burners. The percentage of loss for each 1 per cent. of air present in the gas was 6 to 7 per cent. with flat flames, and 4 or 4½ per cent. in the case of argands. All these tests were made with coal gas; and the author was not aware that similar examinations had been made of water gas. He produced a table embodying the results of five series of tests made by himself upon water gas of 25½ to 26½ candle power, each series including a number of mixtures ranging from 3 to 40 per cent. of air. The burner used was a No. 7 Bray slit-union; and the loss of illuminating power per cent. of air added remained fairly regular at 2 per cent. up to 10 per cent. of air, but showed a steady rate of increase in somewhat more than mere arithmetical proportion. Starting with 2.03 per cent. for each unit in a mixture containing 3 per cent. of air, it rose by regular increments to 2.38 per cent. in a 12 per cent. mixture, and to 2.67 per cent. in a 24 per cent. mixture. The loss of value for water gas was therefore approximately only about one-half that arrived at by other experimenters for coal gas; but, of course, the tests were made under different circumstances, and were not fairly comparable. With regard to the appearance of the flame, photographs were exhibited which showed that no marked change was observable if the proportion of air present was not more than 5 per cent. The effect of additions of air was to diminish the size and impoverish the appearance of the flame; and this was, of course, the more prominent with larger proportions of air. The author had made a few observations with an argand burner, and found that the loss by admixture of air was very small; but the effects were more noticeable in the appearance of the flame than at the photometer disc. The first effect was a shortening of the flame, followed by the disappearance of the reddish tip, and a decided increase in the intensity of the brighter portion. At about 25 per cent. of air, the height of the flame was reduced fully one-half; the effect being similar to that produced by lengthening the chimney.

Discussion being invited, Mr. Wheeler said that he had made some tests upon a 24-candle half-and-half gas, and had always found that 5 per cent. of air reduced the illuminating value 13 to 14 per cent. Similar results were observed with a 23-candle water gas. The amount of air that could be safely admitted during the process of oxide purification was under 2½ per cent. The usual practice was, perhaps, 1½ per cent., with which some claimed that there was no loss, and others a slight gain, in luminosity. In this connection, the experiments of Professor Lewes, communicated at the 1897 meeting of The Gas Institute, on the quantity of air, nitrogen, and carbonic acid required to render the flame of a 17-candle gas non-luminous when consumed through a bunsen burner, might be referred to. About 2.3 volumes of air or nitrogen, or a little over one-half this proportion of carbonic acid, rendered the flame completely non-luminous. But with a 43-candle gas, the quantities were respectively 7.9 volumes of air, 4.7 volumes of nitrogen, and 3.1 volumes of carbonic acid—showing that rich gas required far less nitrogen than air to bring about loss of luminosity. A 24-candle gas needed 5.4 volumes of air; and there was also a difference between the proportions required for blue, compared with green, non-luminous combustion. Mr. A. C. Humphreys said that in experiments of this kind it was necessary to bear in mind the initial illuminating power, and the kind of burner used. For instance, it was possible to make a burner that would give better results with 40 per cent. of air than without any air at all. A considerable quantity of air could be added to a rich oil gas without depreciating its practical value.

Dr. Love, in reply, said that photography did not give the exact size and appearance of the flame, as the actinic rays were the only ones that affected the photographic plate. The subject could be followed out in many different ways, some of which were more interesting to him personally than the line he had chosen. He had aimed at treating it as a thoroughly practical question that might be of service to the gas fraternity; but, of course, it might be dealt with scientifically, both as to the proper burners for securing the best results from each mixture and as to the composition of the gas used. The results were affected not so much by the candle power as by the carbon constituents that made up that power.

Mr. J. M. Rusby, of Jersey City (N.J.), read a paper on "The Depth of Fire in a Water-Gas Set," giving the results of some special tests made with a standard double superheater Lowe apparatus, of 5 feet internal diameter, and using naphtha and anthracite coal. The first set of tests was made with a fire 7 feet deep, alternate up and down runs of seven minutes each, similar periods for blowing, and cleaning every twelve hours. The power consumed in blasting was 24 indicated horse power; and the pressure, from 7 to 8 inches of water. The average make of gas (corrected) was 8450 cubic feet per run; the consumption of steam in the generator, 32 lbs. per 1000 cubic feet of gas made. The heats were good, and the consumption of coal and oil satisfactory. In the second series of tests, the fire was only 3 feet deep, with runs and blows as before; but the power consumed in blasting was only from 8 to 14 indicated horse power, and the pressure 5 inches. The fire was cleaned once in seven hours. The make of gas per run was about 5500 cubic feet; the consumption of steam, 48 lbs. The net consumption of fuel was 6 per cent. more per 1000 cubic feet of gas made, and the consumption of oil a little more than in the first series. The conditions of the third series of tests were similar to those of the second, except that the length of blow was varied from three to seven minutes. The make of gas per run was still lower; but the shorter blows caused some economy of fuel. The heats, however, were low, and the consumption of oil excessive. A number of holes were made through the sides of the generator, through which perforated iron tubes could be passed so as to get samples of gas from all parts of the fire. Even with the heaviest blast, it was found that free oxygen disappeared entirely at 2 feet above the grate. As the temperature of the fire rose, during the process of blasting, the conversion of carbonic acid to carbonic oxide was almost coincident. With a seven-minute blow, at a point 2 feet above the grate, the percentage of carbonic acid would range from 17 at the beginning to 7 at the end. The conversion was increased by depth of fire, as the percentage of carbonic oxide was continually increasing toward the top of the 7-foot fire. But owing to the comparatively low temperatures at the upper part, this increase was small; the conversion chiefly taking place in the hot belt found at 2 to 3 feet above the grate. The percentage of carbonic oxide was considerably increased by partially closing the blast-valve so as to reduce the supply of air. With a three-minute blow, the proportion of carbonic acid could be kept within 11 to 16 per cent.; and it was always 2 or 3 per cent. less after a down run than after an up run, because the fire was hottest after a down run. A few analyses of water gas were also made. The percentage of carbonic acid in the uncarburetted gas would increase at the rate of 2 or 2½ per cent. during the progress of a run; but it was reduced by shortening the run and decreasing the steam supply. In making plain gas, the object was to keep as much of the heat in the generator as possible; but when carburetted gas was desired, the superheaters also required to be heated up. This had to be done by the combustion of carbonic oxide from the generator; and it needed a sufficient period of time. A great increase in production of gas, both per minute and per run, was obtained when the depth of the fire was increased to 7 feet. As much air was supplied to the shallow as to the deep bed, and the combustion was complete in each case. The larger production was therefore due to the absorption of heat from the blast gas in the upper part of the fire. But this did not mean increased economy of fuel, because the percentage of carbonic oxide was also increased, and there was a loss of carbon. The upper part of the fire, however, stored heat during the blast, and gave it out during the run, increasing the quantity and also the temperature of the product, and thus making the work of the carburetter and superheater more regular and easy of control. A shallow fire offered the advantage of a saving of power in blasting, and the reduction in size and speed of the blowers; but against this a larger or a specially designed generator was required to give the same productive capacity as a deep fire. The consumption of steam, and the difficulty of properly heating the fixing vessels, would also be increased. The coarseness or fineness of the fuel used largely affected the depth of the fuel-bed; and with the kind of fuel at his disposal, he believed a depth of 5 to 6 feet, with short blows, would give the best all-round results.

Mr. Norris, in opening the discussion, said it was evident that the heat retained in the fuel-bed after blowing up was the difference between the calorific value of carbon and the heat carried off, as sensible heat or as potential heat, by the products of combustion. Anything that tended to reduce the heat carried off, would therefore tend to economize fuel. A shallow bed of fuel would give less potential heat carried off because the percentage of carbonic oxide in the escaping products would be less, but more sensible heat as the products did not have so much opportunity of giving up their heat to the upper part of the bed of fuel. The effect of reducing the depth of the fuel-bed was a gain in one way and a loss in another; and it did not appear from the figures quoted that the net consumption of fuel per 1000 cubic feet of gas made was very largely affected by the depth of the fuel-bed. But in other ways there was a marked advantage with the deeper fire. The author's analyses also showed that the percentage of carbonic acid in the products was affected more by the temperature than by the depth of the fuel. Commencing with 18 per cent. of carbonic acid at the beginning of the blow, there was less than 10 per cent. at the end, and, of course, a proportionate increase of carbonic oxide.



A common idea was that fuel would be saved by cutting off the last minute of the blow; but this was a mistake, as reducing the length of the blow would also reduce the length of the run. He proceeded to quote a number of analyses of products of combustion, made with a 4-inch blast pressure, and with gas coke as fuel, in a 6-foot generator. In each case the percentage of carbonic acid gradually decreased, being only about half the quantity by the end of the seventh minute, as at the end of the second. The carbonic oxide showed a corresponding increase; reaching 18 or 20 per cent. at the end of the seventh minute. The proportion of carbonic acid had been shown to be to some extent independent of the depth of fuel. The deeper the fuel, the stronger the blast, and therefore the larger the quantity of steam admitted. The decomposition of steam tended to increase the bulk of the gas, and therefore apparently to reduce the percentage of carbonic acid, though the actual quantity might remain the same. Mr. Miller had made some experiments to check the author's results; and they showed a marked agreement. He had also determined that the more economical plan was to run the fire at a low temperature. Mr. Egner remarked that Dellwik obtained the advantages of both the shallow and the deep fire, by admitting air into the generator at various levels above the grate. He was thus able to make short blasts and save fuel, at the same time getting sufficient heat to decompose all the steam. Dellwik's idea seemed to be that in the ordinary form of apparatus there was a waste of heat by the production of an unnecessarily large proportion of carbonic oxide; and he aimed at obtaining more carbonic acid in the products of combustion. Mr. Searle had given close attention to the operating of a water-gas set; and he found the best results were obtained with a 3 or 4 foot fire, and a high-pressure blast. In working with anthracite coal, after a time the lumps became coated with ash, and the strong blast penetrated this coating more efficiently than a weak one. A separate generator might work with less fuel; but it required ten times the attention necessary for a double superheater set, and was neither efficient nor economical. He gave anthracite a ten to twelve minutes' blast, but could work gas coke with two-minute blasts and five-minute runs. He regulated the depth of fuel and length of blow according to the quality of the fuel. Mr. Francis Carroll had found that as good a quality and yield of gas could be obtained from a 3-foot bed of fuel as from a 6 foot one; but there was too much danger in working the low fuel bed. Mr. Forstall said that the separate generator appeared simpler and easier in working than the combined set; and he hoped someone would find out how to work it as cheaply. He was rather hopeful about the Dellwik process, as there was less danger of loss of sensible heat than of loss of carbonic oxide. He had worked both the separate and the combined systems; and his experience differed from that of Mr. Searle.

Mr. Rusby, in reply, observed that Dellwik had shortened the blast considerably; and in his opinion this accounted for the improved results. Gas coke was more porous, and therefore a worse conductor of heat, than anthracite; consequently it heated up more rapidly under the blast. With a high temperature in the generator, the formation of carbonic oxide was immediate; and if a coke fire got very hot on the surface, there would be a large production of carbonic oxide. In this case, the only thing possible was to reduce the thickness of the fuel-bed.

(To be continued.)

**Gas Workers' Pay and Holidays at Blackburn.**—The Secretary of the Gas Workers' Union has made application to the Blackburn Corporation Gas Committee for an increase of the wages of the labourers, and a week's holiday with pay for all the men employed at the gas-works. Last Thursday, the Town Council confirmed a resolution of the Committee that the matter should be deferred until the next meeting, and that in the meantime the Gas Engineer should prepare a tabulated statement showing their position in the matter.

**Street Lighting by the Incandescent Gas System.**—Now that the question of the adoption of the Welsbach system for street-lamps is being discussed more or less by lighting authorities in various parts of the kingdom, it is interesting to note that in Liverpool, where the Corporation are the owners of the electric light undertaking but not of the gas-works, they nevertheless employ the above-named system for illuminating the thoroughfares of the city, while recommending the use of the electric light to the public generally. The fact affords evidence of the satisfaction of this important Local Authority with the incandescent gas system on the score of economy and efficiency.

**Letting Gas-Stoves on Hire at Southport.**—On Monday last week, Mr. E. P. Burd, one of the Inspectors of the Local Government Board, held an inquiry at Southport respecting an application by the Corporation for a Provisional Order authorizing them to borrow an additional sum of £5000 on the gas-stove account, and for the purpose to amend the Order of 1895, by altering the amount to be borrowed from £10,000 to £15,000. Among those present were Dr. Williams (Town Clerk), Mr. G. Lloyd (Borough Accountant), and Mr. J. Booth (Gas Engineer). The Town Clerk said the Corporation had borrowed the sum of £10,000, and had already expended about £8600. They estimated that the whole of the amount would be spent by about May next, and that the additional £5000 for which they asked would carry them on for about two years. The Borough Accountant and the Gas Engineer gave evidence in support of the application, showing by statistics the great increase there had been in the sale and hire of gas-stoves in the borough. It was stated that the profit on the gas sold for cooking purposes came to 1½d. per 1000 cubic feet. The net profit on the gas supplied for cooking and lighting last year was £6800. The inquiry only lasted a few minutes.

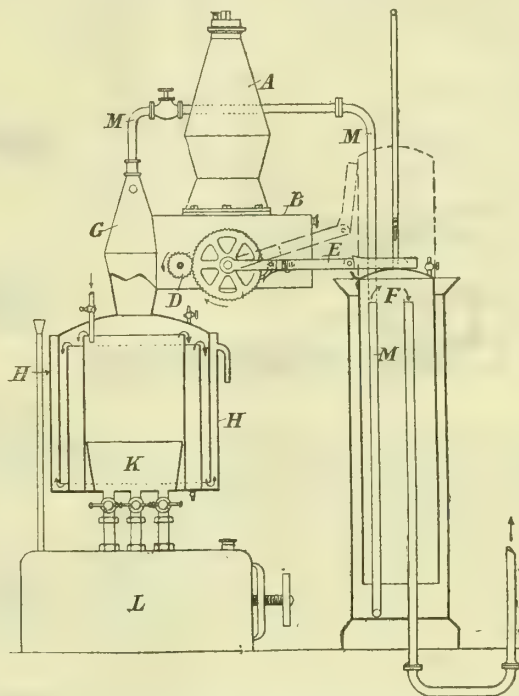
## REGISTER OF PATENTS.

**Burners for Incandescent Gas Lighting.**—Wilson, J., of Birmingham. No. 24,328; Oct. 21, 1897.

The patentee proposes to use, in the manufacture of an atmospheric burner for incandescent gas lighting, a "Bray's regulator burner," for the purpose of governing the amount of gas passed into a conical mixing-chamber, the lower part of which is in the form of a flat plate.

**Production of Acetylene.**—Ravel, L. de, of Marseilles. No. 25,002; Oct. 28, 1897.

The patentee claims as his invention "an automatic and unexplodable apparatus for the production of acetylene gas, characterized by the combination of a hopper and of an oscillating receiver with a distributor-transporter, with endless band always worked in the same direction, automatically by the descent of the bell of the gasometer, through a lever with pawl and toothed gearing."

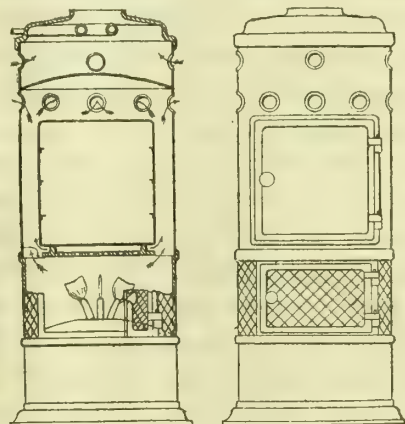


The distributor comprises a hopper A (hermetically closed at top), disposed upon an automatic "distributor-transporter" shut in a box B. In the box B, and beneath the hopper, a receiver oscillates on a transverse shaft; and underneath is arranged an endless band carried by two rollers provided with a pinion D, gearing into a toothed wheel, which causes it to rotate in the direction shown by the arrow, and so bring the carburet from the receiver to the gasogene. The travel of the transporter and the oscillations of the receiver are effected by a lever E, which is raised by the gasometer bell F through a projection, and lowered with it by reason of its own weight when the bell is lowered and no longer supports it. From the band the carburet falls into the gasogene, which is surmounted by the hopper G, having free communication with the box B. The bottom of the hopper is in communication with a fixed bell integral with an exterior vessel H with a waste-pipe. Arranged concentrically within the vessel H are two other vessels, one higher than the other. Finally, in the middle of the central vessel is disposed a tank K, for receiving the carburet falling from the transporter. This tank is in communication with a lime-tank L. At the upper part of the fixed bell, and above the central vessel, is a tube fitted with a cock, for the inlet of water, which it directly pours into the vessel at the time of the charging.

At the top of the part G is a conduit M, with cock, for the passage of the gas from the gasogene to the gasholder already described.

**Gas Heating Apparatus.**—Richmond, E. W. T., of Warrington. No. 25,252; Nov. 1, 1897.

This is a combined stove and oven, with illuminating gas-burners affording the heating medium. It depends for its equal distribution of



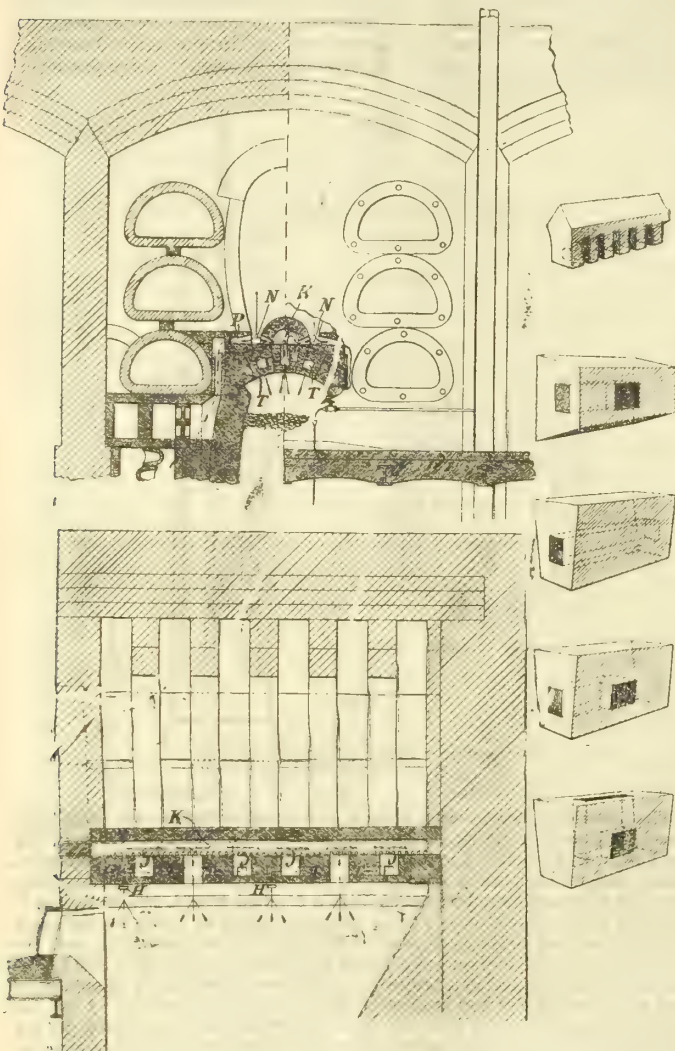
heat upon deflectors, which (as shown) are placed—one over the burner and under the oven, and another above the oven. The heat is by the



latter further utilized for heating the apparatus; while the deflector or distributor under the oven (which is of cast iron) causes the heat which has not been radiated into the room to act upon, and be utilized by traversing, the whole of the exterior of the oven portion.

**Regenerative Furnaces for Gas-Retorts.**—Helps, G., of Nuneaton. No. 25,265; Nov. 1, 1897.

The principal features claimed for this invention are: (1) The mixing of the gases generated from the fuel, and the dividing up and distributing of them before they are allowed to come into contact with the secondary air. (2) The forming of a number of burners in one arch or oven, whereby several tiers of retorts can be heated from one generator independently of each other.



The illustration represents in part a front elevation and part a transverse sectional elevation of a retort-setting, and part of a regenerative furnace for heating it built with tubular bricks or conduits, and mixing and distributing chamber, and having burners composed of several jets, in accordance with this invention; and a horizontal section of the bench.

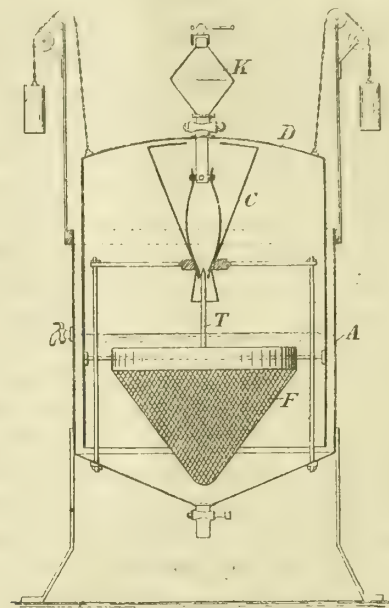
The gases evolved in the generator enter the arch G through the exit passages or ports H leading to the conduits T, through which they are conducted to the uptakes J, and thus into the distributing chamber K. In this manner the gases, entering the exit in the generator side of the arch, near to the front wall, are caused to travel to the back wall or to the middle of the setting, before being allowed to enter the distributing chamber. In the same way, generator gases entering an exit on the generator side of the arch near to the back wall may be caused to travel to the front wall before being allowed to enter the distributing chamber, if desired; and the gases evolved from the generator midway or between the front and back walls of the setting may be caused to pass directly into the distributing chamber, or conveyed to the back or front or to any desired position in the distributing chamber—being conducted to the uptakes J by tubes or passages in the arch over the generator. The tubes or conduits in the arch G can be increased to any number that the thickness and circumference of the arch will allow.

The distributing chamber K extends from the front to the back of the setting, or the generator and all the conduits T are connected with it by uptakes J; and so the gases become thoroughly mixed. Before being allowed to pass into the combustion chamber or setting, they are caused to travel through openings on either side of the distributing chamber, of small area tapering from about 3 square inches on the combustion chamber side to about 1 square inch on the distributing chamber side; and in this manner "the gases are broken up and distributed evenly throughout the whole length of the retort-setting." These openings are similar to those described in patent No. 17,530 of 1896. The gases from the mixing chamber may be distributed throughout the setting to form, in conjunction with the secondary air-inlets P, any number of burners that may be required for the heating of several tiers of retorts. The generated gases issuing from passages N on either side of the distributing chamber, meet the secondary air issuing from a parallel line of similar passages P; and thus two distinct burners are formed, one on each side of the distributing chamber, and each composed of a number of small jets.

The details at the side of the main illustration show: (1) A perspective view of a distributing brick, through whose orifices the generated gases issue from the distributing chamber—similarly constructed to those described for the breaking up of the primary and secondary air in patent No. 17,530 of 1896. (2) A perspective view of a tubular junction arch-brick, for communicating between the generator and the tubular conduit T. (3) A perspective view of a plain tubular arch-brick. (4) A perspective view of a tubular junction arch-brick, for communicating between the tubular conduits T and the uptakes J. (5) A perspective view of an uptake junction arch-brick.

**Acetylene Generator.**—Kremer, J., of Gilly, Belgium. No. 26,776; Nov. 16, 1897.

It is claimed that this invention will permit of the maintenance of a constant pressure in the generator by "a peculiar arrangement of stopper which, in combination with the gasholder, allows the latter to stop the fall of the carbide into the liquid at the proper moment, without, however, it being limited in its upward movement, which can consequently be continued in proportion to the quantity of gas produced after the stoppage of the hopper."



In the outer receptacle A, containing the liquid for decomposing the carbide, is fixed the hopper C containing the carbide; and in it moves the gasholder D, carrying a vessel K, which allows, even while the apparatus is at work, of renewing the supply of carbide to the hopper by simply operating the cock between it and the holder. The end of the tube conducting the carbide into the hopper is provided with springs forming clips which, moving with the holder, have for their object to push the carbide towards the lower aperture of the hopper and facilitate its fall through same. The holder D is provided with a cross-bar supporting a sieve F, into which the carbide falls. The closing of the exit aperture in C is effected by a cylindrical rod T, pointed at its end. The upward movement of the holder is thus not arrested until it arrives at the top of its course. When a sufficient quantity of carbide has fallen into the liquid, the holder rises, and the rod entering the aperture in C stops any further fall. The production of gas continuing, the holder can still rise; but when, through the consumption of gas, the pressure diminishes, the holder again descends, keeping the pressure constant up to a limit determined by the length of the rod T, which at this moment again uncovers the exit aperture from C, and allows a fresh quantity of carbide to fall into the liquid.

**Increasing the Illuminating Power of Coal Gas.**—Wigham, J. R., of Dublin. No. 28,526; Dec. 3, 1897.

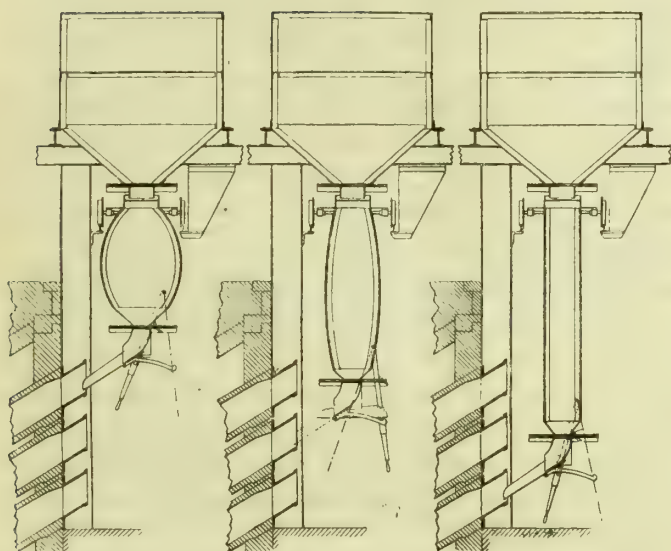
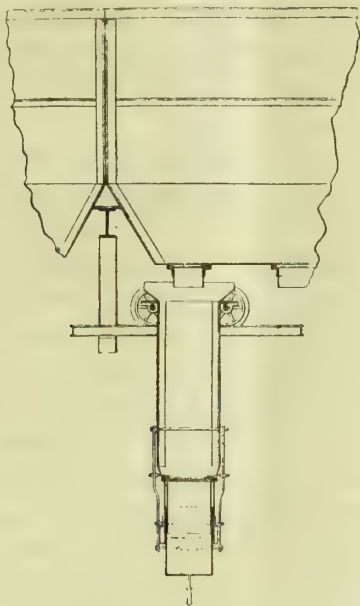
This invention (the specification of which is not illustrated) is "intended to enable consumers of ordinary gas to use acetylene gas made from calcium carbide for the purpose of increasing the illuminating power of such gas, either throughout the entire premises so lighted, or in such parts of them as it may be desired to have lights of increased illuminating power." It consists in a method of applying acetylene gas to gas made from coal or other material, in order to increase its illuminating power, by means of a governor and other appliances of well-known construction, so as to allow of the exact adjustment of the two gases in any desired proportion. The patentee claims as one "advantage" of his plan that "it would enable gas companies to supply at a cheap rate gas of low illuminating power suitable for cooking and heating, relying upon the combination above described for providing gas of high illuminating power for lighting purposes."

**Inclined Gas-Retorts.**—Drake, J. A., and Marsland, J. S., of Halifax. No. 29,096; Dec. 9, 1897.

This invention consists in so constructing the apparatus for charging inclined gas-retorts that the fall of coal into the shoots is the same whether it be supplied to the uppermost or the lowermost retort. This is effected by dispensing with the measuring hoppers hitherto employed, and using instead measuring hoppers of different lengths, to suit the positions of the various retorts. Each of the hoppers is of the same capacity, but of a different diameter or size. In order to liberate the coal contained in the hopper, a sliding door or damper is removed from the bottom; but this damper is arranged to be in close proximity to the shoot, so that "the rush of coal which has hitherto choked up the inclined retort is avoided, and perfect work is insured." The invention, so far as it relates to the shoot, consists in mounting it upon a pivot or



fulcrum, so that when it is not in use it may be put back. In doing this, it closes (self-actingly) the damper at bottom of the measuring hopper; but when it returns into action, it does not open the hopper, but slides back alone—the damper in this case being opened by the workman.



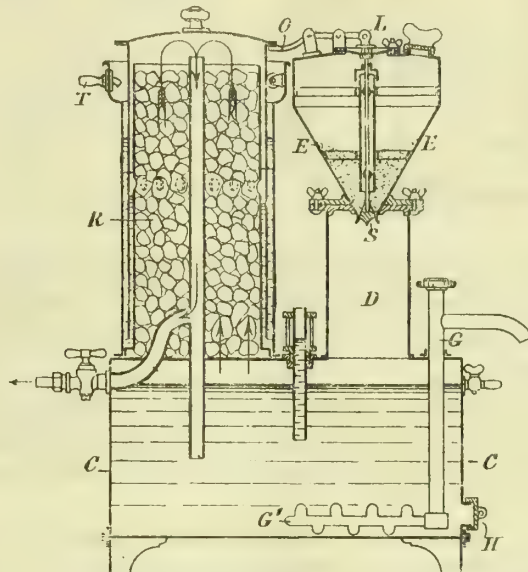
The illustration shows a front elevation of the arrangement and side elevation (to a smaller scale) of the three sorts of hoppers required to charge a bench of retorts three tiers high. It will be seen that they are of different shapes, but all of the same capacity for containing a like amount of coal. They are supplied with fuel from the coal-carrying hoppers above; and their bottoms are provided with sliding dampers. When the retorts require charging, the workman takes hold of the handle of the damper, and pushes it forward, thereby placing the open space of the damper opposite the bottom of the measuring hopper, and allowing the coal to run down the shoot for supplying the retort. When required to feed again, the workman may draw the damper back by the handle, so as to close up the bottom of the measuring hopper to obtain a fresh supply of coal; but the damper may also be shut by a moving handle, as shown in the centre of the three side views, where the lever arm engages with a bowl or stud fixed on a stud underneath the shoot—the shoot being drawn thereby out of position and placed at rest. The action of the handle not only removes the shoot out of position, but at the same time moves the damper so as to place the dead part opposite the bottom of the measuring hopper. The reverse movement of the handle, however, while placing the shoot into position with regard to the retorts, does not slide the damper, but leaves it alone—the damper being slid back into its open position by the workman when required. As the measuring hoppers are all of the same capacity, it will be understood (the patentees remark) that, whether the uppermost or the lowermost retort be fed, the descent of the coal in each case only drops from the dampers which are equi-distant from the retorts; and therefore the rush of coal is the same to one retort or to the other. The arrangement also permits the coal to be lifted from the ground into the coal-carrying hoppers the same height. Therefore the raising of the coal, whether for the top retort or the bottom retort, is the same.

**Producing Acetylene.**—Lake, H. H.; a communication from J. Grand, of Lyons, France. No. 8382; April 7, 1898.

The patentee remarks that in the greater number of acetylene generators, the carbide container, or distributing funnel, is arranged directly within, and at the centre of, the apparatus—an arrangement which presents numerous disadvantages. It appeared to him therefore to be more practical (while constructing the apparatus with one body only, which serves as its base) to arrange upon this body two distinct parts—the gas-holder bell and the carbide container, or distributing funnel, upon which the bell acts. By this means, the carbide reservoir is not only not subjected to the action of the water vapours in the body of the apparatus,

but it is independent, and is thus capable of being rapidly removed in case of need.

The apparatus consists (as shown) of a double circular casing, constituting a water-seal arrangement, within which a gasholder bell works, the weight of which determines the pressure of the gas. The casing is rigidly fixed on a water reservoir C, of sufficient capacity to prevent heating. Upon the side of the reservoir is arranged the gas-supply cock, in communication with a central vertical tube J drawing gas from the upper part of the apparatus, after it has been purified by passing through any suitable purifying medium R (such as coke, iron filings, and so forth) arranged within the casing.

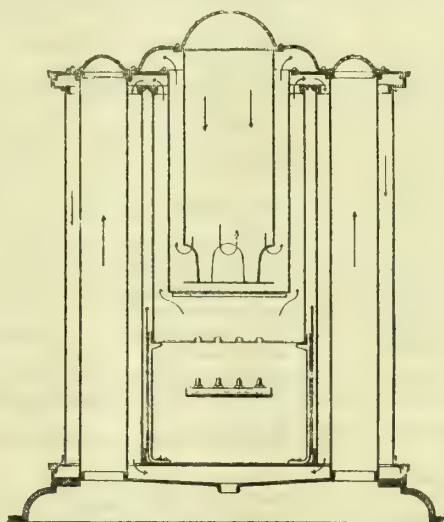


At the side of the casing is fixed (likewise upon the reservoir C, and therefore above the decomposition water) the support D, at the upper part of which is mounted the carbide distributor E. Within the distributor is provided a vertical guide tube, in which slides the rod of a loaded valve S, closing the aperture for the escape of the carbide from the distributor. The upper extremity of the rod is provided with a fork L for the purpose of connecting it with an operating lever O, so as to raise the valve when the holder dome bears against the extremity of the lever.

The apparatus is also provided with an exhaust-pipe G, enabling the decomposition water to escape; a stirring board G' for use when the decomposition water is too thick to pass off readily; a cleaning-out door H; and a water-supply nozzle T.

**Condensing Gas-Stoves.**—Fletcher, T., and Neil, J., of Warrington No. 16,675; Aug. 2, 1898.

In this condensing gas-stove a flat-flame instead of an argand burner may be used, or the atmospheric burner may be arranged to give a circular or bunched flame. Above the flame in the upcast-tube is a throttle-plate, having an oblong opening through it, which practically corresponds in form with the shape of the maximum cross section of the flame, and is arranged with its axis in the plane of the flame. This opening is sufficiently large to allow the products of combustion to pass through it freely; while it limits the induced current of air to such a



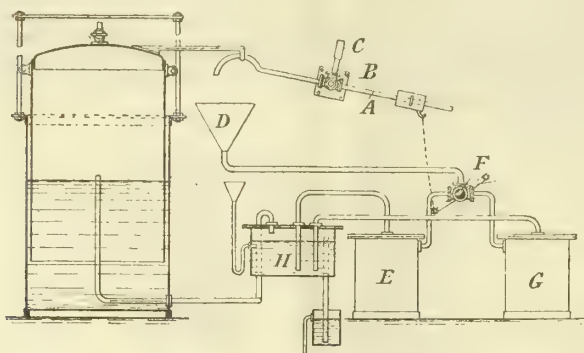
quantity as "will not interfere with perfect condensation." The gases and vapours are thus "caused to pass into the condensing-tubes without admixture with any surplus quantity of air; and the heat carried by them is more easily yielded up, and the vapours therein are more perfectly condensed." Above the throttle-plate there may be arranged a tubular casing closed at the bottom and open at the top. The products of combustion ascend between this casing and a surrounding casing or wall, and pass downwards through one or more condensing-tubes. Each condensing-tube is provided with an internal concentric tube, open at top and bottom, so that air may pass freely.

Within the tubular plate arranged above the throttle-plate, there is a second tubular casing, which is also open at top and closed at bottom. This casing is formed with perforations at a convenient point in its lower end, so that air may descend within the casing, and ascend in a heated condition through the annular space between the two casings—this annular space being also open to the atmosphere at the top.



**Acetylene Generators.**—Manger, T., of Bamberg, Bavaria. No. 17,449; Aug. 13, 1898.

This invention has for its object to automatically supply the acetylene generator with water, "so that the plant requires very little or no attention, except such as is necessary to recharge the carbide vessels."



As shown, a pipe A has at one of its ends a weight which causes it to press firmly against a lever or arm fixed on a gasholder, and also to close the cock B to the water-pipe C when the holder is by pressure of gas moved upwards. When it falls through diminished pressure of gas, the lever presses down the pipe A and opens the cock, so that water flows into the funnel D.

When all the carbide enclosed in the vessel E is consumed, and the holder sinks, the chain attached to the lever A turns the cock F by means of the lever shown, so that water flows from the funnel D to the second carbide vessel G and the development of gas is continued in the latter.

From the vessels E and G the gas is conducted to cleaning apparatus, and from this to the holder.

#### APPLICATIONS FOR LETTERS PATENT.

- 24,002.—TROUBETZKOY, L., "Acetylene gas apparatus." Nov. 14.  
 24,007.—JACQUINET, L., "Incandescent burners." Nov. 14.  
 24,040.—LÉRY, J. B. DE, "Mantles for incandescent gas and oil lamps." Nov. 15.  
 24,065.—MARGULIES, P., "Acetylene gas generators." Nov. 15.  
 24,093.—WILLIAMS, D. S., "Acetylene gas generator." Nov. 15.  
 24,100.—RHODES, A., "Glasses for gas and other lamps." Nov. 15.  
 24,103.—HENZE, G., and BARG, B., "A new or improved inverted incandescent burner." Nov. 15.  
 24,141.—COLLINGBOURNE, T. H., "Acetylene gas-lamps." Nov. 16.  
 24,157.—RICHARDSON, S. T., and PRICE, R., "Preserving carbide of calcium." Nov. 16.  
 24,180.—TOURTEL, J., and THE TOURTEL GAS AND GENERAL ENGINEERING COMPANY, LTD., "Coin-freed prepayment meters." Nov. 16.  
 24,224.—BOUGHTON, W. J., jun., "Gas and oil engines." Nov. 17.  
 24,239.—GINDER, W. J., "Generation of acetylene gas." Nov. 17.  
 24,283.—JUHASZ, F., "Automatic gas igniter for incandescent mantles." Nov. 17.  
 24,293.—GOODSON, J., "Gas-governors." Nov. 17.  
 24,364.—NORDMANN, R., "Incandescent mantles." Nov. 18.  
 24,408.—ORMANDY, W. R., "Gas-producers." Nov. 18.  
 24,409.—BEECH, W. W., and JONES, H., "Generating and storing acetylene and other gases." Nov. 18.  
 24,458.—WORSNOP, C. H., "Acetylene gas-lamps." Nov. 19.  
 24,493.—EXLEY, J. H., "Generation and storing of acetylene gas." Nov. 21.  
 24,501.—ELLEN, W., "Acetylene generators." Nov. 21.  
 24,504.—SIMPSON, W. M., "Gas-stoves." Nov. 21.  
 24,541.—STRICKLAND, F., "Internal combustion engines." Nov. 21.  
 24,580.—MELLING, H. T., "Gas-engines." Nov. 22.  
 24,597.—SANDERSON, A. W., "Acetylene generators." Nov. 22.  
 24,609.—ALLYNE, E. E., and ANDERSON, R. G., "Gas-engines." Nov. 22.  
 24,623.—NEWMAN, F. W., and CRITCHLEY, A. H., "Production of acetylene gas." Nov. 22.  
 24,653.—SEMADENI, H. G., "Incandescent gas-mantles." A communication from U. C. Loewy. Nov. 22.  
 24,679.—HIGGINS, F., "Chimneys for gas and other lamps." Nov. 22.  
 24,682.—FALBE, O., "Acetylene gas-generators." Nov. 22.  
 24,704.—SPITTLEHOUSE, R. W., "Acetylene gas-generator." Nov. 23.  
 24,770.—MYERS, T., "Gaseous power engines." Nov. 23.  
 24,771.—LANCHESTER, F. W., "Gas-generators." Nov. 23.  
 24,772.—SALISBURY, H., "Carbide holders." Nov. 23.  
 24,775.—MYERS, T., "Gas and other engines." Nov. 23.  
 24,785.—BAILEY, C. J., and NICKLIN, J. H., "Generating acetylene gas." Nov. 24.  
 24,819.—DYE, F., "Leak stoppers for gas, steam, and other tubing." Nov. 24.  
 24,828.—MYERS, T., "Explosion engines." Nov. 24.  
 24,846.—IRWIN, W., "Carburetted or enriching gas." Nov. 24.  
 24,862.—DICKSON, A., and WALLACE, R., "Generation and storage of acetylene gas." Nov. 25.  
 24,891.—YOUNG, W., and FIFE, J., "Retorts for the destructive distillation of shale." Nov. 25.  
 24,908.—LEWIS, J., "Gas-brackets." Nov. 25.  
 24,909.—WALKER, H., "Making calcium carbide." Nov. 25.  
 24,910.—BURRELL, B. A., "Reverberatory gas-furnaces." Nov. 25.  
 24,953.—MORRIS, L., "Generators and lamps for acetylene gas." Nov. 25.  
 24,954.—SMITH, W. B., "Incandescent gas lighting." Nov. 25.  
 24,956.—SMITH, R. H., "Anti-vibrator for incandescent lamps." Nov. 26.  
 24,975.—LEVETUS, E. L., "Acetylene generators." Nov. 26.  
 24,988.—SHELLEY, R. M., "Incandescent mantles." Nov. 26.  
 25,006.—LAFOND, J. B., "Internal combustion engines." Nov. 26.  
 25,014.—MORIS, L., "Automatic lighting of gas-mantles." Nov. 26.  
 25,016.—SCHWASS, A., "Acetylene generators." Nov. 26.

## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### The Carburation of Coal Gas.

SIR,—When I wrote you last week giving what appeared to me to be a rational explanation of the action of Mr. Botley's process, I did not expect that the theory advanced would go without criticism. I am, however, much pleased with the spirit displayed in Mr. Botley's letter which appeared in your issue for the 29th ult.

Though I have not seen Mr. Botley's process in operation, I have seen one substantially identical with it, but upon a much larger scale, applied to the abstraction of hydrocarbon vapours from the gases produced in shale distillation; and I was quite aware that it did not require a large volume of gas to spray or atomize the oil. But small as it is, Mr. Botley is, I think, in error in supposing that it does not play the part in his process which I attributed to it. The system to which I have referred is described in the specification of Mr. Beilby's patent No. 2585 of 1882, wherein it is stated: "My improved processes, which are to be used instead of the ordinary washing or scrubbing operations, are effected by injecting, in an improved manner, into the gas to be treated the solvent liquid or substance in the form of a very fine spray, so that the gas and the solvent may be brought into very intimate contact." The specification goes on to describe an arrangement consisting of an engine to compress a portion of the gas to be treated, a coil of pipes to cool the compressed gas, a reservoir for the compressed gas, and various forms of injectors or devices for spraying the solvent into the bulk of the gas in the tower or scrubber. The patentee then says: "My improved processes and apparatus may be applied with advantage to such operations as follow: The separation of soluble hydrocarbons from gases, and the separation of the impurities of coal and other gases. In many cases, the efficiency of the apparatus is much increased by cooling the compressed gas (as hereinbefore described), as in its subsequent expansion when acting on the solvent liquid a further cooling action takes place, which renders the liquid a better absorbent of the soluble matters in the gases. In some cases, however, the cooling may be omitted when not of advantage."

Now, as stated in my last letter, though modified in design, Mr. Botley's process is substantially identical with the system described in this specification; the main difference being that a less quantity of the solvent oil is used, because it is desirable to remove only a small portion, instead of the whole, of the hydrocarbon vapour from the gas, and that part with the lowest vapour tension—the naphthalene. Consequently, it is necessary to compress only a small percentage of the gas to be treated, to spray the smaller quantity of solvent oil; but though small in volume, and proportionately small in degree, it is yet identical in its action.

Mr. Botley says that the temperature of the compressed gas when used at the atomizer is precisely the same as the gas in the carburetter and the town mains. While this may be quite true, it is equally true that the compressed gas on leaving the compressing cylinder will have a very high temperature—many degrees above that of the gas in the main from which it was drawn—due to the mechanical energy expended in compressing it, appearing as sensible heat. According to Mr. Botley, this compressed gas must therefore have parted with this heat before getting the length of the atomizer. Now the compressed gas, in expanding and atomizing the oil, would be suddenly cooled through exactly the same number of degrees as it was previously heated at the time of its compression; and this sudden reduction of temperature would have the effects I attributed to it in my letter, and that stated to result in the specification of the patent referred to.

The statement that the portion of atomized oil precipitated out of the gas and collected in the carburetter itself, and in the syphons of the town mains within the area of the works, does not hold naphthalene in solution, I believe to be equally in error. Petroleum lamp oils, such as those used in Mr. Botley's process, have so powerful a solvent affinity for the hydrocarbon vapours diffused through coal gas, that by bubbling the gas through such oils, or passing it through sawdust moistened with such oils, the illuminating power will be reduced by about one-half; and the supposition that such oil, when presented to the gas in an atomized state, loses its solvent affinity and ceases to be a washing and scrubbing agent, and fails to absorb from the gases the hydrocarbon vapours (including the naphthalene), is what I am afraid Mr. Botley will have some difficulty in getting those engaged in the gas industry to credit. Still less will he be able to convince them that the same conditions which, when applied to the treatment of shale and coal gases enable the vapour tension of the hydrocarbons diffused through them to be so far reduced as to cause them to assume the liquid form and be held in solution in the scrubbing fluid, will have, when applied to the coal gas at Hastings, the very opposite effect—that of creating an artificial vapour tension which not only keeps the vapours in diffusion in the gas, but causes the previously precipitated naphthalene to be again taken up in diffusion, and be carried right up to the burners. I have no doubt but that the scrubbing liquid absorbs or dissolves the previously precipitated naphthalene, and carries it away—but to the drip-well, not right up to the burners.

That the oil used does act as a scrubbing fluid, is further evidenced by Mr. Botley's statement that the portion precipitated and collecting in the drip-wells becomes so saturated with substances taken up in solution, and is precipitated in such quantities, as to make it desirable to transfer it to be worked up in the water-gas plant. The quantity of oil deposited in the fittings of the consumer may be very small; but that it will collect there is no doubt, as, once deposited, it will not, owing to its low vapour tension, be volatilized.

That the illuminating power of the gas is not deteriorated, but, on the contrary, that at the extremes of the districts supplied is better maintained than formerly (which I have never questioned), is no evidence against the theory of Mr. Botley's system being a scrubbing process carried out in the mains and services. It only proves that the part of the scrubbing fluid which is driven into the gas, in a sufficiently fine state of mechanical division to accompany the gas through the burners and add to its luminosity, is greater than the illuminating value of the hydrocarbons (naphthalene, &c.) which have been removed or dissolved from the gas by the less perfectly atomized portion of the scrubbing fluid precipitated in the mains and services. If all the scrubbing fluid was in a sufficiently fine



state of division to pass with the gas through the burners, the illuminating power of the gas would be still better maintained at the extremes of the district. But the very nature of the process makes this desirable result unattainable; for, however finely atomized the oil may be, it is still present suspended as a cloud or mist, and liable to be precipitated by gravitation unless the gas is in rapid motion. On the other hand, the rapid motion causes the particles to be rubbed or impacted out of the gas on its coming into contact with the surface of the mains, services, fittings, &c.

Priorsford, Peebles, Dec. 2, 1898.

WM. YOUNG.

### Prepayment Meters.

SIR,—I have been reading Mr. Richmond's articles upon "Slot Cookers." I am not desirous of rushing on every occasion into print; but at the same time I feel that in this question I have no right to be left in the cold.

Mr. Richmond has given to the public much valuable information on the system of prepayment for gas. He has, however, either inadvertently or from a lack of knowledge of the fact, omitted to mention that the first real practical installation of prepayment meters was due in the first instance to Messrs. Marsh and Thorp, and afterwards to their licensees, Messrs. Sawyer and Purves and the Automatic Meter Company.

At the outset, the system of supplying gas through prepayment meters met with a most chilling reception; and the writer canvassed personally every gas undertaking in the kingdom, and also brought the matter before their notice by letter and pamphlet.

The first practical and successful installation was one of a hundred meters that were fixed under a guarantee from the writer that he would remove them if not satisfactory, and pay all costs and damages that might follow upon the installation. Fortunately, the installation was a great success. The writer had the almost unanimous support of the Press; and it is due to Mr. Livesey, of London, to Colonel Robinson, of Liverpool, and to the writer, that the invention of Mr. Brownhill (to whom the greatest credit is due) was brought into actual use. The meter makers as a body stood aloof. They enjoyed the various difficulties that were put in the way of the parent makers; but immediately the battle was won, and the introducer had carried his way, then they rushed into the field to annex some share of the spoil. So-called prepayment-meter inventors became as plentiful as mushrooms in season; and the writer looks forward with confidence to the day of reckoning, when the real inventors shall reap their further reward, and when the imitators shall also receive their due.

58, Lombard Street, E.C., Dec. 3, 1898.

THOMAS GARDINER MARSH.

**Corrections.**—In our report last week of Mr. Brearley's remarks on the subject of "Purification," at the meeting of the Manchester District Institution of Gas Engineers on the 26th ult., the amount of profit made (eighth line) should have been £13 18s. 10d. and not £18 13s. 10d.; and the estimated quantity of new oxide to replace spent oxide sold, 55 tons instead of 50 tons.

**New Joint-Stock Companies.**—The Automatic Lighting Company, Limited, has been registered with a capital of £10,000, in £1 shares, to acquire and turn to account any real or personal property, patents, patent rights, business concerns and undertakings, &c. The Incandescent Accessories and Maintenance Syndicate, Limited, with a capital of £2000 in £1 shares, will acquire the undertaking of the Wholesale Incandescent Fittings and Maintenance Company and the business of the London and Suburban Incandescent Maintenance Syndicate, and develop and extend the same. The Wholesale Incandescent Mantle Company, Limited, has been formed with a capital of £5000 in 4900 £1 ordinary shares and one deferred share of £100, to acquire certain patents relating to improvements in gas mantles and burners, and develop them. The Morton-Pringle Gas-Heating Company, Limited, has been registered with a capital of £30,000 in £1 shares, to enter into an agreement with the Morton-Pringle Gas-Heating Company, Limited (in liquidation), and C. A. Wright, the Liquidator, to carry on the general business of gas engineers, ironfounders, metal workers, &c., and to acquire and turn to account certain patents.

**The Powers of the Tipton Gas Committee.**—The Tipton District Council a short time since thought it necessary to clip down the powers of the Gas Committee to such an extent as to render them incapable of prompt action even in the most trivial matters; but the Committee have quickly convinced the Council of the folly of their proceeding. At a meeting of the latter body last Tuesday, the Committee reported that they had considered the difficult position in which they were now placed with reference to the carrying on of their business; and, feeling certain that serious loss and inconvenience would ensue in consequence, desired to call the attention of the Council to the matter, in order that they might take such action to obviate loss and inconvenience as might be most expedient. The Chairman and Mr. D. Hipkins illustrated the absurd position of the Committee by referring to two cases in which it had become necessary for them to take proceedings to recover certain debts, one being above £20; but the Clerk informed them that they had not the power to deal with the matter. Under the old procedure action would have been taken; and the money in all probability recovered. Mr. Doughty declared that all that was useful and beneficial had been swept from the Committee. He considered that the sooner the resolution recently adopted was rescinded the better it would be for the successful working of the department; and he proposed that the matter be regarded as one of urgency. The resolution having been carried, Mr. Doughty proposed that the Gas Committee have restored to them all the powers previously possessed. He remarked that the only objection to the old arrangement was that the Committee had the power to appoint officials, which he considered a paltry one. Mr. Millington seconded the resolution. Mr. Aston proposed as an amendment, and Mr. Moore seconded, that the Council adopt a resolution, drawn up by the Chairman, giving the Gas Committee all the powers they previously possessed, with the exception of the appointment of the office staff and the fixing of their salaries, borrowing money, making the gas rate, and entering into contracts. This was ultimately carried by 11 votes to 7.

## PARLIAMENTARY INTELLIGENCE.

### NOTICES OF APPLICATIONS TO THE BOARD OF TRADE FOR PROVISIONAL ORDERS (SESSION 1899).

#### Under the Gas and Water Works Facilities Act, 1870.

**Alton (Hants) Gas.**—The Alton Gas Company purpose making application for power to construct new works for the manufacture and storage of gas and residual products.

**Bedworth Gas.**—The Bedworth Gas Company, Limited, will seek authority to maintain and continue the existing gas-works in the parish of Bedworth, in Warwickshire, and supply gas, meters, fittings, &c., in the parish and in part of Astley. The exact limits, however, are to be defined, as is the share capital; and power to raise more money will be applied for.

**Brigg Gas.**—The Brigg Gas Company, Limited, intend to apply for power to maintain and continue their existing gas-works, and to manufacture and supply gas in the Urban District of Brigg, in Lincolnshire; also to sell gas in bulk, supply fittings and appliances, and generally carry on the business of a Gas Company. The existing capital is to be defined, and additional money raised. Authority will be sought to apply for a Provisional Order under the Electric Lighting Acts.

**Burnham and District Water.**—The Burnham, Dorney, and Hitcham Water Company intend to apply for power to raise additional capital, and to amend their Order of 1896, and any Acts or Orders relating to the Company.

**Elstree and Boreham Wood Gas.**—The Elstree and Boreham Wood Gas Company purpose applying for powers to raise further capital to the extent of £10,000, to meet the requirements of their business. They will ask for authority to supply gas in bulk, and to manufacture and sell or let on hire stoves, fittings, meters, &c.

**Farnham Gas.**—The Farnham Gas Company, Limited, intend to apply for power to maintain and continue their existing works, construct new ones, and supply gas in Farnham and Farnham Rural, in Surrey. The usual privileges will be sought, as well as authority to raise more capital.

**Freshwater Gas.**—Application will be made by the Freshwater Gas Company, Limited, for power to maintain and continue their existing works, and supply gas, meters, fittings, &c., in the parishes of Freshwater and Totland, in the Isle of Wight. The present capital is to be defined and the amount fixed, and authority sought to increase it.

**Harlow and Sawbridgeworth Gas.**—The Harlow and Sawbridgeworth Gas Company will seek authority to maintain their existing works and construct others, manufacture and supply gas or other means of obtaining artificial light, fittings, and engines, and levy rates and charges within the parishes of Harlow and Latton, in Essex, and Sawbridgeworth, in Hertfordshire. Permission will be sought to increase the capital and to acquire additional land.

**Harpenden Water.**—The Harpenden Water Company intend to apply for power to raise additional capital.

**Herne Bay Gas.**—Application will be made by the Herne Bay Gas Company, Limited, for authority to continue and extend their works, manufacture gas and residual products, and supply gas in Herne Bay and Herne in the county of Kent. They will ask for the usual power to open roads, levy rates and charges, &c. Provisions will be included with respect to the supply of meters, fittings, &c., and "engines and machines for the production of motive power for domestic, agricultural, manufacturing, and other purposes by means of gas." The existing capital, and any additional money authorized to be raised, are to be applied to these purposes. The Company will ask for power to hold patents for the production of artificial light by any means.

**Hoylake and West Kirby Gas and Water.**—Application will be made by the Hoylake and West Kirby Gas and Water Company for authority to raise additional capital, make provision for the protection of the works, property, and supply of the Company, prevent or prohibit the contamination and the waste and misuse of water, and impose penalties in respect thereof.

**Laindon Gas and Water.**—Application will be made by the Laindon Gas and Water Company, Limited, for authority to extend their limits of supply, raise additional water capital, erect gas-works and obtain money for the purpose, supply gas or other artificial illuminant (except electric light), meters, fittings, &c., sell gas in bulk, &c.

**Limavady Gas.**—The Limavady Gas Company, Limited, intend to apply for power to maintain and continue their existing gas-works, and works connected therewith, open streets, lay mains, and supply gas in the town of Limavady and the townlands of Rathbreadybeg, Rathbreadymore, and Killane, in the parish of Drumachose, in the county of Londonderry.

**Maidstone Water.**—Application will be made by the Maidstone Water Company for authority to raise additional capital.

**Morecambe Gas.**—The Morecambe Gas Company have notified their intention of applying for power to raise additional capital, and amend their Act of 1879.

**Newtown and Llanllwchaearn Gas.**—This Company intend to apply for power to maintain and continue gas-works, manufacture and store gas and residual products, and supply gas, meters, fittings, &c., in the urban district of Newtown and Llanllwchaearn, in Montgomeryshire. Provision is to be made with respect to capital and dividends.

**Stourbridge Water.**—The Stourbridge Water Company will apply for power to raise additional capital, extend their limits, sell water by meter or in bulk, and make provision for the prevention of waste.

**Tilehurst, Pangbourne, and District Water.**—The Tilehurst, Pangbourne, and District Water Company, Limited, purpose applying for power to raise additional capital, and amend their Provisional Orders of 1894 and 1896.

**Tonbridge Gas.**—Application will be made by the Tonbridge Gas Company for authority to maintain and extend their existing works, and supply gas within limits to be defined. Additional capital will be required.

**York Town and Blackwater Gas.**—The York Town and Blackwater Gas Company will seek power to construct and maintain works for the



manufacture and storage of gas and residual products, acquire lands, and increase their capital.

#### Under the Electric Lighting Acts, 1882 and 1888.

Applications will be made under the above-named Acts for powers in regard to the supply of electricity for lighting and other purposes in the following places: Alloa, Arbroath, Ashford, Audenshaw, Aylesbury, Barmouth, Barnstaple, Battersea and Fulham District, Bermondsey, Bethnal Green, Bexley, Blackheath and Greenwich, Bognor, Bournemouth, Brentford, Broadstairs (with Westgate and Birchington), Burslem, Camborne, Carshalton, Castleford, Cheltenham, Cheriton, Christchurch and Pokesdown, Clontarf, Cromer, Crowborough, Darfield, Dukinfield, Dumfries, Durham, East Barnet Valley, East Retford, Eastbourne, Erith, Failsforth, Farnborough, Fenton, Finchley, Gateshead, Glossop, Gorton, Grays Thurrock, Guildford, Halesowen, Handsworth, Hartlepool, Haslemere, Haslingden, Hawick, Heaton Norris, Hendon, Heywood, Horsham, Hythe and Sandgate, Ilkerton, Inverness, Keighley, Kensal Town, Kensington and Notting Hill, Kent (West), Kilmarnock, Kirkcaldy, Knutsford, Leamington Spa, London (City, Holborn, St. Luke's, South-East), London County (East), Lewisham, Longton, Ludlow, Lye and Wollescote, Lymington, Maerdy, Mansfield, Marylebone, Merthyr Tydfil, Mexborough, Midland District, Mirfield, Musselburgh, Newcastle-under-Lyme, Newport, Newton Abbot, Partick, Pemberton, Penzance, Plumstead, Rathmines, Rawtenstall, Rhyll, Rcmford, Rugby, Runcorn, Ryde, Sandown and Shanklin, Shipley, Slough and Datchet, Sutton Coldfield, Stourbridge, Swinton and Pendlebury, Teignmouth, Twickenham and Teddington, Walker, Walton-on-Thames and Weybridge, Wath-upon-Dearne, Wednesbury, Weston-super-Mare, Winsford, Worksop.

#### NOTICES OF APPLICATIONS TO THE LOCAL GOVERNMENT BOARD (SESSION 1899) FOR PROVISIONAL ORDERS.

##### Under the Gas and Water Works Facilities Act, 1870, and the Public Health Act, 1875.

**Ashburton Gas.**—The Urban District Council of Ashburton will ask for authority to purchase the undertaking of the Ashburton Gas Company, and to manufacture gas and residual products, supply gas and fittings, purchase land, and levy rates and charges.

**Kirkby Lonsdale Gas.**—The Kirkby Lonsdale Urban District Council intend to apply for power to purchase so much of the undertaking of the Kirkby Lonsdale Gas Company as is situate within their district, and to manufacture gas and residuals, supply gas and fittings, levy rates and charges, acquire lands, and generally carry on the business of gas supply.

**Wallingford Corporation Gas.**—The Corporation of Wallingford will apply for power to purchase and carry on the undertaking of the Wallingford Gas Company, maintain and extend the existing works, and construct new ones, supply gas, deal in residuals, meters, fittings, and apparatus, and levy rates and charges. Provision will be made for winding up the Company and distributing the purchase-money.

**Wokingham Corporation Gas.**—The Corporation of Wokingham intend applying for authority to acquire additional lands and construct new works for the manufacture and supply of gas within the borough. Further borrowing powers will be needed.

**Larne Gas.**—The Town Commissioners of Larne purpose making application to the Local Government Board for Ireland for power to purchase the undertaking of the Larne Gas Company, and manufacture and supply gas within their district. It is proposed to extend the manufacturing plant and erect a gasholder of 50,000 cubic feet capacity. The necessary authority to borrow money will be applied for.

## LEGAL INTELLIGENCE.

### HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, Dec. 2.

(Before Mr. Justice ROMER.)

**Welsbach Incandescent Gas-Light Company, Limited, v. The Daylight Incandescent Mantle Company, Limited.**

This was a motion for an injunction to restrain the defendant Company from infringing the Welsbach patent of 1885.

Mr. TERRELL, Q.C. (Mr. WALTER with him), who appeared for the plaintiffs, said the facts were much as usual, except the analysis of the mantle. It was substantially a zirconia mantle, which was one of the substances mentioned in the patent; and the judgment of the Court of Appeal was to the effect that if the class of substances mentioned in the patent were taken, it was an infringement.

Justice ROMER asked who appeared for the defendants.

Mr. TERRELL said he did not know that anybody did, but he had just been informed that Mr. Bousfield was instructed.

His LORDSHIP said Counsel had better mention the matter again later. After a short interval, the motion was again brought forward.

Mr. BOUSFIELD not being present, Mr. GRAHAM, who was with him, suggested that the matter should stand over for a week, as it was a very important case, and it could not make much difference to the plaintiffs.

Mr. TERRELL said this was just the busy season, and even a week's delay meant a serious sum of money. Defendants were clearly within the four corners of the patent and of the judgment in the Court of Appeal, even upon their own showing.

Justice ROMER said if the motion was pressed he must hear it—at least to the extent of seeing whether or not it was a case for an interlocutory injunction. Mr. GRAHAM was quite competent to look after the defendants' interests.

The proceedings were accordingly continued, and in a short time Mr. Bousfield came into Court.

Mr. TERRELL said there was no conflict as to what the defendants did. They procured a fabric, and steeped it in a solution of zirconia, with some magnesia and lime; then, after burning it, they dipped it in a solution of

cerium, and so got a coating of cerium upon it. Not only did they use some of the substances mentioned in the Welsbach specification, but every one of them. The main ingredient was zirconium, and cerium was added for the purpose of giving light. Counsel then read the judgment of the Court of Appeal in the De Mare case, and submitted that the defendants came within it, and that the variation they made was merely colourable, so as to give them an opportunity of infringing the patent. It was one which could easily be infringed, and enormous sums could be made before a trial could take place. He relied on the defendants' affidavits, in which they said the analysis made by plaintiffs' witnesses was correct. The affidavit of Professor Lewes in fact described how they were made. One of the points raised in the De Mare case was that lanthanum was left out, and therefore they did not infringe. The patentee described three things, one of which was lanthanum. Then he said one of them might be left out, and something else substituted; and on this an argument was founded. In the present case, the analysis showed: Zirconium, 96.02 per cent.; oxide of cerium, 0.28 per cent.; and lime, 3.06 per cent. The only complaint the defendants made of the analysis was that it did not show the presence of magnesia. In the specification, it said that zirconium and magnesia might be used. He submitted, therefore, that these mantles were an infringement.

Mr. BOUSFIELD said he should have to call attention to the Sunlight case as well as the De Mare case. In the latter, it was decided that lanthanum was not essential (which was going a long way, but must be accepted now), though the specification said that one must either have lanthanum or an equivalent for it; and in the De Mare mantle there was not any equivalent for it at all. In the Sunlight case, it was decided that they must make a skeleton of zirconium and magnesia, and things of that kind, which were not rare earths. The mantle there complained of was one containing zirconium and aluminium, and it was made in precisely the same way as the Welsbach mantle; but it was held not to be within the specification. The light it gave was very feeble; but when it was sprayed with a solution of chromium, it was converted into a highly luminant mantle. Chromium was not within the class of bodies known as rare earths, which, according to the judgment of Mr. Justice Wills, were substantially the yttrium and cerium groups, probably, with the exception of didymium and cerium itself. It was distinctly held, therefore, in the Sunlight case, that it was open to anyone to use a mantle of zirconium, and something else like aluminium, and to make it into a light-giving mantle by means of something that was not a rare earth or within that class. Counsel then read a portion of the judgment in the Sunlight case, and stated that what the present defendants were doing was just the same, only they were coating their mantles with cerium instead of chromium. He then submitted that the oxide of cerium used in this case did not come within the class of rare earths, because, though present in cerite earth, Welsbach pointed out in his specification that, if this earth were used in place of lanthanum, care should be taken that it contained no didymium and but little cerium.

Justice ROMER asked if he was correct in supposing that Mr. Justice Wills's view was that the essence of the patent was to take a strong ground of zirconia and alumina, with or without magnesia, and then saturate it with either one of the cerium group or one of the yttrium group.

Mr. BOUSFIELD said he was, with this exception—that it was not to make it first and then saturate it, but all the salts were mixed together when the mantle was dipped. It was quite true that the zirconia and so forth were used to give strength, and the rare earths to give light. But they were all put into one solution, in which the mantle was dipped; and when it was burned off they had a skeleton of the mixed oxides. Mr. Justice Wills held that the rare earths were the essence of the patent. Cerium was one of the rare earths; but it was one of those excepted in the patent. Having read a portion of the Welsbach specification,

Justice ROMER said the substantial question seemed to be whether the defendants were using cerite earth.

Mr. BOUSFIELD then read the affidavits of Mr. Mackean, Mr. Ballantyne, and Professor Lewes. The last-named gentleman said that cerium was not given in Welsbach's specification as one of the permissible equivalents; its presence being at that time supposed to be very injurious to the light, and to give it a yellow colour. In his opinion, the mantle of the defendants was not an infringement of the Welsbach patent.

Justice ROMER said he should like further expert evidence directed to the exact point of what chemists would understand by cerite earth. Did it contain lanthanum.

Mr. BOUSFIELD said lanthanum was its chief constituent; he thought his friend and he would agree about that. But, before going more deeply into the question, he would ask his Lordship if he thought this was really a case for an interlocutory decision.

Justice ROMER said he did not. It was a case for advancing the trial, because he could see it was rather pressing; and the defendants, of course, would keep an account.

Mr. TERRELL pressed his Lordship to hear the motion; saying the plaintiffs' business was being seriously interfered with, as the defendants were selling at a lower price, and in some cases keeping an account did not answer any useful purpose.

Justice ROMER, however, said he could not decide such an important question on an interlocutory application. The case might be mentioned on the first day in next sitting; and he would then fix an early day for the trial. He should then want to have evidence as to what the state of knowledge was at the date of the patent, as to the effect of a slight trace of cerium.

### PRESTON (ADJOURNED) QUARTER SESSIONS.

Friday, Nov. 25.

(Before the Chairman, Mr. W. H. WORSLEY-TAYLOR, Q.C., and other Magistrates.)

**The Assessment of the Rossendale Union Gas Company.**

This was an appeal by the Rossendale Union Gas Company against the Assessment Committee of the Haslingden Union, in respect of a poor-rate.

Mr. BRADBURY and Mr. McKEAND appeared for the respondents; and Mr. SUTTON and Mr. FORMBY, for the appellants.

Mr. BRADBURY said that the appeal was by the Rossendale Union Gas



Company against the Assessment Committee of Haslingden Union and the Overseers of the township of Rawtenstall. It was against a supplementary valuation list deposited on March 17 last, and proved on April 20. The figures appearing in the valuation list showed that in the Rawtenstall assessment, the net rateable value was £5369; but it was necessary, in considering these figures, to refer to a second case in which the Company appealed against the Overseers of the township of Bacup. The Bacup rateable value was put at £2502—making a total of £7871. On June 10, the Gas Company gave notice of objection, to the effect that the premises were assessed at a higher sum than they were legally liable to be rated and assessed at; and they also contended that the works were assessed at a greater amount than they might be reasonably expected to be let for, year to year, free from all tenants' rates and taxes. Appellants went before the Committee on Aug. 3; and this body, after hearing both sides, decided to reduce the Rawtenstall assessment to £5100, and Bacup to £2377—making a total of £7477. It was against this assessment that the appeal was now made. The assessment of the Company, down to 1898, was upon a valuation made in 1888 on the accounts of the Company for 1887. At this time, and down to the present increase, the matter stood this way: Rawtenstall was assessed at £4659, and Bacup at £1700—a total of £6359, as against £7477. This, of course, was a substantial increase in the rateable value; but one reason for it was that the township of Spotland, which in 1888 was partly in the Rawtenstall Union and partly in the Haslingden Union, had since been transferred entirely to the Haslingden Union.

The CHAIRMAN: Is Spotland in the Company's district?

Mr. BRADBURY: Yes.

The CHAIRMAN: There are works of the Company in the Spotland district?

Mr. BRADBURY: Yes.

The CHAIRMAN: Which at the time of the 1888 valuation was outside the present area?

Mr. BRADBURY: Yes, but has since been brought in.

The CHAIRMAN: Are you going to give the rateable value of Spotland.

Mr. BRADBURY: I have not got it.

Mr. SUTTON: I think it was £427 net.

Mr. BRADBURY said this would bring the rateable value in 1888 to £6786, as against the £7477, which would leave the increase at something like £700. This, of course, did not allow in any way for the increased business of the Company and the increased expenditure by way of landlord's capital which had taken place since 1887. The undertaking had not remained stationary. The Company had spent a great deal of money, first of all, on permanent works. Learned Counsel believed they had built new offices at Bacup, at a cost of something like £2000; and there had also been an extension at Clough Fold, Rawtenstall. The increase of the business, receipts, and profits, was best shown by the following figures: In 1887, the gross receipts were £28,628; and the working expenditure, £16,051—leaving £12,577 as balance of receipts. In 1897, the gross receipts were £34,470, and the working expenditure £19,576—leaving a balance of receipts of £14,894. The balance of receipts therefore showed an increase of 18½ per cent. Of course, the total increase of £2317 had to be divided between the landlord and tenant. What the Court had to consider was the proportion of increased rate to increased receipts. Respondents were not increasing the rates without good cause; for while they had raised the rateable value, there had been a total increase of £2317, of which respondents said the landlord received £1100. In arriving at the rateable value, the mode adopted was to first ascertain the gross total receipts of the undertaking. From the gross receipts were deducted the working expenses, which gave the balance of receipts, out of which fund the landlord and tenant and rates were paid. The first deduction made was the tenant's share. He had a share of the profits taken off for what was known as interest, profit, and risk on his capital—proper remuneration for risk as the carrying on of such a business as this entailed. The tenant's remuneration was taken at a percentage upon the amount of capital he employed in the undertaking; and it was here that the great bone of contention came in. The rate of interest usually allowed was abnormally high, for the tendency of a tenant in cases of this kind was to swell his capital by any means he could. What was the proper figure to allow for tenant's capital?

The CHAIRMAN: What have you taken the figure at?

Mr. BRADBURY: We have taken it at £15,477. We have allowed what I think I shall satisfy you is a liberal figure—indeed 17½ per cent. on the whole of the capital employed.

Mr. SUTTON: We accept that figure.

The CHAIRMAN: Then the dispute will be about the capital account?

Mr. BRADBURY said it would. They had allowed 17½ per cent. upon the whole of the capital; and it was obvious, having regard to some of the items of the capital, that this was an absurdly high figure. There would be great dispute as to the amount of capital which the tenant employed in furnishing his place with coal and other products used in the manufacture of gas. If the tenant was to have this very liberal allowance of 17½ per cent., his capital account ought to be scrutinized most strictly. It was not right to swell the capital, and in addition to have this 17½ per cent., which was an absurd rate of interest to be derived from a concern of this kind. At the time this figure was fixed, capital bore a very different rate of interest to what it did now. Then from the balance of receipts they had to arrive at the figures for the rates; and the amount left went to the landlord. A proper sum was allowed for the renewal fund; and the balance was the net amount which the landlord put into his pocket. The tenant did repairs, which were included in the working expenditure. The landlord's renewal fund came as a last deduction, and from this they obtained the net rateable value. This was the principle upon which the respondents had gone. The valuation based upon this principle showed the rateable value for the whole undertaking to be £8541, which was something like £1000 in excess of the figure already given to the Court. The amounts upon which the figures of the rating agent, Mr. Cross, were based were the Company's own accounts for 1897; but the figures upon which the supplementary valuation list was made out were the 1896 figures.

Mr. SUTTON: We accept the 1897 figures.

Mr. BRADBURY remarked that this might account for the difference between Mr. Cross and the Assessment Committee. The figures were these: He first of all took the gross receipts—after allowing discounts for

bad debts—which came to £34,470; working expenditure, including certain renewals, but not rates and taxes, £19,576; balance of receipts for landlord, tenant, and rates, £14,894; tenant's share on capital of £15,477, at 17½ per cent., £2708—leaving a balance of £12,186. From this had to be deducted annual sinking fund and insurance, to provide for the renewal of such perishable goods as had not been renewed out of the current expenditure, £1332, which left £10,854. Then rates were deducted at 5s. 5d. in the pound on the net rateable value (£2313); leaving a net rateable value of £8541. This was the principle, and those were the figures by which the hereditament had been assessed. For the information of the Court, he thought he might indicate one or two points whereon he gathered the difference arose. The respondents' figures were based on the Company's books; but in dealing with the revenue account, they found great difficulty in separating what were strictly charges against revenue from what ought to be charged against capital. Therefore they had been obliged to make certain corrections. The total receipts (£34,000) were, he believed, the same as Mr. Newbigging's figure; but there was a dispute in regard to the working expenditure, and the discrepancy arose in this way: There was first of all a matter of something over £1000 debited for cost of furnishing new offices at Bacup. Obviously that was a capital charge, and ought to go, not against the revenue account, but against the capital account. In the accounts for 1897, a large sum was charged for new gas-meters, which ought also to be put against capital account. The meters had to be repaired and maintained out of the working expenditure; and where they had, as in this year, an abnormal expenditure, it was improper to charge the whole of the outlay to revenue. The respondents had allowed £510, which they regarded as a fair and ample sum to cover the replacement of old meters. In the working expenditure, there was another item of difference. The Assessment Committee deducted something like £800 more for rates and taxes than did Mr. Newbigging—the respondents' figures being £2313, as against £1520—but they allowed it in another place. His (Counsel's) expenditure account allowed a fund for the renewal, properly so called, of meters, retorts, mains, and service-pipes. It did not matter whether they were taken off in the expenditure account or afterwards; but they must not take them off twice. Then with regard to the tenant's capital, a considerable question of principle arose. The sum which was allowed by the Assessment Committee for tenant's capital amounted to £15,477, which was made up of the following four principal items, upon which disputes might arise: Tenant's capital, four months' current expenditure, £7060; stock, £1058; meters, stoves, &c., £6759; and tools, implements, and furniture, £600. The first item was the floating capital which the tenant needed to carry on the business. The problem was what capital was required to carry on the undertaking from Jan. 1 to May 1. No man in the ordinary way of business would provide capital for his March coal bill, because he would trust to his revenue coming in in May. But while the gas bills only became due once a quarter, another very important item—namely, the sale of residual products—went on all through the quarter. During the year under review, the sales of residual products amounted to £4341. As the Company bought the coal, so they sold residuals, which were a considerable portion of the gross receipts. Therefore four months' capital was really more than was required.

The CHAIRMAN: Has Mr. Cross estimated on the principle of four months?

Mr. BRADBURY: Yes. The total expenditure is £19,576. Mr. Cross's item for the four months is £7060, which is more than one-third of the total expenditure.

The CHAIRMAN: Mr. Cross allows four months, and he also allows the tenant the money accruing from residuals?

Mr. BRADBURY said that was so. Taking one-third of the residuals, the amount would be £1441. Stock, coal, and other materials used in the manufacture of gas furnished another item wherein there existed a considerable difference of opinion. The greatest difference in figures was with regard to meters. Mr. Newbigging's amount for meters was £13,484, which he contended was the price of them when new.

The CHAIRMAN: Is there any dispute about the figure? Do you accept it, Mr. Sutton?

Mr. SUTTON: I do not accept this way of dealing with the figures at all. I protest against it.

Mr. BRADBURY: Our figure is £13,518. The important difference is how the figure is dealt with. Supposing a hypothetical tenant is taking the gas-works in their present condition, what capital would he require? The meters are tenant's fixtures. At what rate does he take them? Not at the original cost. He would not require capital to buy so many thousand new meters, but would purchase at the current value. You have to arrive at the average value; and we have taken half the original cost.

Mr. SUTTON: You asked me if £13,484 was the cost of the meters. No; the price of the meters when new, and not the whole of them, was £16,114.

The CHAIRMAN: On the question of depreciation, of course, there may be differences of opinion.

Mr. SUTTON: I am willing to give you our figures. The cost was £16,114, from which we have taken 32½ per cent. This leaves £10,867.

Mr. BRADBURY then discussed the sinking fund, whereon he said there was also a difference of principle. To ascertain the annual sinking fund which would enable the landlord to renew his premises from time to time, they had estimated the life of the different constituents in the landlord's capital—including buildings, gasholders, tanks, machinery, &c. Mr. Cross valued the landlord's capital account at £105,205; and the sum required, on the 3 per cent. table, to produce this amount in 42 years (which he believed to be the average life of gas undertakings) was £1282. By adding £50 for insurance, the figure was brought up to £1332.

Mr. John Cross, of Manchester, gave evidence bearing out Counsel's statement. He had valued the Company's undertaking on several occasions. Since the valuation in 1888, new offices had been erected and furnished at Bacup. The revenue of the Company had increased considerably. The gross receipts in 1887 were £28,628; in 1897, the same items were £34,470. The figures for working expenditure, not including rates, discounts, &c., for the same period, were £16,181 and £19,576 respectively. The slight reduction of the Assessment Committee in March, 1898, was made for the sake of peace, and not because there was any need for it. The actual rate, at 5s. 5d. in the pound upon £8541, amounted to £2313. Of the total revenue of £34,470, £4341 was for residual products. The total gas-rental was £30,727. Discounts and bad



debts amounted to £1301, leaving as net gas-rental £29,496. Of course, the discount allowed for early payment was taken off in the sum of £1301. Meters and stove rents in this particular year produced £665. Some of the items, from a revenue and rateable point of view, had not been accurately charged. For instance, building and furnishing new offices, £1038, ought not to appear in the revenue account. For working expenses he allowed £20,138, from which sum he deducted £562 as improperly charged to the revenue account. Repairs and maintenance included £3048 for the renewal of retorts; and from this amount he deducted £1038. Before he knew what the item of £3048 was composed of, he allowed one-third of the amount, whereas he ought only to have allowed one-third of the balance of it. Some of the residuals were ready money—coke, for instance. But perhaps this applied more to large towns. The stock of coal and sundry stores in December, 1897, he wrote down at £1058; and tools, implements, and furniture, at £600. Many of the Company's meters were of considerable age. Some had been sold for as little as 2s. each; and he contended that they were not worth more than half the sum charged to capital. The price of the meters used by the Company would range from 19s. to 30s.

Mr. SUTTON (in cross-examination): Are you aware that there has been a large reduction in the price of gas to consumers from Jan. 1, 1898?

Witness: No; I have taken the accounts for 1897.

Then you have not taken into consideration the reduction at all?—No; I was not aware of it.

Do you know that there is a Bill before Parliament for electric lighting in this district?—No. Electric lighting schemes have not resulted in a reduction in the consumption of gas.

Cross-examination resumed: He had allowed £1068 for purification; £1396 for actual salaries; and £4719 for wages. He had included in the expenditure, repairs of retorts and renewals, which he considered was a right course to pursue. He knew it had been stated, but as a rating expert he did not accept the statement, that 3d. per 1000 cubic feet of gas sold represented the cost of keeping in repair the works, plant, &c., of a gas company, exclusive of retorts. He could not say how much of the total expenditure of £21,676 was to be attributed to the repair of retorts. The collection in the fourth month amounted to from 75 to 80 per cent. of the gas-rents; and he could not believe that the remaining 25 per cent. was often outstanding for a considerable time. Before the winter season commenced, the stock of coal ought to be larger than at other times, but not at its largest.

Mr. SUTTON: I suggest to you that eight weeks of the maximum daily consumption is not an unreasonable quantity of coal for the hypothetical tenant to have at the beginning of October?

Witness: I say it is outrageous. I allow him four months' coal to begin with; and he wants eight weeks more.

In further cross-examination witness said he had not allowed anything for railway waggons; but for sundry stores and stocks he had adopted the figure in the balance-sheet—namely, £1058. If he endeavoured to ascertain the value of the meters by taking the original cost price and striking off a certain percentage each year, it would come to a less sum than he had already put down. He had allowed £876 for repairing, renewing, and replacing meters. The retorts were part of the landlord's property. The repairs must be deducted somewhere; and witness deducted them in the working expenses. In his opinion, the sum was sufficient to provide for a renewal of two-thirds of the mains. He did not accept Counsel's suggestion that 30 years was the average life of a gas-works; for his own figure of 42 years was less than the actual life. Part of the works had been in existence since 1835. The Cloughfold works were established in 1854; and there was no renewal fund yet. It was true the new buildings at Bacup had been erected on the site of the old offices. Except for the years 1896 and 1897, he had not looked at any of the Company's books; but he perused the balance-sheets for many years.

Mr. Henry Edge, Chartered Accountant, of Blackburn, said he had been through the appellants' books. He found items of capital expenditure in the revenue account. His investigation revealed a large sum charged to revenue every year that should not have been so charged.

Cross-examined: The books did not show that anything had been put by for depreciation of meters. The Company kept buying meters, and charging them to stock account. The net profits to June, 1898, were about the same as in 1897, so that the Company had not suffered much from the reduction in the price of gas.

Mr. T. T. Wainwright, Surveyor and Valuer, of Liverpool, bore out Mr. Cross's evidence as to the expenditure account including the items he had deducted as charged to capital. The sums of £1038 and £562 ought not to be charged to the revenue account. In valuing meters for capital account in the absence of evidence as to age, it was necessary to divide the capital by two. This question was continually exercising the minds of valuers. In his opinion, four months was a sufficient time to allow for current expenditure.

#### Saturday, Nov. 26.

At the commencement of the proceedings this morning,

Mr. BRADBURY put in an extract from the Company's ledger, showing the bank balance for 1897.

Mr. Wainwright, further examined, said he did not agree that the hypothetical tenant should have a stock of coal in hand to the value of £3000, to provide for a possible strike. The 17½ per cent. on the tenant's capital covered any such risk.

Mr. Edge, recalled, handed in a statement showing the bank balances for and against the Company at the end of each month in 1896 and 1897. The additions to the capital account for meters between 1888 and 1896 were as follows: 1896, £12,183; and 1888, £10,986—being an increase of £1197. The sum of £200 odd chargeable to the 1897 working expenses for station meters was not, in his opinion, properly charged. If charged to this account at all, it should have been spread over several years.

This closed the respondents' case.

Mr. SUTTON announced that he would call his witnesses first, and then address the Court.

Mr. Thomas Newbigging was called, and explained his principle of valuing. He took the gross receipts; and from these he deducted the expenditure. The balance left represented the net receipts which had to be apportioned in some way between the landlord and the tenant. In order to find out how much of these net receipts were due to the tenant, it was necessary to determine the amount of capital he would require to

rent the concern; and having arrived at this sum, they made the usual allowance—5 per cent. for interest, 10 per cent. for trade profits, and 2½ per cent. for risks. Whatever this came to was deducted from the net receipts, and the figure left was the gross estimated rental—viz., the amount of rent the tenant would pay to the landlord. The landlord had to maintain the works in a state to command this rent; and he had to provide a sum of money to reproduce, not the mere buildings and mains, but the capital invested in the concern at the end of its life. The life of a gas-works was, on the average, 30 years; and they had to provide a fund which, invested year by year, would reproduce the whole of the capital at the end of this period. Having arrived at the amount necessary for the fund, it was deducted from the gross estimated rental; and the sum left represented the rateable value. He had taken the actual figures from the Company's accounts, but there were certain adjustments to be made. The gas-rentals amounted to £30,727, from which sum he deducted £1301 for bad debts and discounts; and, in addition, he also took the reduction in the price of gas. On an average, this reduction was equal to 1·43d. per 1000 cubic feet sold—amounting to £1101—and, added to the discounts and bad debts, totalled to £2402, which left a net rental of £28,325. Other receipts included rents for gas-meters, £500; rent of stoves, £100; residuals, £4341; and profit on fittings, £48. Profit on fittings had nothing to do with hereditament; but he left it in. The gross receipts were £33,369, as against Mr. Cross's £34,470; the difference being accounted for by the £1101 due to the reduction in the price of gas. As a matter of fact, the consumption for the first six months of this year was a quarter less than it was in 1897, notwithstanding the reduction. It had been stated that, in spite of the reduction in price, the profits of the Company for the half year to June last were equal to those in the corresponding period of 1897. This was so; but it did not arise from increase in the consumption of gas. It arose in this way: There was £1000 less spent in repair of works; £200 less for repair of mains; £50 gained in the residuals; £10 gained in the fittings; and the discounts were £336 less, owing to their having been reduced from 5 to 2½ per cent. These items added together made £1596. But there was an excess paid for rates and taxes of £236, which, deducted from £1360, accounted for the profits being nearly as much as they were in the half year ending June, 1897. Turning to the expenditure account, there was little difference between them except in the matter of purification. This was a fluctuating amount. The usual cost of purification was from ¾d. to 1d. per 1000 cubic feet; but witness had allowed 0·21d. In the matter of tenant's repairs to works, mains, and plant, witness took it at 3d. per 1000 cubic feet sold. This was a figure which experience showed was required. It was always necessary to average these repairs, because some years they were very trifling, while at other times they were extremely high. For example, in 1892 repairs cost 4·64d. per 1000 cubic feet; in 1893, only 3·48d.; in 1894, 8·07d.; in 1895, 5·58d.; in 1896, 6·79d.; and in 1897, 5·44d. So it was necessary to adopt an amount which would represent the average. Taking these figures, witness said 6d. per 1000 cubic feet was a fair average all round—3d. going to the landlord, and the same sum to the tenant. He had taken a figure which was a fair average, not including the extra expenditure challenged by Mr. Cross. In his opinion, 0·6d. per 1000 cubic feet of gas sold would be sufficient to repair, renew, and refix meters at the end of life. This, in fact, was a less sum than Mr. Cross allowed, basing his estimate on the years 1895 and 1896. The amount in the books for the repair of meters during the year was really £876; but witness's figure was only £462. So that here again it might be said that part of the meters should be charged to capital. This might be so; but he (witness) had no necessity to take it into account. He adopted a figure which would repair and reproduce the meter value at the end of its life; and this figure was 0·6d. He did not allow the restoration of the retorts to be taken into the accounts of the expenditure, which he considered was a landlord's charge; but he did take into account the rates the tenant had to pay.

Mr. BRADBURY: I understand the retorts are renewed every year.

Witness said that was not so; but even if they were, it would not be a landlord's charge. They lasted on an average three years. It was true the rates worked out to nearly 5s. 5d. in the pound; but Mr. Cross had included rates paid on some cottages, which ought to have been deducted, because they were separately assessed. As to the working capital of a gas company, it was important to bear in mind that there was a great difference between a gas and a railway company. On the one hand, a railway received revenue day by day, and had no bad debts; whereas the gas company received very little until the expiration, certainly, of four months. The appellant Company covered a wide district; and their expenses were heavier than in the case of a company confined within a narrow area. Instead of four months, he allowed five for working expenses; and he did so because five was an average figure. Take a winter quarter, the consumption of gas during October—or rather the make—was 18,714,000 cubic feet; in November, 26,951,000; and in December, 32,247,000. Now these were the three heaviest months of the quarter; but no money came in until the very end of January. The January consumption was 30,228,000 feet; and the four months added together gave a total of 108,140,000 feet, while the make for the whole year was 201,840,000 cubic feet. The make of gas for the four months under review was therefore actually 53·57 per cent. of the year's make; and 53·57 per cent. of the expenditure for the year (£20,602) amounted to £11,036. The average monthly expenditure was £1716, so that the amount the tenant would have to expend during the four months, before he received one farthing—or at least only a trifling sum—was equal to 6½ months of the year. The five months' expenditure would amount to £8584, as against Mr. Cross's figure of £7060. Witness was strongly of opinion that, in addition to the average consumption, there ought to be eight weeks' maximum daily consumption of coal. It would never do to work from hand to mouth. Two or three years ago six weeks' store was considered sufficient; but since the strikes, the period had been raised. Colliery proprietors would not make a contract now without a strike clause. Railway waggons had been disallowed by Mr. Cross; but witness had taken the twenty waggons at £55 each, which, after a depreciation of 25 per cent., left a net value of £825. New ordinary and prepayment meters in stock, on hire, or in repair, worked out to a total of £11,439. Although the life of a meter was put at from 25 to 30 years, meters, in witness's opinion, enjoyed a permanent life. They never wore out; and the Company charged meter-rents upon the new value of the meters, and not on the depreciated value. As a concession to the ideas of some of the



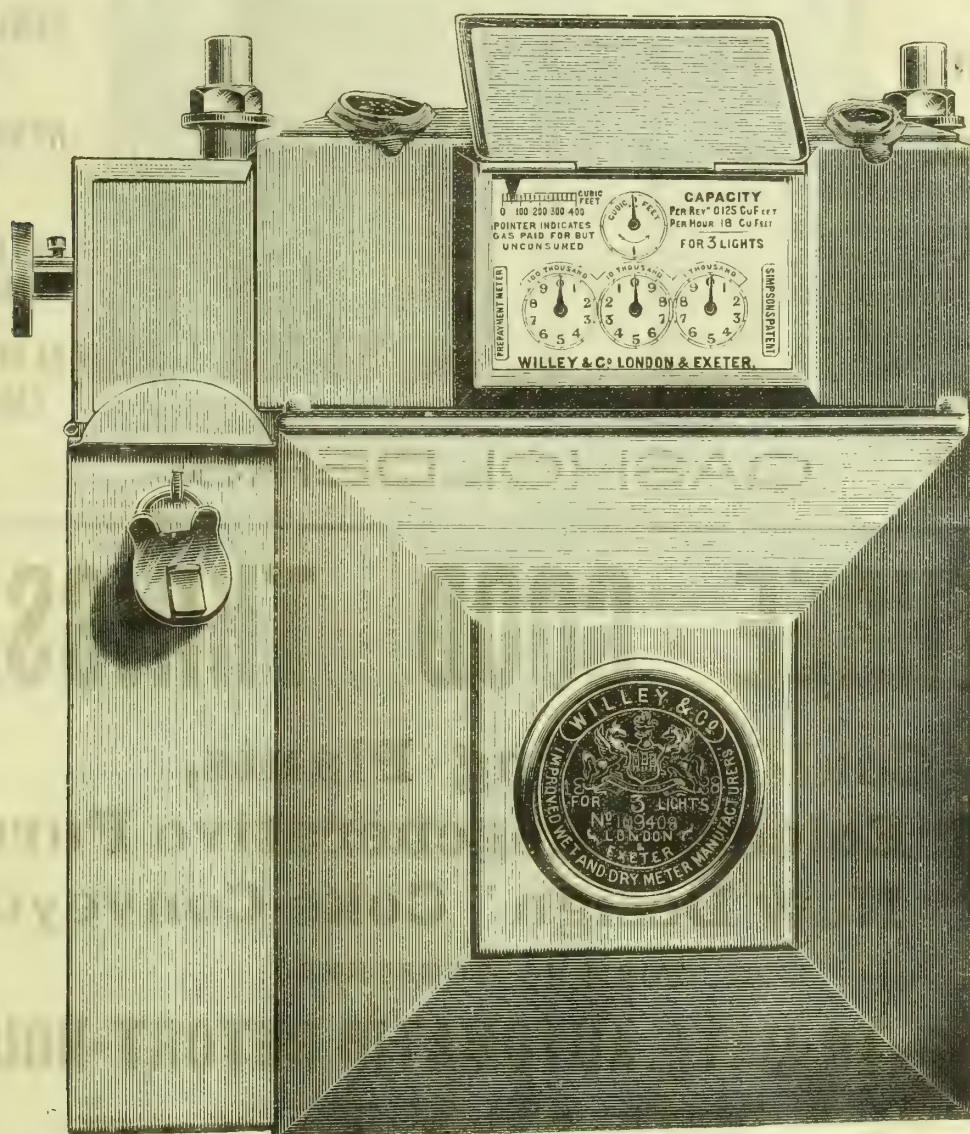
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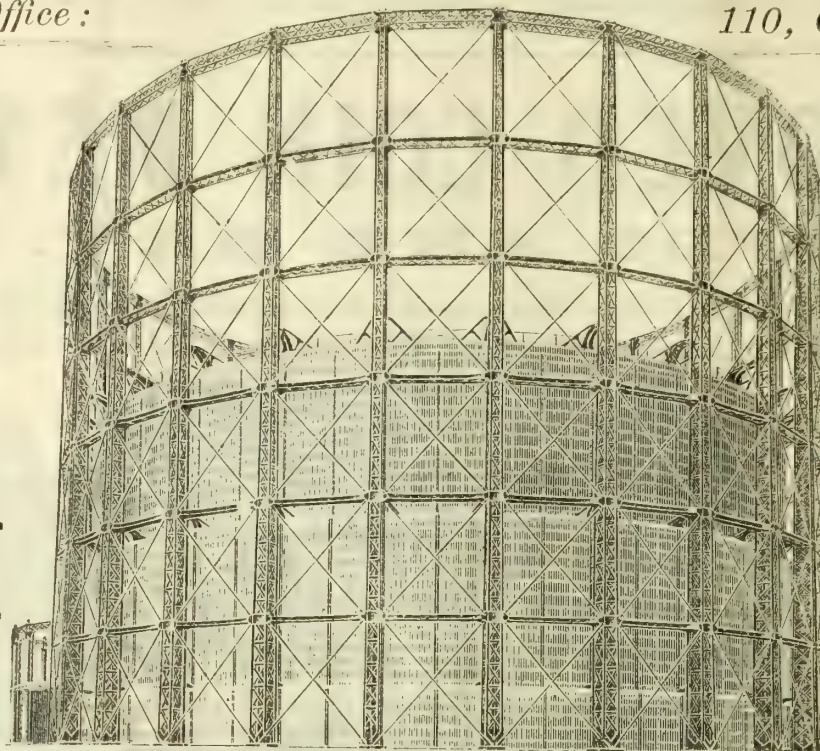
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valuers, he had taken 15 per cent. off. He had entirely ignored the old meters, because they were of no value until repaired. He could not see any justification for Mr. Cross's method of depreciating the meters, for by this means the Company would be throwing away half of their capital expended on them. The tenant should have capital in hand to pay his quarter's rent, because he was always a quarter behind. The present structural value of the hereditament, not including land, was £114,000; and a fund must be set aside to reproduce the capital value in 30 years. The rateable value of the whole was £5404.

**Cross-examined by Mr. BRADBURY:** The hypothetical tenant would not need directors; but he would have to bear certain expenses for his 17½ per cent. If he charged a salary for his own time, witness thought he would be entitled to do so. He was not aware that during 1897 the Company sold old meters to the value of £105. He agreed with Mr. Cross that a fourth of the residuals ought to be deducted. The £114,000 was the original cost value of the undertaking. The Company put by £2300 as a renewal fund, by spending it on renewals.

**By the CHAIRMAN:** As far back as 1870, when he managed the appellant Company, and the consumption of coal was about half what it was now, he used regularly to have a stock of 4000 tons.

**Mr. Corbet Woodall** said, with regard to the alteration in the price of gas, the tenant going into the premises would make inquiry as to the rate he would charge. It was in the matter of the distribution of the net receipts between tenant and landlord that the real question arose. He did not agree with Mr. Newbigging that it would be necessary to hold the coal in stock all through the year. In the lighter part of the year, the stock might be reduced. The custom with all companies in regard to meters was to keep them up as they maintained the whole undertaking, so that Mr. Newbigging's perennial theory was a perfectly just one. Dealing with the question of the 17½ per cent., witness said to offer a person £2700 a year for interest on his capital in an undertaking crowded with risk, would be looked upon by the average man as a joke. He suggested that in such a case £5474 was not by any means a large return. After the statutable deductions, he gave the rateable value of the whole undertaking at £5055. He had no experience of the practice among Lancashire gas companies as to stocking coal.

### Wednesday, Nov. 30.

When the hearing was resumed to-day,

**Mr. BRADBURY** explained that the case was adjourned in order that the respondents might investigate the question of the meters, for which purpose the Company had given every facility.

**The CHAIRMAN:** Have you not been able to agree upon a figure?

**Mr. SUTTON:** Yes; our figures were rather less than the numbers found in the books.

**Mr. BRADBURY:** So far as numbers go, I do not think there is any real dispute; but as regards Mr. Woodall's figures, there certainly is a dispute. Mr. Woodall charges a total sum of £2394 for taps and fixing of taps. I want to show, with reference to this and other items, how in point of fact they are treated in the books.

**Mr. Edge,** re-called, said up to nine years ago taps, fittings, and fixtures were re-charged by the Company to capital account.

**Cross-examined:** He could not say whether the taps went when the meters were taken away; and he was unable to state whether 10,186 was the total number of meters on hire, as shown by the Company's books, as compared with Mr. Newbigging's figures of 10,127.

**Mr. Cross,** re-called, said that the tap on the service-pipe was essentially a part of the supply-pipe, and not of the meter.

**Mr. SUTTON:** Have you made inquiries to ascertain whether the Company leave the taps on when removing the meters?

**Witness:** I do not know what the Company do. The practice is to leave the taps.

Your statement is entirely in contradiction to Mr. Woodall, that the usual custom is to take away the tap?—I contradict that.

In answer to further questions, witness said that in his previous items in the account for working expenditure he had allowed the amount charged in the books for new meters, but had deducted £510 because the sum charged in that particular year was excessive. It was a capital outlay.

**Mr. Wainwright** agreed with Mr. Cross's evidence as to the taps. When meters were taken out in Liverpool, it was the custom to leave the taps behind.

**Mr. Newbigging,** in answer to Mr. SUTTON, said the invariable practice was to unscrew the tap off the service-pipe, because it would not be safe to leave it there. On an average, the value of the tap was 2s. 6d.

**Mr. SUTTON** then proceeded to address the Court on behalf of the appellants. He urged that they were there to ascertain the rate at which hereditaments might reasonably be expected to let from year to year, free of all usual tenant's rates and taxes, tithe commutation, and rent-charge, and deducting therefrom the probable average annual cost of the repairs, insurance, and other expenses necessary to maintain them in a state to command such rent. He quoted the words of Lord Herschell in 1893 in the case of the Sheffield Gas Company, wherein the difficulties of dealing with such rates was commented upon, and his Lordship stated that the only course the Court could adopt was to adhere to the principle laid down in *Regina v. West Middlesex Water-Works Company*. In the present case, there were certain difficulties which did not arise in regard to railway companies and undertakings of that character, because Acts of Parliament had introduced a set of provisions which made dealing with gas-meters entirely different. Hitherto the authority which had been considered the foundation was the Lee case, where it was laid down that meters were tenant's capital. The rates and taxes were made part of the tenant's annual expenditure; and Counsel could not see how it could be contended that they could be dealt with otherwise than as part of the expenditure which must come from the tenant, because the Act distinctly stated that it was to be "free of all usual tenant's rates and taxes." It was in consequence of Mr. Cross introducing the retorts into the expenditure, and cutting out the rates and taxes, that one of the great difficulties in the case had arisen. It was true the Company submitted to the rate of 1887. Gas companies were not anxious to fight these expensive cases; and while strongly advised that the rate was in excess of what they ought to pay, they submitted. But when on the top of this the Company were still further rated, they found it necessary to ask the Court to assess the fair rateable value of the undertaking. It must be remembered that

the Court were not dealing with the profits in any sense, except for the purpose of ascertaining what rent would be given for the hereditament. It was on the question of expenditure that he considered the valuers for the Assessment Committee had gone wrong. In omitting rates, they had ignored the Act; and bringing in the repairs of retorts, was not in accordance with the decision in the Lee case. Certainly £300 was a small enough sum to give to any hypothetical tenant who undertook the management of such an important concern as the Rosendale Gas-Works. In the Southampton case, which was decided when Lord Chief Justice Cockburn was Recorder of Southampton, it transpired that a sum of £1000 had been originally paid to the Directors of the Southampton Docks; but in consequence of the rather unfortunate financial position of the docks, the amount was not handed over for a few years. Nevertheless, the Recorder allowed the sum for the hypothetical tenant; and the Court of Queen Bench upheld his decision. Dealing with the thorny question of repairs of works, mains, and plant, Counsel submitted that it was not right to base the calculation simply on the books for one, two, or three years. They should ascertain the probable average in a wider and more scientific manner. Discussing the working expenses, he urged that the tenant must be prepared with capital sufficient to enable him to meet the outlay at the period of largest gas consumption. It could not be disputed that October, November, December, and January constituted the busiest four months of the year. In fact, the expenses during these four months were admittedly equal to six and a half average months. The Company, however, had only taken five months; and in doing this they adopted a very fair and reasonable proportion. With regard to the stock of coal, the Company ought to have in hand 6216 tons. If the Company had not kept up such a stock, they ought to do so, in order to safeguard themselves against possible strikes and other contingencies. The omission on the part of the respondents to include the Company's railway wagons in the working expenses, threw a very strong light on the way in which the case had been got up for the Assessment Committee.

**Mr. BRADBURY:** The Company entirely omitted any reference to them; and that is the reason they were not put in.

**Mr. SUTTON,** in conclusion, pointed out that, by section 19 of the Gas-Works Clauses Act of 1871, the Company were bound to keep the meters in thorough repair.

**Mr. BRADBURY,** in reply, said that because Directors' fees were allowed in the Southampton Docks case, it was no reason why they should be granted in the present instance. He contended that the question of Directors was mixed up with the total salaries and expenses of the concern. The figure Mr. Cross allowed in respect of these salaries was very high. For salaries of Secretary, accountants, and clerks, he put down £671; and for engineers, &c., £425. Apart from the Directors, therefore, there was a sum of over £1000. The hypothetical tenant would have no Directors; and if he was getting 17½ per cent. on his capital, he would not be allowed anything beyond that. As to the tenant's capital, Counsel urged that their evidence as to how the coal was bought and payments made had not been touched at all. The hypothetical tenant ought not to take four winter months' supply, but three. With regard to the inclusion of rates and taxes in the working expenditure, he thought Mr. Sutton must have been somewhat misled by the case he had quoted, for he (Mr. Bradley) did not find anything which said that the rates and taxes, although relied upon by the Company, were allowed by the Court as expenditure. The material point in the present appeal was whether a tenant ought to be allowed interest on capital provided for the purpose of paying rates and taxes; and he asked the Court to say that, conducting his business in an ordinary way, a tenant would have money wherewith to pay the rates, and would not include them as part of the tenant's expenditure. He appealed to the Court to deal with the matter as business men, and not to allow the Company to swell their capital on the fanciful hypothesis of what an imaginary tenant ought to do, but what no commercial man ever did. In conclusion, he reminded the Court that in 1888 the Company were rated upon one-half of the net receipts, and there had never been a single objection to that assessment. If the proportion of 50 per cent. was correct in 1888, why was there not the same right to a similar proportion in 1897?

The Bench retired, and were absent a considerable time. On their return,

**The CHAIRMAN** said: We have to deal only with the total rate of £7477, which we affirm.

**Mr. BRADBURY:** The appeal will be dismissed with costs.

**The CHAIRMAN:** Yes. I do not know how the amount will have to be apportioned.

**Mr. BRADBURY:** The apportionment will have to take place; and if any question arises, it will have to come before you again.

**Mr. SUTTON:** How about the Bacup case?

**The CLERK OF THE PEACE (Mr. Hutton):** According to the rateable value, Rawtenstall is £5100, and Bacup £2377.

**Mr. SUTTON:** I understand that all that has been affirmed is that £5100, plus £2377, is the aggregate rateable value of the whole.

**The CHAIRMAN:** All we have decided at present is the £7477.

### GREENWICH POLICE COURT.—Wednesday, Nov. 30.

(Before Mr. G. G. KENNEDY.)

London County Council v. South Metropolitan Gas Company.

The Question as to Exemption of Gas-Works from the London Building Act.

Judgment in this case was delivered to-day. The Company, it will be remembered, were summoned by the London County Council for an infraction of the London Building Act, 1894, by the erection of a coal-shed at the Rotherhithe Gas-Works within the prescribed distance of 20 feet from the centre of the roadway, and without having first obtained the consent of the Council. The Company claimed that, under clauses of the Building Act itself, they were exempt; and, furthermore, that the Surrey Consumers' Gas Act of 1854 made it lawful for them to construct "such houses, buildings, and approaches upon the lands belonging to them, or which they may acquire under the powers of this Act, and to make and supply gas, or to contract for the making and supply of gas in such manner as they shall think proper," &c. A report of the arguments of



Counsel, and the evidence adduced at the hearing of the action, was published in the "JOURNAL" for Nov. 22.

His WORSHIP, in giving his decision, said he had carefully considered the case, and had come to the conclusion that the Company could not claim exemption from the provisions of the Metropolitan Building Act, either by virtue of their Special Act, or because the land on which the building was erected was their own curtilage. Therefore the County Council would obtain the order they sought. There would be a nominal penalty of 40s. He had also had to consider that very odious question of costs; and he thought 15 guineas should be payable in this case by the defendants.

On the application of Mr. C. F. T. BLYTH, his WORSHIP consented to state a case.

Mr. BLYTH asked his Worship if he would say what he found as to the question of the building being necessary.

His WORSHIP replied that he held it to be a necessity, and so decided that point in the Company's favour. Any other questions of fact he would consider hereafter.

#### Tampering with Water-Pipes.

At the Wakefield West Riding Police Court, on the 25th ult., Messrs. E. & J. W. Simpson, Limited, were charged by the East and West Ardsley District Council with fraudulently extracting water from their mains. Mr. R. B. Hopkins, Clerk to the Council, prosecuted; and Mr. Lodge represented defendants. Mr. Hopkins, in opening the case, said the defendants carried on a large business; and Mr. Eli Simpson had been a member of the Council and also Chairman of the Water Committee. Up to July 13, 1896, the whole of the premises, including two cottages, were supplied through one meter. In the month named, the pipes were altered; the cottages being charged on a rental and the mill premises by meter. On Oct. 1 last, the water inspector accidentally discovered that the connection which had been cut off had been restored, and that water was passing by the domestic main to the mill without flowing through the meter. Mr. Lodge contended that defendants were perfectly innocent, and had no idea the mains had been tampered with. The full penalty of £2, with £3 15s. 6d. costs, was imposed.

#### Thefts from Prepayment Meters.

At Tottenham, a few days since, Henry Ruskin (13), of Enfield, and Jesse May (11), of Edmonton, schoolboys, were charged with being concerned together in stealing from No. 17, Findon Road, Edmonton, 11s. 9d. in bronze from a prepayment gas-meter, the moneys of the Tottenham and Edmonton Gas Company, and also with damaging the meter to the extent of 10s. It was shown by the evidence that the boys forced the catch of the kitchen window of the house, got in, and with a poker broke open the gas-meter and stole the money it contained. The next day they procured a ladder, and climbed into the bedroom window, ransacked a chest of drawers, took 5s. 9d. in cash and an overcoat, which they afterwards sold. Both boys bore a very bad character. The Bench ordered each to receive six strokes with the birch-rod. The aunt of May requested the Magistrates to "lay it on thick;" and this was done in the course of the afternoon.

**Oil v. Gas Lighting at Aldeburgh.**—For some two years Aldeburgh has only been partially lighted, and that by 27 oil-lamps; the reason being that, although members of the Paving and Lighting Committee of the Corporation were agreed to the price of £1 12s. 10d. per lamp asked by the Gas Company, the latter would not be tied to terms regarding the quality of the gas, and penalties for non-lighting, cleaning, &c. Just recently there has been an interview between members of the Corporation and the Board of the Company, and an arrangement was arrived at by which the Corporation will pay £1 7s. 6d. per lamp and do the lighting and cleaning themselves.

**Gas Workers' Wages at Darlington.**—An application was recently made to the Darlington Corporation Gas Committee, by Mr. H. Lynas, the Local Secretary of the Gas Workers' Union, for an advance of wages for the men employed at the gas-works. After discussion by the Committee, the Town Clerk was instructed to reply that the Gas Engineer (Mr. T. Smith) would be prepared to meet a deputation of the men to consider any application they might make, but that such application must be made by the men direct. At a meeting held yesterday week, the men decided that they would not meet the Engineer without the presence of Mr. Lynas, and that they would, if necessary, tender their notices in support of this action. The application was for an advance of 2s. per man per week for stokers, labourers, coal wheelers, &c.; and it included a request that the lamp-lighters should be relieved from yard work.

**Brighouse Gas Supply.**—At the last monthly meeting of the Brighouse Town Council, Alderman Sugden (Chairman of the Gas Committee) drew the attention of the members to the report of the Engineer (Mr. J. Parkinson) and the balance-sheet of the Gas Department. Those who had read the balance-sheet would have seen that there was a slight profit. Of course, this was not so satisfactory as the Committee would have liked. Brighouse would be able to make as much profit as ever if it stood alone; but they had taken over the Rastrick Gas-Works, and Rastrick had gained at the expense of the ratepayers. But there was one thing which was not altogether satisfactory. The Committee were surprised that, although the price had been lowered, the increase in consumption was not larger in Rastrick than was the case. The consumers were relatively small as compared with Brighouse. It was suggested that they should commence using penny-in-the-slot meters, which he thought would increase the consumption. More consumers were required; and then the Committee would not only supply gas at the present price, but also make a good profit. Mr. Helliwell inquired the reason why they had no report as to electric lighting. Were they making so much profit that they dare not show it to the consumers? Alderman Sugden replied that it was considered by the Committee that the report should not be published at present. Of course, they could not expect to make a profit with the plant as it was at present. The gas made during the past year was 152,803,800 cubic feet; being an increase of 6,375,300 cubic feet. The gas sold to customers was 124,450,900 cubic feet—an increase of 5,763,000 cubic feet. The works are to be improved, and fitted with an installation of inclined retorts.

## MISCELLANEOUS NEWS.

### THE GASLIGHT AND COKE COMPANY'S STOCK-CONVERSION SCHEME.

To Come into Operation, Jan. 1, 1899.

The Directors of The Gaslight and Coke Company have issued a circular intimating that, in pursuance of the powers conferred by the Company's Act of last session, the consolidation and conversion of stocks thereby sanctioned will take effect on and from the 1st prox. There are at present eleven classes of ordinary and preference stock, and four classes of debenture stock; and under the consolidation scheme they will be converted into four classes, to be designated respectively, "ordinary stock," "4 per cent. consolidated preference stock," "3½ per cent. maximum stock," and "3 per cent. consolidated debenture stock." The existing "A" ordinary stock, bearing a standard rate of dividend of 10 per cent. per annum subject to the sliding-scale, with an initial price of 8s. 9d. per 1000 cubic feet, will be converted into ordinary stock with a standard rate of dividend of 4 per cent. per annum, subject to a sliding-scale providing for the reduction or increase of such dividend by 2s. per cent. per annum for every 1d., or part thereof, charged in excess or in diminution of the above-named standard price. Each £100 of the present "A" ordinary stock will be converted into £250 of the substituted stock. Each £100 of the "A" and "F" 5 per cent. preference stocks will be converted into £125 of 4 per cent. consolidated preference stock; the "B" 4 per cent. maximum stock will remain unchanged; each £100 of the "C," "D," "E," and "J" 10 per cent. preference stocks will be converted into £250 of the above-named 4 per cent. consolidated preference stock; each similar quantity of "G" 7½ per cent. and "K" 6 per cent. preference stock, into £187 10s. and £150 respectively of the 4 per cent. stock; and each £100 of "H" 7 per cent. maximum stock, into £200 of 3½ per cent. maximum stock. Each £100 of the present 4, 4½, 4¾, and 6 per cent. debenture stocks will be converted into £133 6s. 8d., £141 13s. 4d., £150, and £200 respectively of 3 per cent. consolidated debenture stock. Amounts of existing stock other than £100 will be converted into amounts of new or substituted stocks in the same ratio as that set forth above. In accordance, however, with a provision contained in section 11 of the Act, the new or substituted stocks will be issued and be transferable only in amounts of £5 or multiples thereof; and where any proprietor would be entitled to an amount of new or substituted stock which is less than £5, or which exceeds £5 or some multiple thereof by an amount which is less than £5, the Company will purchase such fractional amount of stock at the market price for the time being. Subject to the provision above referred to, the holdings of the new or substituted stocks registered in lieu of those of the existing stocks will in all cases, and under all circumstances, be such as, at the ratio of dividend or interest on the new or substituted stocks, and under the revised sliding-scale as applicable to the ordinary stock, will yield exactly the same amounts of income as would have been received by the proprietors on their holdings of the existing stocks if the conversion had not taken place.

In connection with the foregoing particulars, reference may be made to a letter, signed "Manu Forti," which appeared in the "Financial News" last Friday. Early this year, the writer called attention in the columns of the paper to the financial position of the Company, which he says has proved correct in every particular. He points out, however, that since that date various things have happened to materially improve the position; and he thinks it only right, seeing that in the letter referred to animadversions were made on the policy of the Directors, that the present position of the undertaking should be placed before the investing public. He goes on to say: "To-day the ordinary 'A' stock of the Company stands at the low figure of £280, yielding a return to the investor of £4 7s. 6d. per cent., whereas the South Metropolitan Gas Company's ordinary stock yields only £3 16s. 2d. per cent. This is paradoxical, to say the least of it; and I will endeavour to prove that it is so. The South Metropolitan Company have now got the price of gas down to 2s. 3d. per 1000 cubic feet—a figure which must be admitted very low for London, and for which every credit is due to the management. However, there is a limit to good management; and I am of opinion that in the case of the South Metropolitan Company this limit has already been reached, and it would be unreasonable to expect any further improvements under existing conditions. The Gaslight and Coke Company are now charging 3s. per 1000 cubic feet; and the indications at the present time are that this figure will be reduced, and carry with it increased dividends. The advance of 2d. per 1000 cubic feet on April 1, 1898, will increase the revenue by about £180,000 per annum. In addition to this, the market for sulphate of ammonia has improved to such an extent that sulphate may be expected to yield about £50,000 more than last year; and, taking into account the present state of trade, coke should yield a further increase of at least £50,000. These figures added together make a grand total of £280,000—a sum which should build up the lately depleted reserve fund, and place the Company on a sound financial basis. By powers recently conferred upon the Company, the 10 per cent. ordinary stock, paying 12½ per cent., will be converted on Jan. 1, 1899, into a 4 per cent. ordinary stock, paying £4 18s. per cent.; and the new issue of the converted stock—to be sold by public auction on the 6th prox.—ought to be a good investment at £122 10s. per £100. At this price it would yield 4 per cent. per annum. To make matters more clear, it may be well to point out that the ordinary stocks of both Companies are now identical. The South Metropolitan Company pay dividend on their ordinary stock at the rate of £5 6s. 8d. per cent. per annum, with the price quoted at £140 per £100—yielding £3 16s. 2d. per cent. The Gaslight and Coke Company pay dividend at the rate of £4 18s. per cent. per annum; and at the price recommended—viz., £122 10s. per £100 of stock—will yield 4 per cent. per annum, to say nothing of the prospective enhanced value of the stock."



**MANCHESTER CORPORATION GAS UNDERTAKING.****Further Money Required to Meet Increasing Business.**

On behalf of the Local Government Board, Mr. G. W. WILLCOCKS held an inquiry at Manchester last Tuesday into an application by the Corporation for sanction to borrow £500,000 for the purposes of the gas undertaking. There was no opposition.

Mr. T. HUDSON (the Deputy Town Clerk), in opening the proceedings, stated that the Local Act of 1875 authorized the Corporation to borrow £250,000 for gas-works. Since then, in 1880, 1884, and 1893, the Act had been amended by Provisional Orders, granting power to borrow further sums of £250,000, £200,000, and £500,000 respectively. These four amounts made a total of £1,200,000, all of which had been spent, with the exception of £20,000. It was now necessary to borrow further money for gas-works purposes; and on Oct. 26 last, the Corporation passed a resolution to apply for power to borrow £500,000.

Alderman Gibson, the Chairman of the Gas Committee, first gave evidence. He said that the £20,000 yet unspent would be expended entirely upon meters and stoves, probably within the next twelve months. The £500,000 authorized to be borrowed five years ago had been laid out in a manner profitable to the undertaking, and, he believed, highly satisfactory to the ratepayers, inasmuch as the price of gas had been considerably reduced, and £50,000 a year had been paid over to the city fund in aid of the rates. In 1894 there were 81,637 gas consumers; and in 1898 112,263—being an increase of about 30,000. In 1894, they carbonized 360,000 tons of coal; and in 1898, 407,000 tons. The capital expenditure on the works was: In 1894, £1,557,638; and in 1898, £1,969,333. The mortgage debt in 1894 was £653,976; and in 1898, £1,058,989. The income in 1894 was £569,032; and in 1898, £553,642, although in the meantime the price of gas had been reduced from 2s. 6d. to 2s. 3d. per 1000 cubic feet to consumers within the city, and from 3s. to 2s. 6d. to consumers outside, and meter-rents had been absolutely abolished. Had the prices been maintained at the old figures, and the meter-rents retained, the income last year would have been larger by £105,000. These figures showed that, in spite of the reductions and the competition of the electric light, the net revenue had not appreciably decreased. The £50,000 a year was still being paid into the city fund. The expenditure on revenue account in 1894 was £496,256; and in 1898, with a larger business, it was £440,845. The Corporation had every reason to believe that the number of consumers would continue to increase both within and outside the city. The population was growing, new buildings were being erected, and gas for cooking and heating purposes was becoming more appreciated. There were still some thousands of houses in the city in which there were no prepayment meters. The £500,000 would be required to meet the prospective increased demand within the next five years. The number of out-townships supplied was sixteen, with an aggregate population of 150,933. The highest daily consumption of gas recorded was 23,824,000 cubic feet. The manufacturing capacity was 22,500,000 cubic feet; and the storage accommodation equal to 25,500,000 cubic feet. The total value of the property and assets was £2,223,549; and the total liabilities £1,206,139—leaving an excess of assets of £1,017,410. The gross profit last year was £112,797. To sinking fund £56,168 was paid; leaving a net profit of £56,168, of which £50,000, as he had already said, had been paid in reduction of rates. During the last ten years, £417,762 had been paid out of the gas profits in reduction of rates; and in the same time £544,000 had been transferred to the sinking fund. A remarkable fact was that the introduction of the electric light did not seem to diminish the demand for gas.

Mr. G. E. STEVENSON, the Gas Engineer, stated that the present manufacturing capacity was barely enough to meet the demand. The new works included the making of a complete new section of works at the Bradford Road station, large enough for the manufacture of an additional 6 million cubic feet of gas per day; but apparatus and plant would at first be laid for the production of only 3 million cubic feet. These works would absorb £200,000. At the Rochdale Road works, it was proposed to expend £15,000 upon an extension of the plant, so as to increase the output by 2 million cubic feet per day; and £5000 upon new exhausters, boilers, workshops and stores. The total expenditure at the Gaythorn station would be £30,000, with a view to increasing the output by 2 million cubic feet per day. A sum of £140,000 was estimated to be required for new mains during the five years; £100,000 for new meters and stoves; and £10,000 for new workshops, stables, and stores. Witness stated that the meters would be to a very considerable extent prepayment ones, for which there was a great future. During the last three years they had spent £70,000 on meters and stoves, the demand for which had been above expectation.

Mr. Briggs, the Deputy Chairman of the Gas Committee, thought it quite necessary the powers now sought should be granted. A week or ten days' fog would very severely tax the capacity of the existing works.

This closed the inquiry.

**BIRMINGHAM CORPORATION GAS SUPPLY.****Report by the Gas Committee.**

Among the business to be brought before the Birmingham City Council to-day is a report by the Gas Committee, in which reference is first made to the considerable progress which has been effected in the extension of the gas manufacturing and storage plant at Nechells since the Committee reported to the Council in February last. The output of gas since that time has continued to increase; and there has been nothing in the experience of the Committee since their estimates of future output were made to warrant any departure from the recommendation they then proposed for the further gradual development, as occasion may require, of the whole scheme authorized by the Council. As intimated in their report last February, the Gas Committee have authorized a further capital expenditure of £13,800 in the diversion of the main sewer across the Nechells land, and in re-forming the channel of the River Rea. The total cost of this work on the land occupied by the gas-works, including an enlargement of the sewer required by the Public Works Committee, has been estimated by that Committee at £21,000, including the cost of enlarged sewers of 7 feet and 8 feet diameter

respectively, towards which the Gas Committee have agreed to contribute the sum of £13,000 on the terms already reported to the Council by the Public Works Committee. Subsequently, on the application of Messrs. Brotherton and Co., the Committee agreed to extend the work across the land leased to them. This will involve a further cost of £1000, towards which Messrs. Brotherton will contribute £200. As intimated in the report of February last, the Committee have sanctioned a further capital expenditure estimated at £11,500 in the construction of a branch railway to, and sidings on, the Nechells site. They have considered the memorial from the inhabitants of Nechells referred to them by the Council, and report that the principal portions of the extensions at Nechells being in an advanced stage, it is too late to ask the Council to reconsider their decision to extend the works on this site.

The Committee have entered into a contract with Messrs. A. W. Smith and Sons at £10,180 for the construction of walls, canal basin, &c., in connection with the extensions at Devon Street and Nechells. They have also accepted the following tenders in connection with the extensions at Nechells: Messrs. Laidlaw and Sons, exhausters and engines, £1370; Messrs. Barnsley and Son, building of new retort-house and chimneys, £13,556; Messrs. Parkinson and Co., station meter, £1935; Messrs. C. & W. Walker, purifiers, £10,985. In the absence of effective competition, and having regard to the very large advance in the price of such meters in the last few years, the Committee have ordered one station meter only for the new works instead of two, as would be necessary if a reserve is provided. While it is a matter of convenience to have a reserve station meter, it is not, as it is with some other portions of the plant, essential, as station meters are bye-passed to provide against accident.

The Committee also report on the serious explosion and fire which occurred in the large exhauster-house at the Salfley works on Nov. 13, and the Coroner's inquest on one of the workmen. They have felt that, having regard to the lamentable result of the accident, it would be the wish of the Council, without entering into the question of liability under the Workmen's Compensation Act, to assess on the lines of that Act the compensation to be offered to the dependants of the deceased workman. They have, therefore, made a grant to his legal personal representative of £237 16s. 6d. They have also awarded a sum of £25 to Mr. Morrison, the Assistant Engineer, in recognition of the great value of the services which he rendered at this difficult time, and a sum not exceeding £10 to be distributed by the Engineer among the workmen and others who gave timely and exceptional help. The Committee have given instructions that first-aid appliances shall be stored in readily accessible places in different parts of the works, and that notices shall be kept posted where these and ambulance appliances are placed.

The Committee have made the necessary contracts for coal and for gas oil for the coming year. The prices paid on these contracts will be in excess of those of the previous year. Since the contracts for coal were made, deliveries on some of the contracts for Windsor Street have been delayed, owing either to accidents at the pits or to the default of the contractors. The Committee have, therefore, purchased 7000 tons of coal for winter delivery in substitution for these arrears; and a portion of the additional price paid for this coal will be chargeable against the contractors making default. The contract with Messrs. Lewis Demuth and Co., Limited, for the tar produced at the Corporation works expired in June last, but has been renewed on revised terms for the next four years. The number of prepayment meters in use on Nov. 1 was 4800; and at that date nearly 1000 orders for such meters were unexecuted, owing to the impossibility of securing a sufficient number of gas-fitters in the winter months to execute promptly the orders for fittings work received by the department. The Committee have accepted tenders from several gas-fitters to fix these meters and fittings.

**SALES OF STOCKS AND SHARES.**

At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards offered for sale, by order of the Directors, £13,500 of new ordinary stock of the Southend Gas Company. It ranked for a standard dividend of 5 per cent. per annum, subject to the sliding-scale; but it was entitled, in view of the dividend paid on the existing capital on June 30 last, to an additional  $\frac{1}{2}$  per cent. The stock was sold with the dividend accruing from the 1st prox. The highest price realized per £100 of stock was £115 10s.; the lowest, £111; the average, £111 10s. 11d.—yielding £4 14s. 1d. per cent. on the investment. The total amount of the sale was £15,058 15s. On the same occasion, Mr. Richards sold some new ordinary £10 shares, (7 per cent.) fully paid, in the Great Yarmouth Water Company, the last dividend on which was at the rate of 4 per cent. per annum. They fetched £12 10s. each—yielding £3 4s. per cent. on the investment. A few £10 fully paid 6 per cent. preference "A" shares realized £16 15s. each—returning the purchaser £3 11s. 8d. per cent. on his investment. Some fully paid £10 preference shares (5 per cent.) in the South-West Suburban Water Company fetched an average of £13 9s. 9d. each—yielding £3 14s. 2d. per cent.; ordinary £10 shares, bearing  $4\frac{1}{2}$  per cent. dividend, realizing an average of £13 16s. apiece, and returning the purchaser £3 5s. 3d. per cent. A parcel of £10 "D" water shares (£4 paid) in the Barnet District Gas and Water Company was disposed of at an average price of £7 each, and some "D" water stock at the rate of £160 per £100 of stock; yielding in the former case £3 12s. per cent., and in the latter £3 18s. 9d. per cent. There was a somewhat better demand and keener competition than has prevailed at recent sales; and the total amount realized was £21,222 17s. 6d. At a sale of miscellaneous stocks and shares at Lewes on the same day, four lots of £50 consolidated original capital stock in the Lewes Gas Company were sold at £106 each. Original £25 shares in the Lewes Water Company, earning 10 per cent. dividend, realized £80 and £82 apiece; and some £25 7 per cent. shares produced £53 and £54 each. One lot (£36) of preference stock in the same Company fetched £44. At Gainsborough on the following day, Mr. F. Baines sold by auction £4000 of new ordinary stock, ranking for a maximum dividend of 7 per cent. The prices obtained ranged from £150 to £152 10s. per cent.; and the total yield was £6047 10s. On Wednesday last, Messrs. Bishop and Pritchett submitted to public auction £5000 of new ordinary 5 per cent. stock of the New Swindon Gas Company, issued under the provisions of the Company's Special Act of 1893. Biddings were taken per £10 of stock; the prices realized being from £11 2s. 6d. to £11 14s.



## ELECTRIC LIGHTING NOTES.

The Winsford District Council are among the applicants to the Board of Trade for electric lighting powers. They came to the decision to proceed in the matter on Monday last week, when estimates were submitted by the Engineer consulted, showing that a first instalment of electricity to light the principal streets could be carried out for £7700, and a complete installation for £12,000.

In a pithy letter to a Manchester paper, Mr. T. G. Jenkins, of 17, Deansgate, lays a serious complaint against the Corporation Electricity Department. He says: "Is it not time the Corporation paid some attention to the very irregular supply of electricity? The retail trade of Manchester is constantly hindered by the fluctuations. For hours our shops are in semi-darkness. Can nothing be done? My neighbours at this moment have an excellent illumination of incandescent gas, while my place illustrates the Dantesque statement 'Abandon hope.'"

Complaint was made of the erratic doings of the electric light at the meeting of the Wallasey District Council last Thursday. One member (Mr. Bleakley) asserted that the arc lamps in the streets were "generally" not alight; and Mr. Buck to some extent confirmed the statement. Mr. Lee, as a private consumer, was also disappointed with his supply, and suggested that, if the Committee had not sufficient energy, they should not profess to supply it. The Chairman of the Committee (Mr. Joyce) admitted that there was ground for grumbling by stating that he hoped they would soon have an ample supply, and that the complaint would no longer be justified.

According to the latest report, the electric light undertaking at Torquay is making satisfactory progress, and the light is now available by day as well as by night as heretofore. Since it was inaugurated eight or nine months ago, the number of private consumers has increased from forty to over a hundred. According to a local paper, "a substantial amount will be saved by the substitution of electric arc lamps for the gas-lamps." The meaning of this appears to be that in the current year's accounts the Corporation are charging themselves something less than cost price for the electricity. As a consequence, the item of street lighting in future is bound to be considerably increased.

The municipal electric lighting works at Colchester started on their career last Thursday, although the formal inauguration will not take place until next month. The engine-house at present contains three 300-horse power engines, coupled direct to dynamos of 250 amperes at 250 volts—each dynamo being capable of supplying 2000 8-candle power incandescent lamps. Ample room has been left for developing the business. The charge to consumers is to be 8d. per unit; but after a lamp has been in use 300 hours, the price is to be reduced to 5d. The cost of gas in Colchester being 3s. 3d. per 1000 cubic feet, the consumers will find electricity a somewhat more costly method of lighting.

At last Thursday's meeting of the Hampstead Vestry, the Electric Lighting Committee reported that they found the sum of £2272 which the Vestry decided to apply for permission to borrow, for the purpose of meeting the capital expenditure in carrying out the West End Lane arc lighting scheme, would be insufficient for the purpose; and, as a matter of urgency, they had instructed the Vestry Clerk to bring before the Finance Committee the question of recommending the Vestry to increase such proposed loan to £2560. This was done in its entirety. Some discussion was afterwards caused by a recommendation that further gas-lamps should be erected in certain thoroughfares; but this, too, was eventually acceded to. Mr. Richardson inquired why gas-lamps and not arc lamps were to be used. No reply was vouchsafed to the question; but the fact that the arc light outside the Vestry Hall was at the moment in a state of uncertainty spoke volumes.

There seems to have been lately quite an epidemic of failures and complaints of inefficiency of electric lighting. Even Chelmsford—the one-time show-place of an electrical firm—is dissatisfied with the way in which the Electric Lighting Company are carrying out their contract for lighting the public streets and supplying business and private establishments. Mention was made of the matter at the meeting of the Town Council last Wednesday; and it was suggested by the Lighting Committee that a strong representation should be made to the Company on the subject. Several communications had passed between the Committee and the Company as to the public lighting. On one occasion, remarked the Chairman of the Committee (Mr. E. Lawn), the Company, as an excuse, said "the damper had gone wrong;" another time it was the circuit. The Council paid over £1000 a year for the lighting of their streets; and no town the size of Chelmsford, where the electric light was used, was so badly illuminated as they had been during the last twelve months. The report was adopted. Notification was afterwards given that the Electric Lighting Company intended to lay four new cables, to act as feeders to their system, and also to construct eight new transformer pits in various parts of the borough. The Council, however, disapproved of the scheme on the ground that the plans submitted did not show sufficient details.

"There was a good deal of the bearing element requisitioned in the neighbourhood of Eastbank Street, Southport, on Saturday evening last," writes "A Groper" in the "Southport Guardian" of the 30th ult., "for at an unexpected and altogether unfortunate moment the light failed. To old consumers of course it was not altogether a new experience; they had previously had samples of its vagaries. Recognizing the claims of electricity as the capricious queen of lights, they had grown to anticipate exhibitions of regal self-assertion. But one or two new subscribers—tradesmen whose acquaintance with it is only of the nodding character—stood aghast when, without an instant's warning, the 'glim' was 'doused.' The sudden defection was not anything like general in the town. That was something for the unaffected ones to be thankful for; but, such is the perversity of human nature, the fact only served to further aggravate the unhappy wights numbered among the roll of victims. But lamentations and recriminations were of little avail. Deep and earnest oburgation totally failed to re-kindle the vital spark enshrined within the clear globes of glass; and after a minute or so had been consumed, partly in hope that the current would resume its ordinary course, and partly in silent meditation on the mutability of human affairs—a self-communing conducted in glowing thought—the practical nature reasserted itself, and palliative agents were hastily sought."

The Corporation of Dublin were called upon last Thursday to answer two summonses in the Southern Police Court, taken out by the Sun Fire and Life Insurance Company and Mr. Wilfred Fitzgerald respectively, for

having on the 21st ult. made, and continued to make, default in supplying electrical energy to their premises, thereby rendering themselves liable to a penalty of £2 in respect of every default on each day. It appeared, from the statement of Mr. Shaughnessy (representing the Corporation), that these cases were pioneer ones, and that on the issue hung a tremendous liability. He pointed out that no penalty was incurred where the default to supply the energy was due to unavoidable circumstances, as in this instance. His explanation was that a cable (which was the best known at the time it was laid, and which, it was then believed, would last for 25 years) had become defective in such a way that the electric service collapsed. But a breakdown of this kind could not be foreseen; and so, while the default was admitted, the Corporation denied wilful or negligent default. They were now laying a new cable at a cost of £100,000. Mr. Ruddle, the Electrical Engineer, supplemented this statement; he having supervised the laying of the original cable in 1891. They had discovered that, by some unaccountable reason, the rubber had perished, with the result that the energy escaped, and the supply was stopped. It was impossible to guard against this. The laying of the new cable was commenced in July; and it was guaranteed to last ten years. For the plaintiffs, Mr. Shiel contended that the want of energy was due to the breakdown of defendants' plant, which they should have guarded against. In the result, the Magistrate (Mr. Swift) decided that the accident was an unavoidable one. Electricity, he held, was yet more or less in a tentative position; and at the time the cable was laid down, the Corporation took every possible precaution to get the best material they could. It might be a fair case to investigate; but he would dismiss the summons—giving, however, no costs.

The Walker Urban District Council have notified their intention of applying for a Provisional Order to enable them to supply electricity for lighting and other purposes; and at the meeting of the Council last Tuesday the Special Electric Lighting Committee reported that plans had been prepared and also a memorial, and it was recommended that this should be signed. It was further reported that the Walker and Wallsend Gas Company intended to apply to Parliament for a Bill giving them power to supply electricity in the district. On this subject the Clerk (Mr. T. M. Sturgess) read a communication from the Company, enclosing the copy of a letter containing terms which had been offered by them to the Wallsend Council, and had been accepted as a basis of negotiations in reference to the Company's proposed application to Parliament for electrical powers, and asking if the Walker Council would enter into a similar arrangement, with a view to coming to an amicable understanding which would largely diminish the otherwise very heavy expense which might be incurred before the Parliamentary Committee. The terms offered to the Wallsend Council were: (1) That the Company would not at any time after the passing of the Act oppose or raise any obstacle to the Council, or their successors, applying for and obtaining powers under the Electric Lighting Acts, 1882 and 1888. (2) That the Company, so long as they generated electric power, and so long as the Council did not themselves supply electricity, would supply electrical power to the Council and their successors, and to any company or persons within their district, at as cheap a rate as was *bona fide* offered or supplied by any corporation or public company within the area of the district under statutory authority. (3) That the capital account of the electric undertaking should be kept separate from the gas undertaking. (4) That the revenue accounts, giving the gross profit relating to both electricity and gas, be combined in one common profit and loss account. (5) After paying statutory dividend and other obligations, the surplus profit, if any, to be applied to the reduction of the price as provided by the action of the sliding-scale. The Clerk submitted these terms to the Parliamentary Agents of the Council, who, after dealing with the various offers, said they did not see anything in them which would make it advantageous to the ratepayers of Wallsend to allow the Company to obtain electrical powers in lieu of the Council. The part of the report having reference to the signing of the memorial was then adopted; the question of the offer from the Company, and the reply that should be made to it, being left over for future consideration.

**Additional Stoking Machinery for the South Metropolitan Gas Company.**—The South Metropolitan Gas Company, having recently decided to increase their installations of mechanical stoking machinery, have placed orders with Sir William Arrol and Co. for two charging and two drawing machines of the Arrol-Foulis type for their works at East Greenwich, and also for the same number of machines for their Rotherhithe station. At East Greenwich this system of stoking has been in use for some few years; it being, indeed, the first station in London where this class of machinery was adopted. At Rotherhithe a very complete Arrol-Foulis plant has now been working for two years; and it is satisfactory to notice that the Company propose to still further employ the system at both of these works.

**The Water Supply of St. Agnes.**—The difficulty of providing an adequate supply of water in some of the scattered and thinly populated parts of Cornwall was shown at an inquiry recently held by Mr. H. P. Boulnois, one of the Local Government Board Inspectors, respecting an application by the Truro Rural District Council for a loan of £5000 for the provision of water-works at St. Agnes. The parish has a population of 4249, an area of 5419 acres, and a rateable value of only £6311. In it there are a number of scattered hamlets. To provide water for the more important of these, Mr. R. H. Worth, the Engineer, said it was necessary to take three levels of supply. One would be served from a water-tower; the second from a reservoir with a special service reservoir for a little district of 300 inhabitants; and the low level would have a separate gravitation supply. The total population served by these works will be 1900; and the quantity will be equal to 16 gallons per head per day. At present it is not more than 3 gallons. Opposition was offered by the ratepayers in those parts of the parish which do not come into the scheme. Mr. A. Strauss, M.P., attended the inquiry, and pointed out the hardship which would be inflicted upon the district if repayment of the loan should be required in the customary period of thirty years. At present, the rates are 5s. 6d. in the pound; and if repayment has to be made in 30 years, a rate of 2s. 6d. would have to be levied every year for the purposes of the water-works. The burden would be a very heavy one for a district which is already impoverished through the depression in Cornish mining. The Inspector promised to lay the views of Mr. Strauss before the Local Government Board.



## METROPOLITAN WATER SUPPLY COMMISSION.

Thirty-seventh Day—Monday, Nov. 28.

(Viscount LILANDAFF, Chairman, Sir JOHN E. DORINGTON, Bart., M.P., Sir G. B. BRUCE, M.Inst.C.E., Major-Gen. A. DE COURCY SCOTT, R.E., Rt. Hon. J. W. MELLOR, Q.C., M.P., Mr. A. DE BOCK PORTER, C.B., and Mr. R. LEWIS.)

The Commission sat at the Guildhall, Westminster.

The following are the Counsel engaged: Mr. POPE, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., for the New River and the Southwark and Vauxhall Companies; Mr. LITTLER, Q.C., and Mr. LEWIS COWARD for the Kent Water Company; Mr. PEMBER, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. RICKARDS for the Chelsea Water Company; Lord ROBERT CECIL for the Hertfordshire County Council; Sir JOSEPH LEESE, Q.C., M.P., for the Kent County Council and Kent Local Authorities; Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN, Q.C., for the London County Council; Sir R. NICHOLSON for the Middlesex County Council; and Mr. GABRIEL P. GOLDNEY (Remembrancer) for the Corporation of the City of London.

Mr. R. E. Middleton was further examined by the CHAIRMAN, with reference to a table which he put in, showing his estimate of the cost of supplying 185½ million gallons per day from the Thames on the basis of the circumstances of 1898. This table was intended to compare with a similar one put in by Sir Alexander Binnie. The total storage required was 13,719 million gallons, or, allowing 1247 million gallons for bottom water and evaporation, and nothing for cleaning, 12,472 million gallons. Deducting the existing storage capacity of 866 million gallons, left a total capacity of 12,853 million gallons to be provided, which, at £204 3s. per million gallons, equalled £2,625,868. The cost of pumping into reservoirs 4961 million gallons, the average for sixteen years, at 7s. 6d. per million gallons, was £1860 7s., or, for sixteen years, £29,765. The cost of pumping to supply a quantity increasing from nil to 55½ million gallons per day during sixteen years, at £2 4s. per million gallons, would be £320,178. These three figures of £2,625,868, £29,765, and £320,178, totalled £2,975,811, or, plus £181,980 for pumping machinery necessary for distribution, would make £3,157,791. If the pumping charges were capitalized at 3 per cent., and reduced to present value, a sum of £1,296,837 should be substituted, increasing the total to £4,104,685. This table compared with one put in by Sir A. Binnie, in which he took the total storage capacity at 8000 million gallons, and brought out the total cost at £4,705,185. Witness's table and the one put in at the last sitting were based on the assumption that they would be able to pump into the reservoirs average quantities of water indicated by sixteen years' gaugings of the Thames. If a year like 1893 recurred, they would have to pump a little more than the average of the sixteen years—perhaps, 500 million gallons. Witness put in another table, being his estimate of the cost of supplying 300 million gallons daily from the Thames under the conditions of the river in the year 1893. The total storage required would be 21,725 million gallons, or allowing 1975 million gallons for bottom water and evaporation, and nothing for cleaning, a net storage of 19,750 million gallons. Deducting the existing capacity of 866 million gallons, left 20,859 million gallons to be provided, which, at £212 per million gallons, worked out to £4,422,108. The cost of pumping 7764 million gallons, the average for 35 years, at 7s. 6d. per million, equalled £2911 10s., which, for 35 years, would be £101,902. The cost of pumping to supply a quantity increasing from nil to 170 million gallons per day, during 35 years, at £2 4s. per million gallons, equalled £2,173,794. These three figures totalled £6,697,804, or, plus £557,460 in respect of pumping machinery for distribution, £7,255,264. A sum of about £1,155,000 should be added to this estimate, for connecting mains to the boundaries of the Companies' districts, to compare with the item of £3,000,000 for connecting mains between the service reservoirs at Elstree and those of the Companies in the Welsh scheme, which would increase the figure to £8,410,264. This table also was intended to compare with a similar one by Sir A. Binnie, in which he took the total storage required at 28,000 million gallons, and brought out the cost at £15,589,990. The 35 years referred to were those from 1901 to 1935, and were based on the experience of the past. Witness also put in another table showing his estimate of the cost of supplying 300 million gallons daily from the Thames under the conditions of 1898; the total storage required being 30,468 million gallons, and the cost £9,773,029 (which would include the £1,155,000 as in the previous table). If the pumping charges were capitalized at 3 per cent. and reduced to present value, a sum approximating to £2,908,671 should be substituted for these two items—making the total £10,399,441.

Mr. POPE, in reply to Mr. LEWIS, stated that the interest on the debenture stock of the Staines Reservoirs Committee was paid by contributions from the three Companies, so that to the extent of their contributions their revenue was decreased.

Witness (continuing) said his items for pumping into reservoirs and pumping for supply would only increase as the demands increased; and therefore they were a directly remunerative charge. Consequently, he did not think they should be charged against capital account, though he had included them in his tables. He went on to point out that the effect of the Companies not being allowed to take more than their appointed quantity every 24 hours, was that on a number of occasions they did not get their quantity. This seemed unfair; and he suggested that the average should be spread over a longer period—say, six months. Witness handed in several further tables containing calculations as to future requirements, amounts procurable from the Thames, &c.

The CHAIRMAN: The only inference I can draw from these tables is that the 300 million gallons from the Thames will be sufficient for the supply to Water London to the year 1940.

Witness: Yes.

And that the 400 million gallons is sufficient for the supply to 1953?—That is so.

Further tables were then handed in by witness showing that a much smaller quantity of storage would be required to procure supplies from the Thames, if the minimum flow at Teddington were reduced from 200 to 150 million gallons daily.

The CHAIRMAN: Now, with regard to Wales. Your general opinion is

that to get the supply from Wales will be more costly than to obtain a supply from the Thames?

Witness: Yes.

But it is your opinion that it may be ultimately required?—I do not think we need consider it. In a future generation it might be necessary, but not within the next fifty years.

Mr. DE BOCK PORTER: But if it is necessary to go to Wales at all, is it not desirable to go there while an area can be secured?

Witness: I think it is more reasonable to use up supplies at home than to go to Wales and come back to the Thames afterwards.

Mr. MELLOR: Do you not think it desirable to secure this area, for fear it should be taken?

Witness: I think it quite possible that it might be desirable to do so.

The CHAIRMAN: One does not quite see why London has a right to peg down a claim in Wales?

Witness: I do not think it has.

Mr. MELLOR: But London is only competing with other cities.

The CHAIRMAN: There are not an unlimited number of mountains in the British Islands?

Witness: There are not.

Mr. PEMBER: I think Parliament has been very careless about allowing people to get hold of large drainage areas.

By Major-General SCOTT: There was no doubt that 400 million gallons could be obtained from the Thames as easily as 300 million gallons—still leaving an abundance of water in the river.

By the CHAIRMAN: It became therefore a question whether it was cheaper to get good and pure water from Wales, which could be supplied by gravitation, or to obtain this additional water from the Thames, which would have to be pumped and filtered. The Welsh water also, he thought, would have to be filtered. The existing sources of supply, as defined by the Balfour Commission, were: From the Thames, at least 300 million gallons; from the Lea, 52½ million gallons; from wells in the Lea Valley, 40 million gallons; and from wells in the Kent Company's district, 27½ million gallons—a total of 420 million gallons. Without departing from the ruling of that Commission, he thought the following quantities could be obtained: From the Thames, at least 400 million gallons; from the Lea, 52½ million gallons; from wells in the Lea Valley, 40 million gallons; from wells in the Kent Company's district, 27½ million gallons; from the Southwark and Vauxhall well, 2 million gallons; and from other wells in Kent, at least 123 million gallons—a total, as a minimum, of 645 million gallons. Beyond this in his opinion, could be added, from wells sunk in the chalk basin of the Thames, at least 190 million gallons—making a grand total of 835 million gallons. The 400 million gallons from the Thames would be on the condition that 200 million gallons flowed daily over Teddington Weir. There were days this year when the supply was not sufficient to have enabled the 400 million gallons to be taken from the Thames; but on these occasions the quantity would have been made up out of storage. The 123 million gallons from Kent would diminish by the amount of water flowing into the tidal portion of the Thames. The 190 million from chalk wells in the Thames Valley was based on the yield in the Lea Valley. Turning to the Welsh scheme, he said that, in comparing the cost of this supply with a further supply from the Thames, he ignored works in connection with the obtaining of 185½ million gallons from the Thames, because the works would have to be carried out whoever owned the Companies. The geological position of the Welsh source of supply was not as good as others he had seen. The lengths of banks for impounding the water could not be accurately estimated, because the sides of the valleys were covered with drift, the extent of which was unknown, though a railway cutting showed it to a depth of 20 feet. Some of the stone was too soft, and some too hard, for making a dam; so that stone for this purpose would have to be brought from a distance, or worked at considerable cost. The area of land required for the Welsh scheme, he had heard, would be 488 square miles.

Sir G. BRUCE: In the Thames you get a watershed without paying for it.

Witness: Yes.

By the CHAIRMAN: Fifty-two and a half million gallons was a little less than half the daily flow of the Lea; being 86 per cent. of the smallest flow, excepting this year. The 52½ million gallons, with proper storage, could easily be obtained—still leaving plenty for navigation purposes. The 400 million gallons from the Thames represented 44 per cent. of the available water. Therefore the river was not drawn upon to the full extent it might be. The flow of the Thames could safely be reduced below 200 million gallons at Teddington. The flow of this quantity would have little effect in scouring. At least 1000 million gallons would be required to have any effect in this way. He went on to suggest that the Companies should come to a general agreement with the Thames Conservancy with regard to the drawing of water from the river, under which there should be a gauging station at Teddington, with a limit fixed below which it should not be right for the Companies to pump from the Thames; that the payment to the Conservancy for cleansing the river should be fixed on some calculable basis; that the water drawn should be managed by a Joint Board, constituted as the Companies or Parliament might decide—possibly like the Staines Reservoirs Committee—who should determine how the water was to be allotted to the Companies from year to year, and how distributed. Thus further powers to the various Companies would only be granted as the Board should determine. It would mean practically an amalgamation for the purposes of procuring more water, but not for purposes of dividend or charges. This suggestion expressed simply his own view—not that of the Companies. He expected deposits from the mountains would be swept down into the Welsh reservoirs, and tend to fill up the unevennesses at the bottom. With regard to the Thames, he thought there was no danger of taking flood water at any time. The first few days of a flood brought down more agricultural refuse and sewage than the later days; but this could be corrected by passing the water, if impounded, a little more slowly through the filter-beds. Experience showed that in a short time 80 per cent. of the bacteria subsided—he presumed they died, since they did not re-appear. He agreed that if flood water were put directly on the filter-beds there would be more bacteria. The flow of the Thames this year proved effectually, he thought, that the limit of flow at Teddington might be considerably reduced, because it had been to a lower limit—by 100 million gallons—than in any other year; and there had been no injurious effect.



**Thirty-eighth Day.—Tuesday, Nov. 29.**

All the Commissioners were present except Sir John Dorington and Mr. Cripps.

Mr. Middleton, re-called, said he thought that in a season when the Thames was likely to fail, the Companies were much more likely to fail; also that the water proposed to be drawn from the Thames was far less in proportion than that which it was proposed to draw under the Welsh scheme. The rainfall was very much greater in Wales than in the Thames area—viz., 54 to 60 inches, against 28 inches. He had gone into the question of the income that was likely to result from the increase of supply from the complete Staines scheme, and was of opinion that no reliable calculation could be made. He was, however, certain that the increase would remunerate the Companies for the expenditure on the Staines scheme, and leave a large sum to spare—that was, assuming the present rate of expansion to continue. Before it was necessary to go to Wales for a supply, London would have become such a city as no one had ever heard of; there being enough water in the Thames for a population of 18 million people. The advantages of the Staines scheme were that the reservoirs could be constructed one at a time as required, and that they would become remunerative shortly after the commencement of their construction. Each reservoir would cost about £800,000, be of 3600 million gallons capacity, and afford a supply to begin with of 40 million gallons daily, decreasing to some 20 million gallons as the total supply from the whole of the reservoirs approached 400 million gallons daily. Each reservoir would furnish a less supply as the number of the reservoirs increased. The great drawback to the scheme was that the water would have to be pumped. The advantages of the Welsh scheme were that the water would come from practically uncultivated land, that it would be soft, and that it could be supplied to the greater part of London by gravitation. As to the softness, while it was of benefit for some manufacturing purposes, it was doubtful if, generally speaking, it was a dietetic advantage. Against these advantages, he held the scheme to be more costly, and that the expenditure on it would be unremunerative for a longer time, than in the case of the Staines scheme. Further, there was some danger in relying upon an aqueduct from 150 to 176 miles long for so large a proportion of the supply of the Metropolis. Ultimately there would be two aqueducts. There would also be difficulty in connecting the supply mains from the Elstree reservoirs to the existing service reservoirs of the Companies, and in the fact that the localities traversed might claim part of the water being supplied. He had prepared an estimate of the cost of the Welsh scheme by analogy with the cost of the Manchester, Liverpool, and Birmingham supplies, the three aqueducts in connection with which averaged 81 miles. On this basis, he calculated the cost of the head works, including dam, land, compensation, and 81 miles of conduit, at the average rate of £91,611 per million gallons of supply; and he adopted this figure in his Welsh estimates. The length of the aqueduct from Wales would be 162 miles; so that there remained 81 miles of aqueduct, capable of delivering 215 million gallons a day, to be provided. He had worked out a section of an aqueduct of this description, and found it would cost £64,000 a mile; and he estimated the cost of the second 81 miles on this basis. Nothing was allowed in the £64,000 for connections with the service reservoirs of the Companies.

By Major-General Scott: The conduit which would be first constructed would be for the whole 215 million gallons, though the first instalment would only be for 125 million gallons. Witness handed in tables giving the cost of bringing 12½ million gallons daily from Wales to London, calculated by analogy from the cost of the Thirlmere, Yrwny, and Elan Valley works. The reservoir would be the Yrfon. The cost of storage for the delivery of 12½ million gallons daily, and for 81 miles of pipe-line and conduit, at an average cost of £91,611 per million gallons of daily supply, would be £11,313,958. To this he added for an average of 81 miles of conduit (beyond that in the Thirlmere, Yrwny, and Elan Valley schemes) to convey 215 million gallons daily, at £64,000 per mile, £5,184,000; for service reservoirs at Elstree, £1,314,750; for mains between service reservoirs at Elstree and the service reservoirs of the Companies, £3,000,000; and for cost of pumping machinery to supply 30 million gallons daily, £98,280. These sums totalled £20,910,988, which was his estimate of the capital cost. To this amount he also added the cost of pumping to supply during twenty years a quantity increasing from 21·7 to 29·8 million gallons, at 30s. per million gallons pumped, £279,549; for works in progress, £7,296,098; and for accumulated interest, £13,916,361. In reduction of the total of these figures—£42,403,496—he credited £352,411, the cost of pumping that would be saved. The latter item in this and the other tables of further supplies from Wales, was calculated on the whole of the expenses at present incurred per million gallons pumped. This was, however, an exaggerated view of the case, as the engines must stand ready at all times for pumping in case of necessity. Therefore a certain proportion of the charges for wages, coals, and maintenance must continue; and the saving would be reduced to this extent. Without allowance for further expenditure on works, the estimate would stand: Capital expenditure, £20,910,988, which, less £72,862, cost of pumping saved, became £20,838,126. This sum, plus £13,078,046 accumulated interest, would bring the total to £33,916,172. By work in progress, he meant the work on succeeding reservoirs which would have to be commenced a long period before the first well was completed. Witness put in another similar table showing the cost of bringing 135 million gallons daily to London—the two reservoirs being the Yrfon and Towy—which table was calculated in the same way as the preceding one. The only new item was an addition of £360,000 for 18 miles of pipe to connect the Towy with the Yrfon reservoir. The total capital cost he brought out at £22,327,800; and the final figure (including cost of pumping, and sums for works in progress and accumulated interest, and crediting the cost of pumping saved), at £45,801,037. Without allowance for further expenditure on works, the final figure would be £36,793,176. A third table showed the cost of bringing 172 million gallons from Wales to London (the Ithon reservoir being added in this case); the extra item in this estimate being £480,000, the cost of connecting the Ithon and Yrfon aqueducts by a pipe 16 miles long, at £30,000 a mile. The total capital cost was £27,803,467; and the final figure, arrived at in like manner to the preceding cases, £52,715,831. Without allowance for further expenditure on works, the estimate would

be £46,964,367. Another table gave the estimated cost of bringing 215 million gallons from Wales to London; the fourth reservoir being the Wye. The total capital cost he calculated at £32,799,310; and the final figure, at £57,262,678. In this table, there was no addition for works in progress. A sum of £250,000 was allowed for the connection between the Upper Wye reservoir and main aqueduct—12½ miles of pipe, at £20,000 a mile. Roughly speaking, in the first three cases he practically doubled the cost of the undertaking by works in progress and accumulated interest. In all his calculations, both as to the Welsh and Thames schemes, he had included nothing for connections with the service mains of the Companies. The capital cost of the works in Wales to produce the 123 million gallons daily he made to be five times his estimate of the cost of the Staines scheme.

By Mr. MELLOR: The water from Wales would require a good deal of filtration, because it contained a large proportion of peat, and peat needed more filtration than almost anything.

Sir G. BRUCE: How many more of these Staines reservoirs of 3600 million gallons would you require under the conditions of 1898, than under those of 1893?

Witness: As nearly as I can tell, two.

The CHAIRMAN: I suppose the result of all these tables is that, in your view at least, the carrying out of the Welsh scheme would mean a financial deficit?

Witness: That is my opinion.

The deficit must be made good either from the consumer or from the ratepayer?—Yes.

And if the whole matter is in the hands of the London County Council, and they supply to outside counties in bulk, I suppose it is fair to assume they will have to bear a proportion of the expense?—Undoubtedly.

And the London consumer himself would have to pay more or be aided by the ratepayer?—Yes.

Have you any opinion about the claim that the different counties have made to the supplies of water that exist in their own districts?—It seems to me to be unjustifiable in every way. I do not see how any county can claim that. It merely passes through the county.

For instance, that the water in the Kent chalk does not primarily belong to the county of Kent?—Primarily, no. It is in exactly the same position as a river; it is passing through to the Thames. If they can intercept it, I presume they have a right to do so—so has anybody else. Perhaps, however, something is to be said for the counties being allowed to supply themselves first.

Further examined: The Companies, if left to themselves, would not touch the Welsh scheme in the next century; but they might do so in the century after the next. He did not consider the regulations of the London Water Companies were up to the latest standard—the standard in force (say) in Newcastle. The depth at which a main was laid had not necessarily any bearing on its becoming frozen and bursting. The soil and the pressure of the water had more to do with it. Undoubtedly, however, the risk would be reduced by laying the mains deeper.

At the conclusion of witness's examination in chief, he was subjected to a long cross-examination by Lord R. CECIL, who stated that the position of the county of Hertford was that, as long as London took water without diminishing the streams, springs, and wells of the county, Hertford would not object; but that they would have a grievance as soon as these were diminished. Witness said he certainly held that more water could be pumped from the Herts chalk than was taken at present. As Sub-Commissioner to the Balfour Commission, he made an experiment on the Amwell spring by pumping for seven hours. The spring was considerably lowered; but further pumping would not have reduced the level more, because the lowest point was reached at the end of 2½ hours. The reason it was not reduced further was that the water flowed in too quickly. He agreed that there was nothing to show that if they had continued pumping for 24 hours with full strength, they would not have continued to reduce the level, except the fact that they did not do so. So much of the water of the Lea as came from chalk in the Lea Valley was in hydraulic connection with the water in the chalk. The water which the New River Company pumped from their chalk wells was in hydraulic connection with the great body of the chalk; and the springs of Hertford were also in connection with the great body of water contained in the chalk. It did not hurt the streams to pump from wells, though there was hydraulic connection.

By Major-General Scott: If a well were made and pumping started, the water would not sink round it further than the cone of depression.

Lord R. CECIL put it to witness that if they lowered the level of the water in the chalk, they would eventually destroy the streams; but witness held that pumping would not lower the water beyond the cone of depression. There could be no flow of the water under London towards the sea, because it was all being taken out by private pumping—to the extent probably of 10 million gallons a day. The abstraction of this quantity was sufficient to cause a permanent depression under London.

The Commission adjourned.

The thirty-ninth sitting of the Commission was held yesterday, at the Guildhall, Westminster—Viscount Llandaff presiding, and all the Commissioners being present except Mr. Cripps. Mr. Reginald Middleton, whose cross-examination by Lord Robert Cecil, on behalf of the Hertfordshire County Council, was concluded at the preceding sitting, now attended to undergo cross-examination by Mr. Balfour Browne for the London County Council. In reply to the learned Counsel, witness agreed that, as regards construction of water-works, conduits, large reservoirs, masonry dams such as that which the Council contemplated making on the Upper Wye, &c., he had not had so much experience as Sir Alexander Binnie, Sir Benjamin Baker, and Mr. Deacon. He was further questioned with a view to showing that the basis of his calculations—viz., 35 gallons per head per day—was below what the consumption actually is now, and below what it would be in the future.

**Llanrwst and District Water Supply.**—A meeting of the Urban and Parish Councils of Llanrwst and Trefriw was held at the first-named place last Wednesday, when plans prepared by Mr. P. McIntyre for supplying the district with additional water from the Crafnant Lake, at a cost of about £1400, were provisionally approved.



## LORD ONSLOW ON THE METROPOLITAN WATER QUESTION.

At the Junior Constitutional Club last Thursday evening, Lord Onslow addressed the members on the subject of the water supply of London. He began by tracing the history of the question in its comparatively recent phases, and said he was as anxious as anybody that the undertakings of the Water Companies should be acquired for the lowest sum possible. But he did not think any man in London desired to see the unfortunate investors—many of them as poor as the poorest owner of property—deprived of their possession unjustly; and he was sure Parliament would never sanction it. He grieved very much to say that many of his friends on the County Council whom he thought were stalwarts in the interests of the burdens to be placed on the ratepayers, had been alarmed by the state of affairs in East London, and had given their consent to the introduction of the Bills for next session, containing, as they did, what he thought a most unjust arbitration clause. He called that legislating in a panic. They had done this without waiting for the report of the Royal Commission; but he believed Parliament would insist upon having that report before they gave their vote on the second reading. He scouted the idea that the necessity for such legislation was urgent because of the danger of a water famine; and in support of this view he quoted the figures lately published in "The Times" showing that London had the greatest supply per head of any large town in England. He said the fact was the water famine cry was a gross exaggeration. How were they going to settle the water question? He was one of those who thought it could only be settled in one way, and that was by the acquisition by a public authority of the undertakings of the Companies. The question, of course, was: What was the cost to be? He had gone through all the estimates; and, while they varied a great deal, they were all very high. The late Mr. Smith was prepared eighteen years ago to give between 30 and 33 millions; Mr. Harrison said it would be a sum approaching 50 millions; Lord Farrer, that it would be between 36 and 40 millions; while the Stock Exchange value was about 39 millions. Supposing they took an intermediate figure, and called it 35 millions, the annual charge, after providing for sinking fund, would be £1,167,000. The present income of the Water Companies was £990,000. It was possible there might be some saving in the charges for management; but if there were, it would be far more than obliterated by the fact that the rates charged in various parts of London were so totally different, that it would be obligatory on any public authority to bring down the rate to the lowest which was now paid. Then they must add the 16½ millions which it was proposed to expend as a first instalment in bringing water from Wales. Therefore, adding this, he made out that the annual charge would be £1,717,000; so that the loss between the amount received from the rates and the charge London would have to pay would be £727,000. This was equal to a rate of 4½d. in the pound through the whole of London. He thought the first and most important thing to be done was to compel the Companies who had a sufficiency of water to supply those which suffered from a dearth. This ought not to be delayed a day or an hour. It was admitted that the total quantity of water was adequate to all the requirements of the Metropolis; and it only wanted an equitable and proper distribution. The Bill proposed to be introduced by the London County Council did not provide for this at all, and, therefore, there was nothing to prevent the people of East London from being again brought face to face with a water scarcity such as they had had this year; and they would only have the County Council to blame for not having taken the steps which it was perfectly within their competence to take if they had chosen to do so. He believed the Companies and the Government would remedy this mistake. As regards the administering authority when the Companies were purchased, he did not think it was wise to entrust the administration of one of the first necessities of life to a body who were swayed entirely by political considerations. He was an advocate of purchase upon fair and reasonable terms. He did not mean terms which should be fair and reasonable only to the Council or the purchasing authority, but to the sellers as well as the purchasers. His belief was that an equitable solution of this great controversy would be found by the intervention of the Government. A short discussion followed the address.

## WELSH VIEWS ON THE LONDON COUNTY COUNCIL'S WATER SCHEME.

We learn from the "South Wales Daily News" that public men in South Wales are closely watching events in connection with the London County Council's endeavour to make a wholesale appropriation of water areas in Wales; and there is a general agreement that steps should be taken by the summoning of a conference representing various authorities in the counties affected, to devise means for protecting local interests. There is no disposition to prevent London from securing a supply of water from Wales; but, on the contrary, both a recognition of the need of the Metropolis and a willingness to further any project that does not injure local communities. It is deemed to be quite practicable for both South Wales and London to be served fully. But if the latter obtains exclusive powers of appropriation, the welfare of the former may be seriously jeopardized; and the present is considered to be the time to take precaution against any such eventuality. The Monmouthshire County Council have always kept a keen eye upon any project of water "grabbing," either by the London County Council or any other body. For example, in regard to the Birmingham scheme, they co-operated with other authorities and with landowners in the areas interested to obtain clauses giving compensation water. In regard to the London attempts, the Parliamentary Committee of the Council as long ago as 1895 instructed their Clerk (Mr. Gustard) to consult with the Council's Parliamentary Agents in order that they might be informed as to any fresh phase arising in connection with the project. At that time there was talk of joint action with the Glamorganshire Council; and but for the fact that no definite scheme was propounded, no doubt such concerted action would have been decided on. Later, the aims of the London promoters seemed to be concentrated specially on the Usk and the Llangorse Lake area. Monmouthshire interests were consequently more vitally affected; and it was then determined, in order to more effectually assert the proper rights of the

county, to act independently in opposing any scheme. The opinion has been expressed that the Monmouthshire Council would not rest contented until they had obtained the insertion of a clause giving compensation water for any abstraction from the Wye. This river, so far, was the only one affected; but other adjacent authorities were interested in the same stream, and no doubt would assist in the opposition to gain this end. The present avoidance of the Llangorse area was probably due to the fact that the populous districts of South Wales would ultimately need a supply from that source themselves. Alderman P. Wilson Raffan, a member of the Parliamentary Committee of the Monmouthshire Council, has expressed his willingness to cordially co-operate in any movement to retain areas really required to ensure a full and continuous supply of water to Wales. The claims of Wales in the matter should, he thinks, be absolutely paramount. At the same time, he deprecates any "dog-in-the-manger" policy. London urgently needs fresh sources of supply; and to oppose the policy of the Progressives with a mere sentimental cry of "Welsh water for Wales" would, in his opinion, be not only selfish, but criminal. He cordially approves of the proposal to hold a conference of Local Authorities—including County Councils, District Councils, and Parish Councils; and hopes that compromise is not impossible on lines which will safeguard the interests both of Wales and London. If, however, London scouts reasonable restrictions and reservations, there will be no course left but a determined fight on behalf of Welsh rights. With reference to the effect of the proposals of the London County Council on the Swansea district, Mr. R. H. Wyrill, the Water Engineer to the Swansea Corporation, says they would not have any effect at all on that borough. The Chairman of the Merthyr District Council (Mr. V. A. Wills, J.P.) is of opinion that if London is allowed to take the watersheds, as proposed, it should be upon the distinct understanding that, should any towns in Wales hereafter require water from any of those sources, they would be able, as a matter of prior right, to obtain a supply. The present scheme, without these conditions, would be objectionable; and he thinks a joint conference, representing the combined interests of the different authorities, should be convened to devise means for watching all their interests, and to resist any further attempt to deprive the Principality of its water. The Manager of the Pontypridd Water-Works (Mr. W. Jones) also favours a conference. He says it is a matter of vital importance to take joint action to oppose the diversion of Welsh water to English centres until Wales first has an efficient supply for present and future purposes. He regards this as "a matter of life and death to Glamorganshire;" and he considers there is no time to be lost. The Chairman of the Pontypridd Council (Mr. P. Gowan) agrees that a conference should be held. The Medical Officer of Health for the district (Dr. Howard Davies) is of opinion that the Bill of the London County Council should be strongly opposed. As all the available sources of water are already utilized, he considers it is of vital importance that the catchment areas in Breconshire and elsewhere should be conserved for the future. Mr. D. M. Jenkins, the Neath Borough Engineer, is of opinion that a conference is really necessary to enable the authorities charged with the duty of guarding the interests of the public to fully investigate the matter, and so arrive at a clear understanding of what the proposals of the London County Council really mean. He would like the conference, after discussing the London water scheme, to give attention to the general question of the water supplies of the country, with a view to having water areas allocated. He quite agrees with the convening of a conference, and thinks such a gathering of representative men would at the least succeed in showing that, upon the report of the Royal Commission of 1893, the London County Council are premature with their proposals.

## ARBITRATION UNDER THE STAINES RESERVOIRS ACT.

(Before Mr. A. R. STENNING.)

As one consequence of the parliamentary authorization obtained for the Staines Reservoirs scheme, Mr. A. R. STENNING was engaged as Umpire on Wednesday, the 23rd ult., and following days, in considering the claim of Mr. George Gregory, a Parliamentary Agent and Solicitor, of the Sanctuary, Westminster, against the Staines Reservoirs Joint Committee for compensation; the amount being £6251.

Mr. FREEMAN, Q.C., appeared for the claimant; Mr. CLAUDE BAGGALLAY, Q.C., and Mr. LEWIS COWARD, for the Joint Committee.

Mr. FREEMAN, in his opening statement, said Mr. Gregory was the owner of a riverside estate known as Rivernook, in the parish of Wraybury; and the claim was in respect of certain of his lands which have been taken for the purposes of the Joint Committee, and for compensation for damage to the rest of his estate. Counsel reminded the Umpire that the Committee's scheme was for the purpose of taking water from the Thames just above Bell Weir Lock. From this lock, which was a few yards from Mr. Gregory's property, it was intended to carry the water right across his park by a covered aqueduct, syphon it under the River Colne, and then carry it on in an open aqueduct across the claimant's meadows, passing under the high road from Staines to Wraybury and Windsor, and proceeding across other lands to the reservoirs. Part of the property affected was acquired by Mr. Gregory in 1886; and subsequently he purchased a freehold cottage with about 6 acres of land attached. This was the land through which the covered aqueduct would have to run. Counsel proceeded to describe in detail the measures taken by Mr. Gregory to convert the land he had acquired into a valuable property, and also the steps he had taken to improve the Colne as a fishing stream, by turning into it a number of trout; and he complained that his fishing, both in this stream and in the mill-tail at Hythe End Mill, would be seriously interfered with by the proposed works. For this and other interference with the amenities of the estate, compensation was claimed in addition to the value of the lands taken. Counsel pointed out that the estate was not one which had been acquired as it now stood, but represented a considerable amount of labour, expense, and personal supervision; and its value was obviously as a riverside residence which was only 18 miles from Hyde Park Corner. Mr. Gregory had opposed the Committee's Bill of last session; but he withdrew his opposition on clauses being inserted for his protection.

Mr. G. Gregory was then called, and bore out the opening statement of Counsel. He said that, including the purchase price, he had spent



upwards of £15,000 on the property. He thought the three Water Companies concerned—the Grand Junction, New River, and West Middlesex—were taking a very much greater width of his land than was necessary for their reservoirs.

Mr. BAGGALLAY said a 12-foot bridge should be placed where Mr. Gregory wished to connect two severed portions of his property, and he and his successors in title should have the exclusive right of fishing in the mill-tail from the land which the Joint Committee proposed to acquire. The Companies would also undertake to bring in water on both sides of the aqueduct for the purpose of watering the cattle.

Mr. FREEMAN asked whether the Companies would engage to limit the take from the Colne when the water was low even if 265 million gallons were flowing over Bell Weir.

Mr. BAGGALLAY refused to give such an undertaking. He said the Companies were under obligations to supply within their districts; and to enable them to meet those obligations, statutory powers had been given to them to draw water from the Colne in cases of emergency. He was not in a position to go behind the powers which had been conferred by Parliament upon the Joint Committee.

Mr. W. Clarke gave evidence as to the works intended to be carried out. With regard to the abstraction of water by the Committee, he said if there were 250 million gallons of water flowing over the Bell Weir, and concurrently only 50 million gallons in the Colne, they could under their powers take the whole of the Colne water, and convert that stream into a dry ditch. They had the right to draw up to 100 million gallons from the Colne. The existence of these powers would depreciate the value of the property in a marked degree.

Mr. FREEMAN said he did not intend to go further, but asked that the other side should put in a definite shape what concessions they were prepared to make, so that Mr. Gregory's surveyors might have an opportunity of seeing how such concessions affected the valuation.

Mr. BAGGALLAY said he did not intend to make any further concession, and certainly not with regard to the Committee's right to take the water of the Colne.

On the resumption of the proceedings on the following day,

Mr. FREEMAN read a letter from the Solicitors of the Committee, embodying the concessions which had been offered at the previous sitting. These were, briefly, the erection of a bridge 12 feet wide over the open aqueduct in the meadow, the provision of two watering-places for cattle, and the exclusive right of fishing in the Colne Brook from the Committee's lands.

Further evidence was then given for the claimant.

Mr. R. Vigers said the estate was a very desirable property. In carrying out the works there would be a good deal of temporary inconvenience and disturbance; and he considered that £3000 was not too large a compensation for the general damage to the estate. This, with the value of the land, which, with 10 per cent. for compulsory sale, he put at £1251, made £4251, from which he deducted £100 for the bridge, leaving £4151. To this he added £500 for the possible damage by the taking of the Colne waters, making his total £4651.

Mr. D. Watney said he valued the land in the park at £250; and the 2½ acres of meadow, at £200 per acre, at £555. These sums, with 10 per cent. for compulsory sale, made £885. The loss during the construction of the works and the general depreciation of the estate he estimated at £1790, making £3675. In his opinion, £500 should be added for the restoration of the park, and £500 for the water abstracted from the Colne. Deducting £100, as the value of the bridge to be provided, his total valuation came to £4575.

Mr. H. Martin produced his valuation, which came to £4365.

This concluded the case of the claimant.

Mr. BAGGALLAY then addressed the Umpire for the Joint Committee. He contended that the case was of a special character, and that the special circumstances were dealt with in the Staines Reservoirs Act of 1896, the whole of section 50 of which was for the protection of Mr. Gregory. The Committee undertook to carry underground the aqueduct to the west of the Colne Brook, to cover it with efficient works, and to restore the soil as nearly as possible before the work was begun. An easement was to be taken of the land; and the whole works were to be completed in one year. By the section named, it was declared that the making of the conduit should be compensation for the severance of the land; and the learned Counsel contended that, with regard to the lands on the west side, only two things could be considered by the Umpire—the value of the easement of the land and the compensation for loss during the construction of the works. He urged that the injury to the estate had been greatly exaggerated, and that a considerable reduction should be made in the claim.

The sitting was then adjourned till the next day, when evidence on behalf of the Committee was called.

Mr. R. E. Middleton, Joint Engineer of the scheme with Mr. Walter Hunter, was the first witness. He said at the easement portion of the land the width of the conduit was 21 ft. 5 in., and with staging 22 ft. 6 in. The width of the easement they were empowered to take was 30 feet. After the completion of the tunnel, they would make good the ground according to the Act. As to the maintenance of the aqueduct, it would only be necessary to inspect the tunnel (say) once a year, when some engineer would walk along the surface. Except this, there would be no interference with the property. The aqueduct would cross the Colne Brook by two steel syphons sunk below the bed of the river, which could not be further interfered with. There could be no damage from this work. When there was a flow of 300 million gallons over Penton Hook Weir, there would be a flow of about 24 millions in the Colne Brook. Their intakes from the Thames measured 80 square feet, and from the Colne only about 10·8 feet. He did not apprehend any difficulty as to the Colne Brook. It would not be to their interest to take the Colne water when the Thames was in good order; and at the only times they might take any there would be plenty of water in the Colne.

In cross-examination, witness said the length of the land through the park over which they had an easement was 1067 feet. Of this, 890 feet would be raised above the present level; but the rise would undulate, and would be sloped off at the sides. The width of the land taken in the meadow was 100 feet, and the aqueduct was about 15 feet wide. This extra quantity of land had been secured in case it should be necessary to make four aqueducts. They had statutory powers to take 100 million gallons a day from the Thames, the Colne, the Wrynsbury, and other

streams. They had no intention of taking the whole flow of the Colne; but, of course, there might be occasions when, in the interests of the water consumers, they would be obliged to do it.

In re-examination, witness said the Committee had no intention of depleting the Colne. There might be a remote contingency when they would take the waters of the Colne Brook; but it would only be in case any accident occurred to their sluices from the Thames.

Mr. BAGGALLAY said Mr. Hunter was present, if his friend desired to cross-examine him on any point.

Mr. FREEMAN said he did not wish to do so. He had obtained all the information he wanted from Mr. Middleton.

Sir J. Whittaker Ellis said he was well acquainted with the property, and, without wishing to disparage it, it was not the estate he should have chosen. With regard to the value, he considered, for the purposes of the Committee, the land in the park was worth £200 per acre. He gave one-half the value for the easement, or £100; and if he added £100 for loss and disturbance during construction, he thought this would be a proper figure. The meadow land, 2½ acres, he thought worth £4 an acre, which at 25 years' purchase would be £100. In his view, a fair compensation would be £150 an acre, which, with 10 per cent. for compulsory sale, would come to £453. With regard to the injurious affection of the land, he thought £500 would be ample compensation. In his opinion, the estate was not injured at all. His total valuation was £1153.

Mr. E. Tewson and Mr. E. H. Bousfield entirely concurred in the estimate submitted by Sir Whittaker Ellis.

Mr. BAGGALLAY, in summing up, submitted that the figures adduced on behalf of the claimant were too grotesque to be of any use, and that the valuation of the witnesses for the Joint Committee was alone reliable.

Mr. FREEMAN having replied,

The Umpire said he would make his award at an early date.

## THE BRIDLINGTON WATER-WORKS PURCHASE QUESTION.

### Dissatisfaction with the Award.

The award in the Bridlington Water-Works purchase arbitration, the terms of which were given in the "JOURNAL" for the 22nd ult. (p. 1176), is giving rise to considerable dispute, as a section of the Urban District Council and a large number of the townspeople are not altogether satisfied with the sum to be paid by the town to the Water Company for the undertaking. The price was fixed at £66,260; and it is estimated that, with stock-in-trade, valuation, pensions, and other items, the concern cannot cost Bridlington less than from £70,000 to £73,000. It was recently reported "on absolutely reliable authority" that a private meeting of the Water Supply Committee had been held; and a motion recommending the Council to meet the cost of the works by loan or otherwise was duly seconded, but was thrown out by a substantial majority of the Committee. The exact terms of the amendment did not leak out; but there was said to be good ground for believing that the majority of the Committee were desirous of obtaining Counsel's opinion as to the validity of the award itself. It was also reported that the members of the Water Committee have been at "sixes and sevens" with their Chairman (Mr. Townsend) since he proposed in the Council, and carried in opposition to their votes and desires, that the services of the already retained Umpire should be dispensed with, and that the Arbitrators (Mr. G. F. Deacon, for the Council, and Mr. Thomas Newbigging, for the Company) should decide upon the price.

A crowded meeting of the ratepayers was held on Monday last week to consider the question. Mr. J. Stuart presided, and characterized the price to be paid as "horrible." The effect of the award was that the ratepayers would have to part with £70,000, which was considerably more than one year's value of the property in the district. If they borrowed money at or about 3 per cent., and had to repay in a period not exceeding fifty years, this would mean that they would have to pay £2800 a year. It was generally acknowledged that a considerable amount of money—at least £5000—would have to be spent to bring the works up to date; and this meant that they would have to pay £3000 a year. The revenue of the Water Company for the past year only had been taken; and they could not expect such a period of prosperity again for some time. He condemned the action of the Council in dealing with the matter with closed doors. If the ratepayers refused the award, it could not be enforced. He moved a resolution that the Council be urgently requested to confirm the resolution of the Water Committee, that Counsel's opinion should be taken as to the validity of the award before making arrangements to borrow money; and, if it was found to be invalid, that advice should be sought as to the course to be adopted for having it set aside. Mr. Bailey seconded the motion, and it was carried with enthusiasm.

At the monthly meeting of the District Council on the following day, the water question was the principal subject discussed at a sitting which occupied eight hours—closing at half-past two o'clock on Wednesday morning. The proceedings were unique in the annals of the town; and, according to the reports in the local papers, were nothing short of disgraceful. A deputation from the meeting of ratepayers held on the previous day attended, to present the resolution then passed. Mr. Pool moved the confirmation of the minutes of the last meeting of the Water Committee, containing the resolution to advise the Council to obtain an opinion as to the validity of the award. He stated the grounds on which the award might be questioned; among them being the facts that the Council's Arbitrator had obtained his information and the Accountants had examined the books *ex parte*, and that the Arbitrator had accepted the hospitality of the Water Company. Mr. Townsend, the Chairman of the Committee, interrupted the speaker with a question; whereupon someone made a remark in which occurred the word "jackass." The Chairman (Mr. F. Creaser) appealed to the members to conduct the business in a more gentlemanly way. Speeches went on till half-past nine, when there was an adjournment for refreshments. On resuming, Mr. Bradford spoke for an hour, amid frequent interruptions from Mr. Townsend, who had on several occasions to be called to order. Mr. Bradford condemned the action of the Chairman in having presided over the meetings of the Council while he was a Director of the Water Company. Mr. Sutcliffe gave his legal opinion that it was useless to go forward with the resolution. Mr. Barr pointed out that the Chairman of the Committee would not allow them to ask questions of their Arbitrator



when they were of a certain nature, unless he prefaced them. He said the fact was that the members of the Committee did not dare to speak on the matter except with bated breath. After further discussion, the room was cleared in order that the Council might receive the private opinion of their Solicitor as to the usefulness of the resolution. When the public were again admitted, and a vote was taken, five were for the confirmation of the minutes and five against. They were therefore not adopted; and the award was sent back to the Water Committee for consideration and report. Mr. Townsend afterwards informed the representatives of the Press that he had resigned his position as a member as well as Chairman of the Committee.

In consequence of the dissatisfaction which exists in Bridlington at the District Council's disinclination to take Counsel's opinion as to the validity of the award, a number of influential gentlemen in the town and district are taking steps to obtain an opinion on their own account.

## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Provost Bennet, of Leith, presided at the monthly meeting of the Edinburgh and Leith Gas Commissioners on Monday. The business was not important. The report of Mr. W. R. Herring, the Engineer, showed that there had been an increased output of gas during October, as compared with the same month of last year, of 6,534,200 cubic feet; and since May 16, as compared with the corresponding period of last year, of 11,760,300 cubic feet. Bailie Kinloch Anderson said that the increase was very satisfactory. Mr. Gibb, the Treasurer, reported that he had been able to obtain on loan the £10,000 which was wanted, and that he had also borrowed £5950, repayable at seven days' notice, which he could economically use for the purposes of the Commission. This was approved of. The appointment of Committees and other formal business followed; Bailie Kinloch Anderson being re-elected Convener of the Works Committee, and Bailie Manclark Convener of the Finance and Law Committee. The Finance and Law Committee reported having made what is probably the largest payment the Commissioners have ever had to make at one time—namely, £185,460 17s. 8d. In this sum there was included £125,353 as the price of the new site at Granton.

The Pluto Hot-Water Syndicate have been granted permission to erect six lamps in Glasgow. They are to pay a nominal rent of 1s. per lamp for the first year, at the end of which time the rent is to be revised. The lamps are to be erected free of charge to the Corporation, and are to be removed when the Corporation require it. The Syndicate are also to relieve the Corporation of all responsibility for any accident or claim arising from the use of the lamps.

The Arbroath Gas Corporation, on Monday night, considered a letter from Edmundson's Electricity Corporation, of London, asking that an agreement should be entered into with them, under which they would have power to apply for a Provisional Order for the lighting of Arbroath in certain events; but the Gas Corporation thought that the application was merely a bid for business, and they resolved to decline to enter into any agreement.

The supply of acetylene gas at Cowdenbeath by the local Gas Company, seems to be in a position of greater difficulty than has hitherto been realized. I give the following from the "Dunfermline Journal" of to-day; but as the narrative bears evidence of somewhat loose construction, I would recommend that it be not held to be a final pronouncement on the subject: "The question of the gas supply of the burgh, which for some time back has been the cause of much anxiety to the shopkeepers (we say shopkeepers, because the ratepayers as a whole are not in possession of a gas supply), seems now to have reached a climax. It is hardly necessary at this time to go into the details connected with the question. Suffice it to say that, previous to Sept. 3, the consumers were supplied with oil gas at a cost of 12s. 6d. per 1000 cubic feet. The quality of the oil gas supplied, however, was such that it was considered advisable to have a change; and the Directors of the Gas Company agreed to introduce acetylene gas. The gas has been used in the burgh for nearly three months; and those who have seen it admit that it is a great improvement on the oil gas. The shopkeepers very willingly took to the new light, and freely commented on the brightness of it as compared with the oil gas. There was one feature, however, in connection with the new gas which had not been fully considered—the cost. Consumers were fully prepared to pay more than the price charged for the oil gas; but they never anticipated that the price would be raised from 1s. 3d. per 100 cubic feet to 10s. per 100 cubic feet. The shopkeepers protested against the price; and a meeting of those interested was held. At the meeting, a Committee was appointed to meet the Gas Company's Directors, with a view, if possible, to have the price reduced. At this meeting, we understand, the shopkeepers' representatives considered that 5s. was a fair price for 100 cubic feet; and they were willing to pay this sum. No arrangements, however, could be arrived at, and the meeting broke up without any guarantee being given that the price of the gas would be reduced. It was stated at the meeting that 100 cubic feet of acetylene gas cost the Directors 11s. 9d.; and that they were selling it at a sacrifice to the shopkeepers. A meeting of shopkeepers was held on Tuesday, when there was a representative gathering. The *pros* and *cons* of the situation were again gone into; and it was unanimously agreed to be done with the gas after Tuesday next. The Secretary of the meeting was instructed to inform the Clerk of the Gas Company to take a reading of the meters after Tuesday. During the week, the Gas Company have again introduced the oil gas, with the result that the light given forth by the burners used for the acetylene gas is of the most miserable description. Such a state of matters in the burgh of Cowdenbeath is to be regretted; but we hope that some party or parties will come forward, having as their motto—Let there be light. We understand one shopkeeper intends to manufacture acetylene for his own use."

In the Hamilton Town Council an attempt has been made to violate that first principle in the conducting of all works, of whatever sort—that the Manager shall have absolute control of the staff. In this instance, it was the appointment of the works foreman, which it was intended should be taken out of Mr. Ewing's hands. Mr. Ewing was appointed to the Hamilton works in 1892. Before then, on account of the state of health of his predecessor, the Corporation had appointed a foreman; and he

remained on, on his original appointment. He resigned eight months afterwards, however; and then Mr. Ewing was given absolute power in the filling up of the vacancy. Matters prospered in the works, as we all know, until July of this year, when a man, who had been a labourer, was dismissed by Mr. Ewing. This person had influence in the Council; and he was sent back to the works as foreman. The result is said to be insubordination among the men in the works, and unsatisfactory results in the working. The subject was before the Town Council on Monday, when Mr. Ewing was able to show, by figures, what the loss amounted to, and how it had been caused. The foreman's friends in the Council endeavoured to depreciate Mr. Ewing's services. Those who wish the support of the workmen always strike at the man in authority. Their doctrine seems to be that everyone should do as he pleases. Where such beliefs prevail, the demoralization of the working staff follows. This was what was happening in Hamilton; but it happily is now about to be put a stop to. Only two members of the Council favoured divided management; and the Committee have come to the conclusion that Mr. Ewing should have absolute power, as before.

The policy of popularizing the gas supply is succeeding at Dumfries. It was reported to the Town Council on Thursday that since May 15 the number of prepayment meters has increased from 240 to 385; that there are now 565 gas-cookers in use; and that the consumption of gas since that date has been 3 million cubic feet more than has ever been experienced in the same period.

Mr. J. B. Terrace, of Brechin, has introduced the eight-hour day for workmen employed in the gas-works there. It is to be tried for three months. There is no increase in the number of men, nor reduction of wages; and every man charges in eight hours the same number of retorts as he did formerly in ten hours. I have not heard of the short day being introduced into so small a works as Brechin—which shows that in this matter, as in others, Mr. Terrace always likes to be in the van.

The Stirling Gas Company have recently made application to the Sheriff to have their undertaking valued by Her Majesty's Assessor of Railways and Canals for Scotland, instead of by the local assessors, as formerly. The Burgh Commissioners of Alloa have made similar applications as regards their gas and water works. These applications are made under section 23 of the Valuation of Lands (Scotland) Act, 1854; the intention of the Legislature in this enactment apparently being to give companies or corporations who own continuous works liable to be assessed in more than one parish, county, or burgh, the option of having their undertakings placed under a Government official, whose jurisdiction is not limited to a single county or burgh, but who has power to value the works as a whole, and then allocate the just proportions to each rating area.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Dec. 3.

**Sulphate of Ammonia.**—The firmer tone referred to in the last report was scarcely maintained in the early part of the week; prices becoming again somewhat irregular. But towards the close, the market is rather firmer; and the quotations are £10 per ton f.o.b. Hull and Leith, and £10 1s. 3d. per ton f.o.b. Liverpool. Consumers have come more into line with current prices, and have taken fair quantities; but speculators, though ready to avail themselves of tempting offers, have refrained from large operations. Scotch makers are firm, at £10 5s. per ton, ordinary terms, f.o.b. Leith, for delivery over the spring months; and it is reported that this price has been paid in one or two instances, but buyers abroad do not respond. London quotation remains £10 per ton, Beekton terms, for January-June delivery, without attracting buyers.

**Nitrate of Soda** continues at 7s. 6d. per cwt. for ordinary and 7s. 7½d. per cwt. for fine quality, on spot. In the forward position, there is a firmer feeling; and some improvement in values.

LONDON, Dec. 3.

**Tar Products.**—This market is disappointing in every respect, except in the one article of creosote, which is in fair demand and moving off freely. Pitch is somewhat easier, though there is a demand equal to the production. Higher freights have somewhat interfered with shipping pitch, and have undoubtedly upset many calculations in respect to this particular business. Benzols continue their uninteresting and unprofitable career, although the growth of the home consumption of this article is encouraging to English distillers. There is some inquiry for naphthalene in its several states; but buyers' ideas of value are so low that few makers will care to extract it from the oils.

To-day's values may be taken as: Tar, 14s. 6d. to 20s. Pitch, east coast, 25s.; west coast, 22s. Benzol, 90's, 8½d.; 50's, 8½d. Toluol, 1s. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 1½d. Crude, 30 per cent. naphtha, 3½d. Creosote, 3d. Heavy oils, 45s. Carbolic acid, 60's, 1s. 10½d. Creosote salts, 30s. Anthracene, nominal, "A," 4d.; "B," 3d.

**Sulphate of Ammonia** is not quite so firm; and buyers are generally offering a little less money. But stocks are low; and the home consumption is likely to be extremely large. Makers are at the moment independent; and it is unlikely that any serious drop in price will take place. Nominal value is £10 per ton, less 3½ per cent. at all ports.

## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—The improvement reported in the coal trade of this district last week is fully maintained; a continued increasing demand coming forward on all descriptions of fuel. This is not only keeping pits on full time, but is necessitating the filling up out of stocks in many cases to meet present requirements. The better qualities are generally in fairly active request for house-fire purposes; and prices are exceedingly firm at the full list rates. But there is no quoted advance upon last month, though the tendency is to harden up in some special cases. At the pit mouth, best Wigan Arley remains at about 11s. to 11s. 6d. per ton; seconds and good medium Arley range from 10s. to 10s. 6d.; good Pemberton four-feet, 9s. to 9s. 6d.; and common house coal, 8s. to 8s. 6d. The lower class round coals are in brisk demand, with a hardening tendency in prices, though general quotations are much the same as last month—averaging 7s. 9d. to 8s. 3d. per ton at the pit.



For shipment, there is a fair inquiry; but business is rather restricted, owing to the scarcity of vessels and the advance in freight. Delivered at the Mersey ports or in the Manchester Ship Canal, ordinary steam coals average 9s. to 9s. 3d. per ton. For all descriptions of engine fuel there is quite a pressing demand; and with many of the leading collieries unable to meet the requirements of their regular customers, there is a scarcity of supplies on the market. This position has been gradually accentuated during the past few weeks, with a stiffening up in prices; and there has been with the commencement of the month an officially announced advance of 3d. per ton in the West Lancashire, and 5d. per ton in the Manchester district, on all descriptions of slack and burgy. Nuts have also been advanced 5d. per ton. This represents an upward move of 9d. per ton in the West Lancashire district, and 10d. in the Manchester district, over the prices ruling this time last year. At the pit, common slack is not now quoted below 3s. 9d. to 4s. per ton; good medium sorts, 4s. 6d. to 4s. 9d.; and best qualities, 5s. 3d. to 5s. 6d.

**Northern Coal Trade.**—There has been a continued full demand for coal; and the range of prices is rather higher than it was, while there is now a pressure to get fuel shipped before the holidays. In best Northumbrian steam coals, the price is firm at from 9s. 6d. to 9s. 9d. per ton f.o.b.; second qualities are 9s.; and steam smalls are about 5s. Manufacturing coals are steady, with a large business doing at rather higher prices for next year's supply. Gas coal is irregular; and there is a disposition to quote for next year's contracts at prices considerably below those that are current. For immediate delivery, the quotation is from 8s. 9d. to 9s. per ton f.o.b.; while for deliveries over next year, the prices now quoted may be said to average about 8s. per ton f.o.b. At present, the output is about the highest in the year; and if storms do not interfere with the arrival of steamers, it may be expected that there will be the delivery of the heaviest requirements of the year before the end of the next fortnight. The price of gas coke shows no alteration this week.

**Scotch Coal Trade.**—During the past week prices for coal generally improved. A formal advance of 1s. per ton for splint has been announced; the reason given being that on account of a scarcity of railway waggons there is broken time at the pits. If railway waggons are scarce, the inference is that they are being sent longer journeys than usual—that is, into England—which would make it easy to account for firmer prices all round. The prices quoted are: Main, 8s. 3d. to 8s. 6d. per ton f.o.b. Glasgow; ell, 9s. to 9s. 3d.; and splint, 9s. 9d. to 10s. The shipments for the week amounted to 170,850 tons—an increase upon the previous week of 440 tons, and upon the corresponding week of last year of 4929 tons. For the year to date, the total shipments have been 8,856,392 tons—an increase upon the corresponding period of last year of 1,409,610 tons.

**Ramsgate Corporation Gas and Water Supply.**—The Ramsgate Town Council have resolved, on the recommendation of the Gas Committee, to apply to the Local Government Board for sanction to borrow £20,000 in respect of the water, and £30,000 on account of the gas undertaking—the latter to include the amount required for the purchase of the Minster Gas-Works.

**Service-Pipes and Street Paving.**—A peculiar obstacle to the extension of the prepayment-meter system has presented itself at Devonport. Some difficulty has arisen with the Corporation respecting the repair of the pavement of the footpaths after the laying of service-pipes. Many of the paths are laid with a patent covering known as Coverack, the repair of which is troublesome. In consequence of the difficulties raised by the Corporation, the Directors of the Gas Company have decided to refuse all applications for the supply of gas by automatic meter where it is necessary to break up this pavement to give the supply.

**Tar Distilleries in Holland.**—We are informed that the liquidation of the oldest of the three Dutch tar distilleries has now been completed by the repayment to the shareholders, on each share of 1000 fls. nominal value—the sum of 327-50 fls. The Limited Company—the Maatschappij voor Chemische Industrie (Society for Chemical Industry), formerly the Nederlandsche Roolteerstokery (Netherlands Coal Tar Distillery)—at Amsterdam, with a nominal capital of 685,000 fls. in shares of 1000 fls. (the effective capital being 235,000 fls.), has thus returned 685 × 327-50 = 224,337-50 fls.; while the dividends paid from 1861 to 1893 have been 652 per cent. in all.

**Electric Light in Kandy (Ceylon).**—For some time past negotiations have been under consideration, and now a contract has been signed, by which the Colombo Gas and Water Company, Limited, have obtained the monopoly of supply of electricity in the hill capital of Ceylon. Situated some 70 odd miles inland, at an altitude of 1650 feet above sea-level, and means of communication being by railway, there is much traffic through the place. The scheme includes 200 incandescent lamps in the streets and five 7-ampère arc lamps at the busiest spots. The Government buildings and private houses are to be lighted, and the Council are reducing the police in view of the requirements of the town and the introduction of the electric light. Mr. T. S. Cleminshaw, Assoc. M.Inst.C.E., is the Manager of the Company, and Mr. J. E. Addyman, Assoc. M.Inst.E.E., the Electrical Engineer, is at present in England conferring with the London Board of Directors as to the details of the scheme.

**The Dorchester Corporation and the Gas-Works.**—The proposal of the Dorchester Corporation to purchase the undertakings of the Dorchester Gas and Gas-Fittings Companies, for which, as mentioned in the "JOURNAL" last week, they are desirous of obtaining parliamentary sanction, is not being received very cordially by the ratepayers; for, at the statutory meeting on the 28th ult., the resolution approving of the decision of the Corporation to promote a Bill received the support of only about a score of persons, while, according to a local paper, a "forest of hands" were raised against it. The Mayor (Alderman G. Davis), who presided, consequently had to declare the motion lost. As the people were leaving the meeting, an opponent of the purchase scheme, obviously labouring under a misconception as to the result of the voting, demanded a poll. He subsequently, however, explained to the Mayor that he was perfectly satisfied with the result of the show of hands. The following morning, the Town Clerk received a letter from him formally expressing his desire to withdraw his demand for a poll, in order to save unnecessary expense to the town. But a protest against the adoption of this course having been made, the poll has been fixed to take place on the 29th inst.

### GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1283.

| Issue.    | Share. | When ex-Dividend. | Dividend or Bonus. | NAME.                      | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue.    | Share. | When ex-Dividend. | Dividend or Bonus. | NAME.                                | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|-----------|--------|-------------------|--------------------|----------------------------|-----------------|---------------------|------------------------|-----------|--------|-------------------|--------------------|--------------------------------------|-----------------|---------------------|------------------------|
| £         | p.c.   |                   |                    | GAS COMPANIES.             | £ s. d.         |                     |                        | £         | p.c.   |                   |                    | GAS COMPANIES.                       | £ s. d.         |                     |                        |
| 590,000   | 10     | Oct. 13           | 10½                | Alliance & Dublin 10 p.c.  | 204-213         | ..                  | 4 17 8                 | 75,000    | 5      | Nov. 30           | 6                  | Malta & Medn., Ltd.                  | 43-52*          | +                   | 5 14 3                 |
| 100,000   | 10     | "                 | 7½                 | Do.                        | 16-17           | ..                  | 4 8 3                  | 541,920   | 20     | Nov. 11           | 5                  | Monte Video, Ltd.                    | 13-14           | ..                  | 7 2 10                 |
| 800,000   | 100    | July 1            | 5                  | Australian 5 p.c. Db.      | 105-107         | ..                  | 4 13 6                 | 617,946   | Stk.   | Aug. 31           | 93                 | Newcastle & Gateshead Con.           | 282-283         | ..                  | 4 2 8                  |
| 200,000   | 5      | Nov. 11           | 6                  | Bombay, Ltd.               | 61-62           | ..                  | 4 9 11                 | 252,355   | Stk.   | Jan. 3            | 3½                 | Do. 8 p.c. Db. Stk.                  | 118-117         | ..                  | 2 19 10                |
| 46,000    | 5      | "                 | 6                  | Do. New, £4 paid           | 42-43           | ..                  | 5 1 1                  | 150,000   | 5      | Nov. 30           | 8                  | Oriental, Ltd.                       | 7-7½            | ..                  | 5 6 8                  |
| 880,000   | Stk.   | Aug. 12           | 12                 | Brentford Consolidated     | 275-280         | ..                  | 4 5 9                  | 135,000   | 5      | "                 | 8                  | Do. New, £410s. pd.                  | 62-63           | ..                  | 5 6 8                  |
| 240,000   | "      | "                 | 9                  | Do. New                    | 210-215         | ..                  | 4 3 9                  | 15,000    | 5      | "                 | 8                  | Do. 1879, £1 pd.                     | 11-12           | ..                  | 4 11 5                 |
| 60,000    | "      | "                 | 5                  | Do. 5 p.c. Prf.            | 140-145         | ..                  | 3 9 0                  | 60,000    | 5      | Sept. 29          | 7                  | Ottoman, Ltd.                        | 5-6             | ..                  | 6 6 2                  |
| 159,375   | "      | June 10           | 4                  | Do. 4 p.c. Db. Stk.        | 130-135         | ..                  | 2 19 3                 | 500,000   | 100    | Dec. 1            | 6                  | People's Gas & 2nd M. of Chicago Bd. | 102-106         | +1½                 | 5 13 2                 |
| 226,320   | Stk.   | Sept. 15          | 11½                | Brighton & Hove, Orig.     | 263-268         | ..                  | 4 5 10                 | 848,070   | 10     | Oct. 13           | 6                  | River Plate Ord.                     | 81-93           | ..                  | 6 3 1                  |
| 983,500   | Stk.   | Aug. 31           | 5                  | Do. A. Ord. Stk.           | 190-195         | ..                  | 4 7 2                  | 250,000   | Stk.   | June 29           | 4                  | Do. 4 p.c. Db. Stk.                  | 99-101          | ..                  | 3 19 3                 |
| 420,000   | 20     | Sept. 29          | 10                 | Bristol 5 p.c. max.        | 125-130         | ..                  | 3 16 11                | 250,000   | 10     | Sept. 29          | 10                 | San Paulo, Ltd.                      | 15-16           | +                   | 6 5 0                  |
| 50,000    | 10     | Aug. 12           | 11½                | British                    | 49-50           | ..                  | 4 0 0                  | 135,000   | Stk.   | Sept. 15          | 10                 | Sheffield A.                         | 242-245         | ..                  | 4 1 8                  |
| 75,000    | 10     | "                 | 8½                 | Bromley, Ord. 10 p.c.      | 25-27           | ..                  | 4 5 2                  | 209,053   | "      | "                 | 10                 | Do. B.                               | 242-245         | ..                  | 4 1 8                  |
| 600,000   | 10     | Oct. 13           | 6                  | Do. 7 p.c.                 | 20-22           | ..                  | 3 17 3                 | 447,427   | "      | "                 | 10                 | Do. C.                               | 242-245         | ..                  | 4 1 8                  |
| 98,122    | Stk.   | June 29           | 4                  | Buenos Ayres (New) Ltd     | 92-100          | ..                  | 6 0 0                  | 5,600,000 | Stk.   | Aug. 12           | 5½                 | South Metrop., 4 p.c. Ord.           | 138-142         | ..                  | 3 15 1                 |
| 150,000   | 20     | July 14           | 8½                 | Do. 4 p.c. Db. Stk.        | 98-100          | ..                  | 4 0 0                  | 1,460,000 | "      | July 14           | 3                  | Do. 3 p.c. Db. Stk.                  | 102-105         | ..                  | 2 17 2                 |
| 100,000   | 10     | Sept. 29          | 7                  | Cagliari, Ltd.             | 29-30           | ..                  | 5 10 0                 | 60,000    | Stk.   | Aug. 31           | 12                 | Tottenham & J. A.                    | 280-290         | ..                  | 4 2 9                  |
| 50,000    | 50     | Nov. 2            | 6                  | Cape Town & Dis., Ltd.     | 14-15           | ..                  | 4 13 4                 | 60,000    | "      | "                 | 9                  | Edmonton J. B.                       | 200-210         | ..                  | 4 5 9                  |
| 550,000   | Stk.   | Oct. 13           | 13½                | Do. 6 p.c. 1st Mort.       | 57-59           | ..                  | 5 1 8                  | 182,380   | 10     | June 10           | 7                  | Tuscan, Ltd.                         | 103-113         | ..                  | 6 1 9                  |
| 200,750   | "      | "                 | 10½                | Commercial Old Stock.      | 310-315         | ..                  | 4 5 9                  | 149,900   | 10     | July 1            | 5                  | Do. 5 p.c. Dbs. Red.                 | 100-103         | ..                  | 4 17 1                 |
| 200,750   | "      | June 10           | 4½                 | Do. New do.                | 240-245         | ..                  | 4 5 9                  |           |        |                   |                    |                                      |                 |                     |                        |
| 800,000   | Stk.   | June 10           | 10½                | Do. 4½ p.c. Db. dc.        | 147-152         | ..                  | 2 19 3                 |           |        |                   |                    |                                      |                 |                     |                        |
| 200,000   | "      | "                 | 7                  | Continental Union, Ltd.    | 205-210         | ..                  | 4 15 3                 |           |        |                   |                    |                                      |                 |                     |                        |
| 51,600    | Stk.   | Aug. 31           | 14                 | Do. 7 p.c. Prf.            | 190-195         | ..                  | 3 11 10                |           |        |                   |                    |                                      |                 |                     |                        |
| 168,400   | "      | "                 | 11                 | Croydon A 10 p.c.          | 305-310         | ..                  | 4 10 4                 | 746,164   | Stk.   | June 29           | 10½                | Chelsea, Ord.                        | 913-918         | ..                  | 3 6 0                  |
| 655,000   | Stk.   | Aug. 12           | 5½                 | Do. B 7 p.c.               | 255-265         | ..                  | 4 3 0                  | 150,000   | "      | "                 | 5                  | Do. 5 p.c. Prf.                      | 170-175         | ..                  | 2 17 2                 |
| 60,000    | "      | "                 | 5                  | Crystal Palace Ord. 5 p.c. | 125-130         | ..                  | 4 0 9                  | 160,000   | "      | "                 | 4½                 | Do. 4½ p.c. Prf. Stk., 1875          | 148-152         | ..                  | 2 19 3                 |
| 486,090   | 10     | July 28           | 11                 | Do. 5 p.c. Prf.            | 140-145         | ..                  | 3 9 0                  | 175,785   | "      | Sept. 29          | 4½                 | Do. 4½ p.c. Db. Stk.                 | 155-160         | ..                  | 2 16 8                 |
| 354,060   | 10     | "                 | 11                 | European, Ltd.             | 23-24           | ..                  | 4 11 8                 | 1,720,560 | Stk.   | Oct. 13           | 7                  | East London, Ord.                    | 212-217         | ..                  | 3 4 6                  |
| 5,922,230 | Stk.   | Aug. 12           | 12½                | Do. £710s. paid            | 17-18           | ..                  | 4 11 9                 | 654,740   | "      | June 29           | 4½                 | Do. 4½ p.c. Db. Stk.                 | 158-162         | ..                  | 2 15 7                 |
| 100,000   | "      | "                 | 4                  | Gaslight & Coke, A. Ord    | 233-238         | +1                  | 4 5 0                  | 390,000   | "      | "                 | 3                  | Do. 3 p.c. Db. Stk.                  | 103-105         | ..                  | 2 17 2                 |
| 665,000   | "      | "                 | 10                 | Do. B, 4 p.c. max.         | 120-125         | ..                  | 3 4 0                  | 700,000   | 50     | June 29           | 7½                 | G'd Junction, 10 p.c. max.           | 115-118         | ..                  | 3 3 7                  |
| 80,000    | "      | "                 | 5                  | Do. C, D, E, 10 p.c. Prf.  | 308-313         | ..                  | 3 11                   | 310,000   | Stk.   | Sept. 29          | 4                  | Do. 4 p.c. Db. Stk.                  | 133-143         | ..                  | 2 15 11                |
| 60,000    | "      | "                 | 7½                 | Do. F, 5 p.c. Prf.         | 152-157         | ..                  | 3 8 8                  | 708,000   | Stk.   | Aug. 12           | 14                 | Kent                                 | 365-370         | ..                  | 3 15 8                 |
| 1,300,000 | "      | "                 | 7                  | Do. G, 7½ p.c. do.         | 233-238         | ..                  | 3 3 0                  | 160,000   | "      | "                 | 7                  | Do. New, 7 p.c. max.                 | 212-217         | ..                  | 3 4 6                  |
| 463,000   | "      | "                 | 10                 | Do. H, 7 p.c. max.         | 195-200         | ..                  | 3 10 0                 | 1,043,800 | 100    | June 29           | 10½                | Lambeth, 10 p.c. max.                | 300-355         | ..                  | 3 8 10                 |
| 476,000   | "      | "                 | 6                  | Do. J, 10 p.c. Prf.        | 308-313         | ..                  | 3 11                   | 406,200   | 103    | "                 | 7½                 | Do. 7½ p.c. max.                     | 230-235         | ..                  | 3 9 10                 |
| 1,061,150 | "      | June 10           | 4                  | Do. K, 6 p.c. Prf.         | 185-190         | ..                  | 3 3 2                  | 350,000   | Stk.   | Sept. 29          | 4                  | Do. 4 p.c. Db. Stk.                  | 138-143         | ..                  | 2 15 11                |
| 294,850   | "      | "                 | 4½                 | Do. 4 p.c. Db. Stk.        | 131-133         | ..                  | 3 0 2                  | 500,000   | 100    | Aug. 12           | 13½                | New River, New Shares                | 432-437         | ..                  | 3 0 8                  |
| 958,000   | "      | "                 | 6                  | Do. 4½ p.c. do.            | 148-153         | ..                  | 2 18 10                | 1,000,000 | Stk.   | July 28           | 4                  | Do. 4 p.c. Db. Stk.                  | 138-143         | ..                  | 2 15 11                |
| 70,000    | 10     | Nov. 11           | 8                  | Do. 6 p.c. do.             | 195-200         | ..                  | 3 0 0                  | 902,300   | Stk.   | June 29           | 6                  | Southw'k & V'xhall, Ord.             | 170-175         | +3                  | 3 8 7                  |
| 3,800,000 | Stk.   | "                 | 10                 | Hongkong & China, Ltd.     | 133-141         | +½                  | 5 10 4                 | 126,500   | 100    | "                 | 6                  | Do. do. 7½ p.c. max.                 | 162-167         | +2                  | 3 11 10                |
| 376,400   | 100    | Aug. 2            | 4                  | Imperial Continental       | 232-236         | +1½                 | 4 8 6                  | 489,200   | Stk.   | "                 | 5                  | Do. do. 5 p.c. Prf.                  | 170-173         | ..                  | 2 17 10                |
| 473,600   | Stk.   | Aug. 12           | 5½                 | Do. 4 p.c. Dbs. Red.       | 98-101          | ..                  | 3 19 3                 | 1,019,585 | "      | Oct. 13           | 4                  | Do. 4 p.c. A Db. Stk.                | 188-143         | ..                  | 2 15 11                |
| 560,000   | 100    | Oct. 1            | 5                  | Do. 3½ p.c. Db. Stk.       | 102-105         | ..                  | 3 6 8                  | 1,155,066 | Stk.   | June 10           | 10                 | West Middlesex                       | 295-300         | ..                  | 3 6 8                  |
| 250,000   | 100    | "                 | 4½                 | Met. of Mel. } 5 p.c. Db.  | 110-112         | ..                  | 4 9 3                  | 200,000   | "      | "                 | 4½                 | Do. 4½ p.c. Db. Stk.                 | 162-165         | ..                  | 2 14 7                 |
|           |        |                   |                    | bourne } 4½ p.c. Db.       | 105-107         | ..                  | 4 4 1                  | 200,000   | "      | Sept. 15          | 3                  | Do. 8 p.c. Db. Stk.                  | 102-105         | ..                  | 2 17 2                 |

\* Next dividend will be at this rate.



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## EDITORIAL NOTES.

## An Abortive Libel Action.

THE heaviest libel action relating to the proceedings of a joint-stock company promoter to occupy the attention of a Judge and a Special Jury since the lawsuit between Mr. Samson Fox and "To-Day," was that of Sir Joseph Savory, an ex-Lord Mayor of London, against the journal "London," which ended last Friday in a verdict for the defendants, with costs. The difference between the findings of the Juries in these two cases illustrates the working of the mysterious influence called "public opinion." Our readers do not need to be reminded of the character of the company-mongering performances of Samson Fox; and we are not going to recapitulate the course of the consequent events, which ended in the proprietors of "To-Day" having to pay some thousands of pounds in costs for damaging this person's reputation to the extent of one farthing by their exposure of his dealings. But since then, the Lord Chief Justice of England and other prominent people have raised a mighty outcry against the evils of the joint-stock company system, and particularly against the abuses of company promotion. Consequently, the newspaper-reading classes of the community—especially those who habitually derive their opinions upon the topics of the day from the best journals—have insensibly been led to look at company promoting from a different standpoint than that which members of their own class commonly took even a couple of years ago. The sporting view of company speculations has given place (perhaps only for the time being) to the high moral judgment that condemns gambling even in stocks and shares.

Special Jurors are representatives of the class most susceptible to these changes of public opinion; and their verdicts are apt to register them with a fidelity which is embarrassing to the parties who are called upon to pay for the operation. In the present case, there is no doubt that Sir Joseph Savory has been made a scapegoat for bearing the sins of the City, under the lash of "Progressive" journalism as represented by "London." Into the independence and probity in all respects of this periodical itself it is beyond the present question to inquire. The point is that in recounting the history of the transactions that eventuated in the formation of the City of London Electric Lighting Company, it exhibited the action of Sir Joseph Savory, then Lord Mayor, in a scandalous light. He and his associates in the City Government were accused of having made private gain out of a business transaction over which, as members of the Local Authority, they had control. He regarded the accusation as libellous, and sought his legal remedy, which he has failed to obtain. It is not for us to compare the conduct of Lord Mayor Savory with that of Samson Fox; but we do say that if "London" deserves to be congratulated, then "To-Day" is to be pitied.

The facts of the case are few. From the first introduction of electric lighting on a commercial scale into the streets of the City, which was a temporary display of the quality of the light itself, with no reference to permanent business, the Corporation endeavoured to obtain the service upon an enduring basis. Nobody was willing to touch it; and the City had no prospect of placing its proffered contracts for electric street lighting until 1890, when three contracts, for as many City districts, were taken up by the Brush Company and Messrs. Laing, Wharton, and Down. The truth of the matter is that the method of putting the supply out by contract was a wrong principle, as was the carving of the square mile of the City area into three distinct districts. The business ought to have been done in the ordinary parliamentary manner, like the lighting of the rest of the Metropolis; but the Corporation doubtless acted for the best according to their lights at the time, and by the advice of their officers. The nominal contractors were unable to find the money required for meeting their engagements; and a special Company, called the "Pioneer" City of London Electric Lighting Company, was formed, with the Lord Mayor as Chairman, to finance the whole business, which was done by lumping all the contracts into one. Finally, the present City of London Company emerged from these dealings, with a capital swollen by the financial operations in which the Lord Mayor took part, together with a numerous selection of his relatives. Sir Joseph Savory's participation in these proceedings was characterized as "indiscreet" by the Judge; and he has been



punished for it. Little as we are ordinarily disposed to favour "London," or its municipal politics, we must rejoice, in the public interest, that the recounting of a true story such as that of the jobbing of the City of London electric lighting contracts has been found fair matter of newspaper comment. The tale is not a nice one; and the "moral" is certain to be preached for all it is worth. But almost worse than the original scandal is the canting Phariseism of those commentators who never fail to try to make Party capital out of such regrettable incidents.

#### How to Get Papers for Society Meetings.

THE wail of the secretary of the technical society over the scarcity of "papers" has become so grievous in the land that something will have to be done to quell it, even at the cost of some coercive enactment. It is well understood that, without "papers," technical and professional societies cannot long continue in prosperity. When an organization of the kind is projected, be it a District Association of Gas Managers or any other agency for bringing together men having some common interest, those who consent to become members are supposed to engage themselves thereby not only to attend the meetings as regularly as possible, but also to do whatsoever in them lies to render them both useful and attractive. In course of time, however, the majority of members get into the habit of attending the meetings without the smallest intention of contributing to the transactions. The secretary passes his time between whiles in a peculiar variety of "paper chase" which is not at all amusing; and very often this proves fruitless. Even worse is the lot of the society which is driven to accept any sort of paper offered to it, in despair of getting something worth having. In these circumstances, attention may be directed to a rule of the Architectural Association—an organization which we have often remarked for the high quality of the papers usually forthcoming at its fortnightly meetings, which are regularly reported in the "Builder." It transpired, in connection with a recent admirable disquisition by a member, Mr. Paul Waterhouse, on the interesting subject of "Oriel and Bay Windows," that membership of the Association implies a willingness to contribute a paper, at the request of the Committee, upon a subject selected by them. Excellent idea! Mr. Waterhouse characterized the rule as an "unusually humane" one; and most professional men will agree with him. As he says: "The ordinary untempered request for a paper 'brings with it a double horror, for with the honourable 'burden itself there comes the duty of selection—a duty 'which, as the paper writer passes in review the possible 'titles of possible essays, so fills him with the sense of his 'own ignorance that the process of choice becomes merely 'a process of rejection, followed eventually by recourse '(or shall I say relapse?) into some faltering selection of a 'theme where for the moment the mist of nescience seems 'to hang less thickly than over the surrounding regions.'" Indeed, the more the device is looked at, the more attractive it appears. It is essentially, as Mr. Waterhouse avers, a kindly course. A subject and a man are mated; and, for better or for worse, are they afterwards introduced to one another. It saves a world of trouble, besides being the means of interesting a large number of middle-aged practitioners in subjects of which they had previously no knowledge whatever. For the writer who is faced by an unresponsive title naturally goes straight to the text-books, and afterwards to the works, or even to the Patent Office abstracts of specifications, and straightway finds himself in a new world.

A vast amount of pertinent comment and reflection might be tacked on to this rule, which would go to show that it is, after all, the way of the workaday world in science, literature, and industry. How does the busy journalist keep up his voluminous output—writing "papers" day after day upon all sorts of subjects; while the average member of a technical society protests his want of time and ability to compose one professional paper a year? Simply because the journalist's subjects are, as a rule, dictated to him by the passing events of the day. The possible writer of professional papers who is not a regular scribe for the Press, really suffers because he waits for some special inspiration. He is attempting to live with the essayists of the period of the old "Spectator," when cultured gentlemen sat down in wigs and ruffles to express elegantly their views of Friendship, Envy, and similarly abstract topics. They could tell their equally leisured readers with

approbation, that "Courage is a habit of the Mind, Fortitude an effort of the Will," and so forth. We have long passed all that; and the modern writer of essays has to handle subjects which he must illuminate there and then, or stand aside. Something of the same strenuous suggestion must be brought to bear for the production of professional papers. The Architectural Association have one way of accomplishing this object; and it is an expedient well worth extended trial. Some tact, doubtless, would be needed in applying so new a regimen to the members of an aged society; but if it could be shown to be a matter of life or death for the organization, the experiment would probably be sanctioned.

#### Water Gas and the Size of Domestic Fittings.

SURPRISE seems to have been occasioned at Plymouth by the announcement that the consumption of gas is not increasing. It certainly is surprising. If there is among the larger, as distinct from the largest, towns one which appears to be growing more rapidly than another, it is Plymouth. Besides, gas is exceptionally cheap there; and in addition, a gratifying amount of success has attended recent efforts to popularize its use by means of automatic meters and the hire of cooking-stoves. Since the Gas Company took up this business in June last, in conjunction with Messrs. Richmond and Co. and Messrs. Willey and Co., some 1200 automatic meters and cookers have been fixed, and 700 larger cooking-stoves have been lent on hire. With a knowledge of this fact, a local paper suggested, when complaints were made of "the bad gas" in certain parts of the town, that an explanation might be found in a growth in the demand for gas which had overtaken the means of distribution; and the Gas Company were advised to lay larger mains. On subsequent inquiry, the newspaper was led to modify this opinion. It ascertained that, despite the great activity in the stove and meter department, the consumption of gas in the September quarter was actually less than in the same quarter of last year. Three possible explanations were put forward to account for this phenomenon. One was that the weather of the past summer was very fine, which is true, but unconvincing. Another, that there is a greater use of incandescent burners, which also is true, but appears insufficient to counteract the effect of the increased consumption of gas for cooking. Finally, it is suggested that less gas was consumed because the "blend" of coal gas and carburetted water gas now supplied is of heavier specific gravity than the coal gas formerly sent out. In other words, the people there do not use so much gas because, with the same fittings, it is impossible for them to get as much as they had when coal gas alone was supplied.

It is obvious that this opens up a large question. The explanation of the officials of the Gas Company as to the want of pressure of which their customers complain, is that the gas they are now supplying necessitates a larger area of pipes and burners. In connection with the penny-in-the-slot meters, where the Company supply free fittings, they are fixing No. 7 Bray's flat-flame burners; and the ordinary consumers are advised to do the same, or at least to put in larger burners, if not also larger meters. It is difficult to imagine what will be the effect of such advice upon the thousands of customers of the Company; while the brain positively reels at the prospect of all the gas consumers in every town in which water gas is in use adopting the advice to give attention to their fittings, and put in larger burners. Nevertheless, it is a subject which will demand attention if the theories put forward at Plymouth, as to the influence of the greater density of water gas upon the supply in individual cases, are established.

#### The Malvern Link Award.

IN the Malvern Link gas arbitration, the proceedings in which were reported in the "JOURNAL" for the 8th ult., the Umpire (Mr. J. Shiress Will, Q.C.) has awarded the Gas Company £22,100 for their undertaking. The claim was for £25,457; and the valuers for the purchasing authority thought £18,462 the proper figure. The award, therefore, appears to very fairly strike the mean between these valuations. Of course, the costs of the arbitration must be added to this figure. It will be remembered that the Umpire granted a special case for the ascertainment of the law upon a point raised at the suggestion of the District Council. This referred to the question whether by absorbing the district for administrative purposes the District Council had *ipso facto*



acquired powers to compete with the Gas Company. It is understood that the Umpire's award takes no account of this point; and it is reported that the Council intend to appeal on the point of law. As remarked on the previous occasion of our noticing this arbitration, the point is a regular attorney's quibble. As to whether it is sustainable or not, we cannot presume to say; but there is no harm in expressing the opinion that if they get the Link gas undertaking for the value assigned by Mr. Shiress Will, the Malvern Council will have a good property at a fair price. If they can knock it down to an old-iron value, they will not benefit the ratepayers in the long run one iota; while downright robbery will be inflicted upon a number of honest people who have done no harm. This may be law; but it would be very poor justice.

#### Peddling Ironmongers at Southport.

It was remarked a short time ago in these columns that according to their trade journal, tradesmen of the ironmonger kind entertain special views of their rights as regards competition by other shopkeepers. Yet another illustration of the same arrogance comes from the same source. From a recent number of the "Ironmonger," we learn that two or three years ago the Southport Town Council decided, at the suggestion of "a certain councillor," with a view to extending the use of gas, to supply gas for cooking and heating purposes at 6d. per 1000 cubic feet less than the rate for lighting, and also to fix all stoves free of charge. Several thousand gas-stoves were accordingly fixed gratuitously in the town, "which meant a great loss" to the ironmongers, many of whom are also plumbers." How the creation of a line of business which did not previously exist can be truthfully described as a loss to anybody, our contemporary must be left to explain. Mark, however, the swiftness with which retribution came upon this outrager of the sacred rights of the "trade"! The profits of the Municipal Gas Department last year showed a certain falling off, owing to the fact that the heating and cooking gas hardly paid for itself at the reduced rate. "One of the town councillors chiefly instrumental in carrying the free gas-stove-fixing policy, offered himself for re-election at the polls on Nov. 1. But the Southport ironmongers rallied in their thousands to vote down the free-fix man, who was defeated." More shame to the peddling shopkeepers who could display such spitefulness, with the object of punishing a public man for his vote on a public question. Is the town of Southport to be administered in the interest of its ironmongers? Truly, Local Option opens out a pleasing prospect of life in such provincial communities, where every trade is to have its own way. If anybody requires an illustration of what is meant by Provincialism, here it is. The "Ironmonger" is published in London, and might have been thought above supporting this paltry "tit-for-tat" parochialism. We hope the day will be far distant—in Southport or in any other English town—when town councillors will be deterred from doing what they regard as right and politic in the way of popularizing a public service, through fear of a sordid combination of small shopkeepers groaning over the "loss" of what was never theirs.

#### Mr. J. Fletcher Moulton and the Abuses of the Patent Law.

SPEAKING at the last monthly dinner of the Article Club, Mr. J. Fletcher Moulton, Q.C., gave the company the benefit of some of his opinions respecting the working of the British Patent Law. He mentioned first an abuse of the law of patents which is already a great nuisance to the commercial community, and appears to be rapidly growing—the terrorizing of the trading public by infringement notices. This is a quite modern, and altogether unlovely, excrescence upon our patent system. Time was when the holders of patent rights were content to do their own detective work; but now, in many instances, they prefer to cry out long before they are hurt, and breathe, by the agency of advertisement, threats of what they will do if ever they find themselves injured. This line of conduct is distinctly to the prejudice and limitation of commerce; and sooner or later somebody will have to smart for it. It is quite legitimate for patentees who have made good their property in the Courts, at considerable expense, to publish the fact far and wide, and take every legitimate means of securing the fruits of their pains and outlay. But when people who have never justified their own claims threaten others with what they mean to do, it is a pernicious piece

of interference with trade. Mr. Moulton thinks that the Courts should have power to make sensible arrangements between parties in patent actions, after the rights had been settled. What seems to be even a more pressing need is that, when any parties threaten proceedings of the kind we have mentioned, they should be compelled to be as good as their word. The law punishes a shopkeeper for endeavouring to recover his accounts by issuing a colourable imitation of a "lawyer's letter." It should be possible to bring to book those who wilfully hamper trade by pretending to have "master patents," and trying to frighten everybody with them. Let such claimants bring their action, and get their lawful remedy at the earliest possible moment, if they can; but meanwhile it must do even their own interest an injury to warn the public away from touching the thing which may some time be found to be the subject of a patent. As regards the question of compulsory licences, Mr. Moulton expressed himself with much reserve. He thinks that the determination of what constitutes the use or abuse of a patent should be left to a jury; for the reason that if the Judges have to decide such questions, they will be inclined to lay down hard-and-fast rules for their own guidance, whereas a jury would settle every case upon the facts. Lord Justice Vaughan Williams agrees with this view of the matter. It is satisfactory to learn that Mr. Moulton has not much fault to find with the Patent Law of this country. It is what is done outside the law, although in the shadow of its name, that most troubles the commercial world.

### WATER AND SANITARY AFFAIRS.

IN furtherance of the policy adopted by the London County Council on the subject of the Metropolitan Water Supply, it is not sufficient to have it proved in evidence before the Royal Commission that a supply of water must be introduced from Wales some thirty years hence. Still less will it answer the Council's purpose for it to be shown that the present sources will be adequate up to a date yet farther on. At the sitting of the Commission last week, Mr. Balfour Browne, Q.C., referred to the evidence given by Mr. R. E. Middleton as having "gone beyond the Balfour report," by showing that the present sources of water would meet all requirements for years beyond 1931. "I want to break that down," said the learned Counsel. The object of this was clear; the Chairman of the Commission having previously remarked, "If you satisfy us that it is necessary to go to Wales"—speaking in the present tense—"it will be an argument against the Water Companies, because it will entail a much larger expenditure on the purchaser, and so reduce the price to be paid." The urgency of the case must be proved; for the farther off the crisis is put, the less effect will it have on the current transaction. If it be clearly seen that water must be brought from Wales even fifty years hence, it may tend in a certain degree to influence purchase at the present date; but the effect would be slight compared with showing that the need is so pressing as to render it necessary for huge constructive works to be taken in hand as soon as an Act of Parliament can be obtained. Without admitting that even an early extension would warrant any discount on the value of the existing undertakings, it is quite palpable that the Council indulge in the expectation that this would be the case. Hence the Welsh scheme is made a present-day affair, and the existing sources are described as already failing. "Mr. Middleton will have to anticipate 1931 by a very much earlier date," says Mr. Balfour Browne, who argues that, in order to provide the requisite supply, there will have to be a large expenditure before that year. As if in discredit of the County Council tactics, Lord Llandaff observed respecting this contingency: "That will not diminish the cost of purchasing the Companies as they at present stand." Unquestionably the Council hope to produce such a result; and the manner in which they have now approached the Commission shows distinctly—though it simply conforms to what has been seen before—that the Welsh scheme is intended to depreciate the value of the works that have been already established. At one time, in the course of last week's meeting, Lord Llandaff appeared to be getting into a difficulty as to the functions of the Commission. Addressing Mr. Balfour Browne, his Lordship asked him to remember that the Commissioners had



nothing to do with deciding whether the Thames and Lea were really capable of affording a sufficient supply. In an engineering sense this is true; but in a financial sense the case is otherwise. If present sources are insufficient, a large outlay must be incurred for a supplemental supply; and this enters into the question which Lord Llandaff says forms the "business" of the Commission—namely: "Is it financially expedient to purchase?" In dealing with this topic, Lord Llandaff makes the admission: "We must take into account the probable cost and the probable future expenditure of the purchaser."

Should the present Commission decide that London has at its command a sufficient supply of water for a period quite as remote as that calculated upon by Lord Balfour's Commission, or even farther away, the question of purchase may still be entertained, but will present a very different aspect from that which the County Council seek to give it. Already the East London difficulty is disappearing; and to-morrow the constant supply will have been rendered complete over the entire area of the Company's district. Thus the four hours' supply becomes a thing of the past; and the arrangements which are being made preclude the possibility of such a restriction being repeated. It is a singular fact—to which we have already made some reference—that if the constant supply had never been introduced, the "water famine" of East London would never have been heard of. A supply flowing for four hours into house cisterns would have satisfied everybody. Such a supply exists in the City, and has so existed for years, not only in warehouses but in dwellings; and no discomfort has been experienced. But the constant service once attempted has to be continued; and we fear it is not possible to re-introduce house cisterns where they have already been abandoned. A better system may perhaps be enforced where houses have yet to be built; but, as a general rule, the consumer must consider his own risk, and endeavour to control his landlord. With the constant supply in operation, the subject is likely to be forgotten. The County Council have now lost their chance of buying up the East London Company at a reduction as a Company in "default." The Hackney Vestry have taken up the question in the hope of enforcing penalties and distinguishing themselves, and have appealed against the decision of the Registrar of the Railway and Canal Commission, who disallowed their 500 or 600 interrogatories, arranged in 34 sections. Hearing the appeal last week, the Commissioners decided on striking out some of the interrogatories, and hearing further what Counsel had to say on the subject. The entire proceeding of the Hackney Vestry seems of a fussy and contentious character, such as may serve to harass the Company without effecting any public good.

The Earl of Onslow's figures respecting the cost of carrying out the County Council schemes for dealing with the Metropolitan Water Supply have been challenged by "Ratepayer" in a letter to "The Times" last Saturday. In this letter, the income of the Water Companies is put at £925,236 per annum; this sum being arrived at by taking the average of the three years ending with 1896-7. Lord Onslow's estimate of £990,000 is described as "nearly right." It is so "nearly" correct as to be only about £7000 more than the actual income of the Companies in 1896-7, as stated by "Ratepayer." But we can come to a later date, fairly representing the present time, as shown by the last issue of Mr. Lass's "Analysis," where the net profits of the Companies for the year 1897-8 will be found to be as much as £1,037,998. Assuming that the County Council have to buy the undertakings, the question is entertained as to what they are worth. "Ratepayer" says: "In 1891 the Council had been advised, and began to recognize, that this income was incapable of much expansion, and liable to great reduction." As a matter of fact, since 1891-2, the net profits of the London Water Companies have risen at the average rate of £19,000 per annum, and during the last two years the rise has exceeded £98,000 per annum. Fluctuations of income have occurred, and 1895-6 exhibited an exceptionally low amount; thus serving "Ratepayer's" purpose as creating a reduced average for the three years of which it formed the centre. But the increase since that period has exceeded £197,000—an enormous advance in two years. "Ratepayer" takes no note of this, and predicts that in the next ten years the net profits will be "obviously lessened" owing to the large outlay necessary to maintain a sufficient supply. With an increasing business, the owner has to enlarge his premises;

and this, strange to say, is looked upon as decreasing the value of the concern!

In addition to the large increase of capital outlay, "Ratepayer" dwells on the probability that the Companies will have to bring down their charges to the level of the lowest; and he estimates that this would reduce the gross income from about £2,000,000 to £1,750,000. The gross income, we may just observe, is now £2,171,000. But the probability that Parliament would arbitrarily interfere to alter the rates already granted is fairly out of the reckoning, and forms no appreciable risk. To strengthen his case in foretelling evil days for the Water Companies, "Ratepayer" intimates that "if the present offer of purchase is rejected, a proposal of competition would be strongly reinforced by public opinion." But a competitive scheme cannot be introduced for nothing; and "Ratepayer" may amuse himself by calculating how far such an undertaking would pay. The risk that more immediately presents itself with regard to this water controversy is that "Ratepayer," and all his class, will experience a reduction of their own net profits or personal income by an increase of rates. What the Welsh scheme will cost, and what benefit it will be to London, are matters which the special correspondent of "The Times" made very clear in that journal yesterday; and further emphasis is given to his statement by an editorial article. It is shown that the Welsh supply depends on storage, and would be far more costly than the works at Staines. The catchment area of the Thames, owing to its great extent, is demonstrated to be a more productive and trustworthy source of supply than the mountain rivers of Wales. The physical as well as the financial facts are clearly in favour of the Thames Valley as a source of supply for London. That Wales must be brought in as a supplement is as yet a remote contingency; and the conclusions of the Balfour Commission are fully vindicated by the statements now given—based on irrefragable data.

It will be seen by our "Legal Intelligence" that the Court of Appeal last week affirmed the principle on which the rating of reservoirs is based. Under one of the subsections of section 211 of the Public Health Act, 1875, certain classes of hereditaments—among them being "land covered with water"—are to be rated at one-fourth of their net annual value. In the area under the jurisdiction of the Hampton Urban District Council are the works of the Southwark and Vauxhall Water-Works Company, one of whose reservoirs the Council rated at the full value. The Company resisted the claim, amounting to about £137; and they were accordingly summoned before the Justices at the Teddington Petty Sessions. In support of the claim it was contended that although the words of the Act would apply to an ordinary lake, they could scarcely do so to an artificial structure, consisting of embankments and a concrete bottom, the production of which had required engineering skill and had involved an immense outlay, and which was of the nature of a huge tank or vessel put down upon the land. On behalf of the Company, it was pointed out that a filter-bed, even when constructed upon arches, had been decided by the High Court to be "land covered with water" for the purposes of rating; and that as these beds were only intermittently covered, reservoirs, which are permanently covered, should *a fortiori* come under this ruling. The Justices said they must decide the matter from a common-sense point of view; and they made an order for the payment of the amount claimed, but granted a case. This came before Justices Wright and Darling in the Queen's Bench Division early in the year, when the contention of the Council was ably supported by Sir E. Clarke, who argued that a reservoir held water in the same way that a gas-holder held gas; and nobody would, he said, dream of calling a gas-holder "land covered by gas." Their Lordships thought they were bound by previous cases, which could not without casuistry be distinguished from the one before them; and they decided in favour of the Company, but gave the Council leave to appeal. The matter came before the higher Court (consisting of Lords Justices A. L. Smith, Rigby, and Collins) last Thursday, when the decision of the Divisional Court was upheld. Lord Justice Smith said it seemed to him that, on the plain reading of the Act, a reservoir was "land covered with water" within the meaning of the section cited. With regard to authorities, he pointed out that there were three cases decided on words identical with those in the section in question; and he expressed the opinion that



the cases under the Lighting and Watch Act relied upon by the Council were inapplicable to the consideration of the meaning of those words. This pronouncement settles definitely a matter which has probably been under consideration by other authorities than the one whose action has evoked it.

At the termination of his occupancy of the presidential chair of the British Association of Water-Works Engineers, Mr. W. Matthews, the Corporation Water Engineer of Southampton, will be able to take a retrospective glance at the year's work with considerable gratification. The Southampton meeting held last May left nothing to be desired; and the interim gathering at the Westminster Palace Hotel last Saturday possessed some of those features which give satisfaction to members who, at some little personal sacrifice, perhaps, attend on such occasions. The number of members present was good; and the list of members and associates was augmented by the admission of eight candidates. Among the new-comers is Mr. W. A. Valon, of Ramsgate; and the Association will without doubt be well rewarded, now that they have so far secured him, if they can prevail upon him to give them the benefit of his mature experience in the work of similar organizations. Touching this question of membership, while we have no official information that it is so, we believe that the Council are doing something towards repressing a growing desire on the part of representatives of trading firms to obtain entrance into the Society as associates. If this surmise is true, the Council are acting prudently. The Association was constituted solely for the elevation and dissemination of professional knowledge; and this laudable object should be jealously safeguarded, and not be permitted to be affected in any way by commercial influences. Some traders would deem it an unworthy action to avail themselves of their connection with an Association of this kind to advance their business interests; others would not. In further opening the door, therefore, there is danger.

The Association last Saturday adopted the judicious suggestion made by Mr. D. M. F. Gaskin at the last annual meeting, that Rules 30 and 31 should be amended, in order that the officials—the President in particular—who enter upon their duties at the annual meeting might be elected at the winter gathering. By the old procedure, the President was placed in the singular position of being elected only a few minutes before he had to deliver his Inaugural Address. Under such circumstances, with the address snugly reposing in his pocket, the submission of the President's name to the members, and their grave signification of approval, was nothing but an empty formality. The practice, too, might some day have been the means of precipitating a meeting into a perplexing predicament; but now all chance of such trouble has been averted. The new rule cannot come into operation until after the next annual meeting; but the Senior Vice-President is Mr. William Watts, of Sheffield, and his popularity assures his election. The only technical contribution to last Saturday's proceedings was a paper by Mr. H. Bertram Nichols on "Water Supply from the Lower Greensand at Leighton Buzzard." The principal aim of the author was to show the steps that had been taken to remove the iron which is present in the town's supply in objectionable quantity. The paper was subjected to a searching criticism; but the absence of certain details, and the inability of the author to supply them off-hand, rendered an otherwise good discussion somewhat incomplete.

#### THE "ROBERT HUNTER FUND."

##### FIFTH LIST OF CONTRIBUTIONS.

|                                                                            |           |
|----------------------------------------------------------------------------|-----------|
| Amount already acknowledged . . . . .                                      | £235 17 0 |
| A. B. . . . .                                                              | 5 0 0     |
| Barton, Mr. John, Peterborough . . . . .                                   | 1 0 0     |
| Frith, Mr. J. R., Runcorn . . . . .                                        | 1 1 0     |
| Gas Lighting Improvement Company, Limited . . . . .                        | 2 2 0     |
| Gas Meter Company, Limited . . . . .                                       | 5 5 0     |
| Gibbons, junr., B., Dudley . . . . .                                       | 5 5 0     |
| Lord, Mr. J. E. Calvert, Weaste . . . . .                                  | 2 2 0     |
| Russell and Sons, Messrs. James, Wednesbury, per Mr. Mark Bowden . . . . . | 1 1 0     |
| Tooley, Mr. George, Leeds . . . . .                                        | 1 1 0     |
| Wrexham and Acton Collieries Company, Limited . . . . .                    | 5 5 0     |
| Young, Mr. John, Norwich . . . . .                                         | 1 1 0     |
|                                                                            | £266 0 0  |

## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1369.)

THINGS on the Stock Exchange last week were torpid. Decided symptoms of the approaching death of the year were apparent when old accounts should be wound up and a fresh start made, especially when the inevitable pinch for money just at the close of the year is past and gone. But though business was so quiet, prices are not uniformly down; and in the American market at least, there was a good steady advance. The Money Market remained easy and unruffled by the Continental demand; and short loans and discount rates alike have not hardened. Business in the Gas Market was much slacker than the preceding week. Not many changes in quotations were effected; and the prevailing tendency was very fairly firm, despite a few retrogressions here and there. But the best evidence that good Gas securities still stand well in the public estimation was afforded at the Mart on Tuesday, when The Gaslight and Coke Company had no difficulty in disposing of £187,500 ordinary stock, at an average of 111. Allowing for next February's dividend, this is equal to 28½ for Gaslight "A." In the Market, Gaslight "A" improved upon the strength it had shown at the close on the previous Saturday, and marked 290 more than once on Tuesday. But afterwards it eased off a little; and the closing marks were not equal to the best of the week. A fair amount was done in the secured issues; but the prices were not particularly good. South Metropolitan, which had lately been showing symptoms of giving way, fell back a point and a half; business being marked as low as 137½. There was nothing done in Commercial to notice. Rather more business occurred in Suburbans and Provincials, especially in British, which was offered at lower figures. Alliance and Dublin, however, had a rise. Transactions in the Continental group did not amount to much; all issues being quiet and steady, with quotations unchanged, except that Tuscan had a fall. Among the remoter undertakings, a slight relapse in River Plate was the only incident. Business in Water was of about its usual modest proportions. Southwark and Vauxhall had the lion's share of it, and scored a nice advance in quotation, in view of the next dividend being at the rate of 7½ per cent.

The daily operations were: Business in Gas was only moderate on the opening day; but prices were good, and quotations rose. Gaslight "A" gained 2; and Alliance and Dublin, ½. Tuesday was more lively, with bigger dealing in Gaslight "A," which was very firm. But South Metropolitan fell 1½; British and Tuscan, ½ each; and River Plate, ¼. In Water, Southwark ordinary rose 7; and ditto "D," 5. During the rest of the week, transactions were moderate every day, and without any specially noticeable characteristic. Quotations throughout remained unchanged, except that on Friday Chelsea Water debenture went 2 higher.

### ELECTRIC LIGHTING MEMORANDA.

Sir Joseph Savory's Libel Action—Verdict for the Defendants.—The Prospects of the London Electrical Cab Company—Experience of the Company.

THE hearing of the libel action brought by Sir Joseph Savory, Bart., M.P., an ex-Lord Mayor of the City of London, against the proprietors of the journal "London," for damages for alleged libel, began in the Court of Queen's Bench last Wednesday, before Mr. Justice Day and a Special Jury. The cause of this litigation was given in the "JOURNAL" for July 5, in our "Electric Lighting Memoranda," to which we must refer our readers for information on the point. The alleged libel was of a most serious character; and Sir Joseph Savory claimed £10,000 damages in respect of it. He was charged with discreditable and sordid practices in connection with the promotion of the City of London Pioneer Electric Lighting Company. According to his Counsel (Sir Edward Clarke), the operations in question are properly describable in very different terms. Shortly stated, Sir Joseph Savory became Lord Mayor in November, 1890, when the contracts for the electric lighting of the three districts into which the City had been divided for the purpose were already definitely settled between the Sewers Commission, of which he had never been a member, and two electrical engineering firms—the Brush Company having two of the districts, and Messrs. Laing, Wharton, and Down the third. The Contractors, so it is stated, had not the means of carrying out their engagements; and it was repeatedly pressed upon Sir Joseph Savory when he became Lord Mayor that it was his duty to lend a helping hand in the work of getting the contracts fulfilled. He therefore assisted in floating a so-called Pioneer Company, with the comparatively small capital of £100,000, avowedly for the purpose of keeping the contracts alive and launching a larger Company with sufficient resources for carrying them out as one undertaking. The immediate objects of the Pioneer Company were attained; and the shareholders received their capital back with a bonus of 50 per cent.

In his cross-examination, Sir Joseph Savory was taken through the financial history of the various developments of the city of London electric lighting enterprise, which we must be excused



from following. Counsel for the defence appeared to be desirous of showing that the Pioneer Company was an unnecessary "go-between," largely composed of Sir Joseph Savory's relations and connections. The general contention by which this imputation was met was that at that period electricity supply from central stations was in its infancy; and, the Baring crisis occurring at the time, it would have been impossible to get money without this personal initiative of the then Lord Mayor. Evidence to the effect that the contracts were very favourable to the City was given by Major-General Webber, who settled the terms; by Mr. W. H. Preece, who advised the Sewers Commissioners on the contracts; by Mr. D. J. Ross, the Engineer to the Commissioners; and by others. Some piquant details respecting the electric light finance of the period were given in evidence by Mr. J. B. Braithwaite, jun. The severity of the judicial inquiry was accentuated by the defendants having pleaded justification; and, in the event, judgment was given for them with costs.

The ordinary general meeting of the London Electrical Cab Company was held last week, when accounts were presented which threw anything but a rosy light upon the cause of cab traction by accumulators. The accounts showed a debit balance to profit and loss of £6207. After all the glowing promises held out to the investing public when the Company started, it comes like the echo of an old familiar story to learn from the Directors' report that electricity proved excessively dear to buy, while the maintenance of the accumulators and the cost of renewals of rubber-tires have caused much anxiety and expense. So little did the existing Electricity Supply Companies appreciate the expediency of providing the cabs with electricity upon cheap terms, as a bit of "day load," that the Cab Company have been compelled to generate their own. In this confession there is a good deal more than meets the eye. We are surprised that our electrical contemporaries have not pounced upon it as an illustration of what electricity supply for general purposes by lighting companies is in practice, as contrasted with the theory. Over and over again the world is assured that only a sufficient day load is wanted, to keep the wheels going round regularly at the electric lighting station, for the cost of the unit to be greatly reduced to the public. Nay, such is the sanguine temperament of some electricians, that they even presume to treat the requisite day load as already secured, when they desire to "estimate" the cost of electric lighting "in the future." Well, here is an instance of one commercial Company treating with another for a daylight supply of electricity upon terms meant to be mutually advantageous; and the parties cannot agree to work together for a year. We are not disposed to apportion the blame for the rupture between the two Companies; but the Chairman of the Cab Company let fall some significant hints on the subject. His Company had agreed upon what looked like an advantageous price for their current; but "owing to only being able to obtain it during prescribed hours," and other drawbacks, the actual cost came out very different from the nominal price. This is the "day load" difficulty in a nutshell. In summer time, through the long days, an electric lighting company will be willing to do any amount of daylight work; but as the winter draws in, the overlapping of the night and day demands becomes a nuisance, and the latter has to go by the board.

By manufacturing their own electricity, the Electrical Cab Company expect to realize a saving of £50 a week, which surely means a good deal of day load gone astray from somewhere. In other respects, the experience of the Company is full of teaching for all those who are interested in a carrying or hauling speculation—not excepting gas-power trams. As the Chairman of the Company very pertinently observed, it is easy to point in the case of a pioneer undertaking from the prospectus to the balance-sheet. The stumbling-block of the Company was the absence of sufficient experience of working any vehicle like their own regularly for 50 miles a day. There is all the difference in the world between trial trips and the regular hack work. "It is this running regularly 50 miles a day which develops the weak points, such as tyres, which no amount of foresight could have prevented." If it were not tyres, it would be something else that would behave differently in regular use from anything expected from a trial trip success. The Company's prospectus promised a yearly profit of £38,446 from the running of 320 hackney cabs. The number placed upon the streets of London has so far been only 71; and this is quite enough, seeing how much has needed to be done to keep them going. It is scarcely a cause for congratulation that the newer cabs are admitted to be less comfortable to ride in than the old; while the newest driving-chains make more noise than the old ones, which were too weak. Altogether, the experience of the Electrical Cab Company will not silence the croakers who deny that electric traction by accumulators has any prospects of becoming lastingly successful.

**Professor Lewes on Acetylene.**—At the Society of Arts last night, Professor Lewes gave his concluding Cantor lecture on "Acetylene." Having on the preceding Monday shown how acetylene gas is generated and purified for domestic consumption, he proceeded to deal with its consumption for lighting, heating, and motive power, and with the application of acetylene in a diluted form. In these lectures Professor Lewes has thoroughly maintained his well-established reputation,

## MECHANICAL TRAMWAY TRACTION.

### CONCLUDING ARTICLE.

WE have now reached the point of being able to discern the true elements of the *permanent* solution of the problem of mechanical tramway traction. We italicize the word permanent, because it is the chief consideration in regard to the case of the London tramways. Curiously enough, it does not seem to have been so regarded by our electrical contemporaries, or even by some of the British municipalities who have ventured upon systems of electric traction. The "Electrician" remarks, upon Mr. Baker's report, that "if pretty pictures count for anything, the report should induce the Committee [of the London County Council] to prefer a conduit system; but nevertheless we incline to believe that when they see the prices they would have to pay for conduits, the ever public-spirited London County Council will advocate the trolley system after all." This is a small, short-sighted, and unworthy view of the question. London does not want the cheapest system of tramway working, but the best. Neither does the Metropolis provide an opening for an admittedly imperfect and transitional system which New York has rejected, and which all the most enlightened of European cities will only endure on their outskirts.

The electricians are never weary of reiterating that it is the overhead trolley-wire system of electric traction that has so far made most progress in the United Kingdom; and they point to Leeds, Bristol, Halifax, Dublin, Glasgow, and other places as examples of the reconciliation of British town populations to the drawbacks of the system, for the sake of its convenience as a means of transit. Such examples prove nothing beyond the local result, whatever it may be, because they have all been carefully designed to avoid the greatest difficulties inherent in the system. There is a type of mechanical maniac known to science, who is obsessed with the quest for "perpetual motion." Sometimes he cheats himself into the fond belief that he has succeeded, by making his machine work upon a knife-edge bearing in an agate cup. He thus reduces the friction to the smallest quantity, and thinks it has vanished altogether. This is his mistake. Instead of diminishing the ultimate obstacle to be overcome, the wise man would even exaggerate it, according to the sound philosophical rule that principles are to be tested by their most extreme applications. Those municipalities who have adopted the overhead trolley system of tramway working have followed the safe course of running it out into the suburbs. The electricians who have advocated the introduction of the system into England have fallen into the same weakness. They have described how successful it has proved in the United States, and how little of an eyesore in the most populous places, and have then suggested a trial in some outlying region. In the Glasgow instance, the line starts from near the centre of the city; but it soon gets away, and there are no crossings to negotiate. We would ask: Do the Corporation of Glasgow feel that the same system can be indefinitely extended throughout the centre of the city, as well as into the suburbs? It is in the former situation that the abolition of horse haulage would prove most beneficial, and the presence of the trolley wires most objectionable. Sooner or later, these are the localities which will determine the future of the trolley-wire system. In the case of London, they occupy the forefront of the situation. It is known what the trolley-wire system can do for long stretches of suburban roads; but whosoever would undertake to tackle the problem of Metropolitan tramway working must face, say, the line from Greenwich to Westminster Bridge, and all the cross lines at St. George's Circus and the Elephant and Castle. Half-measures are no good here.

It is only necessary to realize the force of the expression with which the present article commences—the argument for a *permanent* solution of the problem—and consider it as applying to the great centres of Metropolitan tramway traffic, to form the judgment that if electric traction means the trolley wire, the prospects of its complete adoption for London are hopeless. It is not the æsthetic objection that has most weight here. There are plenty of other crying reasons against the suggestion. It would unduly extend this essay if we were to follow Mr. Baker through his catalogue of drawbacks of the system; and therefore we will proceed to consider the only other system of electric traction for tramways remaining to be noticed—that in which the line conductor is carried in an underground conduit under or alongside the track. The chief objection to this method of conveying the necessary energy to the travelling cars is the expense of construction. Everything else, it is expedient to repeat, remains the same for the underground or overhead wire systems. There is the small objection that, with an underground conduit system, there is a longitudinal slot the more in the roadway; but this consideration cannot, with care, spoil the road more than do the tram-rails.

The most weighty argument for the underground conduit system is that it has superseded the trolley wire in New York and Washington, for precisely the same reasons that must operate in the selection of a system of mechanical tramway traction to permanently satisfy Metropolitan conditions. So long as there is sufficient traffic, the first cost of construction is of no importance in a tramway undertaking. Mr. Baker has just supplemented his report with an appendix,



consisting of a reprint from the New York "Street Railway Journal," of a most important disclosure of the traffic and working returns of the Metropolitan Street Railway Company of New York City, which amply proves the truth of this assertion. It should be remembered that this Tramway Company have run through the string of experiences of horse, cable, and underground electric haulage. They wished at one time to obtain permission to instal the overhead trolley wire; but this was denied, owing to the fixed determination of the Municipality to do away with overhead wires of every kind. Now the Company are glad they were prevented from taking up with a mediocre system, which would probably have militated against their changing again even for the best. They are able to compare horse, cable, and electric traction under identical conditions of management, and practically the same general circumstances. The administration has no prejudices in regard to any system. It is remarked that electric traction is harder on the rails than any other, by reason of the great weight of the cars and the grinding action of the driving wheels. On the other hand, the superior speed of the electric car reduces the mileage charges considerably. The net result for the past year gives the conclusion of the whole matter. The operating expenses of the cable lines were 16.42 cents per car-mile; of the horse lines, 17.87 cents; of electric lines, 10.23 cents. Assuming all things to be equal, this determines their choice. Stated in another way, the cable lines operated at 47.7 per cent. of their passenger receipts; the electric lines, at 37.9 per cent.; the horse lines, at 65.3 per cent. The Company, who control over 130 miles of track, are gradually converting their system to electric traction. Mr. Baker, in the covering letter of his appendix, states that "it is now proved beyond all controversy that the electric conduit system, besides its admitted advantages compared with the trolley, is not only electrically and mechanically satisfactory, but has shown results in economical working that have not been equalled by any other system." It is at least proved that there is no real reason why London should put up with the overhead trolley-wire system, if electric traction is to be adopted.

The fact remains, however, that the conversion of the Metropolitan tramways to any electrical system must be a very serious business. It means entirely relaying the lines, to begin with. So far as this part of the work is concerned, it will not make the smallest difference whether the electricity for working the cars is to be conveyed overhead or underground. The section of the Glasgow Corporation tramway relaid for electric traction has girder-rails weighing 100 lbs. per yard. The reconstruction is described in the "Electrical Review" for Oct. 21 and 23 last. The saving of cost to be effected by carrying the line conductor overhead instead of underground, is a question for the suburban sections of the Metropolitan lines. Curiously enough, we do not yet know how the underground conduit system would answer at big junctions and crossings, as the Elephant and Castle. We must be pardoned for so frequently mentioning this locality, as it constitutes the test of all possible systems of tramway working for London. Whatever answers here will answer anywhere.

Supposing the New York Company's achievement of 5d. per car-mile working expenses to be realized in London, it is obvious that the difference between this figure and the 10d. per car-mile given by Mr. Baker as the corresponding figure for London would not be all profit. A large proportion would be absorbed in repaying the cost of reconstruction and providing the new buildings and plant; and most of the balance would be intercepted by improvements and extensions of the service, and the reduction of fares. The public would want some compensation for the disturbance of the thoroughfares, in the form of cheaper travelling.

Many of the objections to electric traction are irrespective of the detail of the method of conveying the current along the line, over which the electrical interest raises such a pother. We have already alluded to the mechanical defect of the waste of power. How considerable this is, may be inferred from Mr. Baker's statement that an electric car usually carries two motors, each of 25-horse power. Fifty electro-mechanical horse-power to do the work, say, of a four-horse team! Of course, trams are usually hauled by a pair of horses; but double the number of hoofs to allow for the higher rate of speed, and still a huge discrepancy remains—to say nothing of the line and station losses. It will be said that all this disappears in the working returns. Doubtless true! The fact, however, remains that electric traction means enormous power generation at the stations.

Electric traction can only be had during stated hours. Whenever one looks into a matter of electricity supply, the "load factor" stares one in the face. Granted that electric traction is all that Mr. Baker's fancy paints it, for how many hours a day does he propose to keep the wheels going round; and what is to be done when the station is shut down? In this regard the electric tram compares best with the cable road. Both can handle any amount of traffic—the more the better. In the case of each, the costs of working begin to mount up with long intervals between the trips. The London County Council have already been approached on the subject of providing an all-night tram service. At least one of the suburban railways has conceded such a service. No system of transport that cannot be utilized at all hours in the same way can claim to be even approximately equal in convenience to a horse and cart.

The danger of electrolysis is the same whether the line conductor is carried overhead or in a conduit, because it is the

leakage from the return lead that does the mischief. When the conversion of a tramway to electric traction is properly done, this evil may not be a very serious matter, although it must always necessitate the exercise of certain extra vigilance, of a new kind, by the proprietors of gas and water pipes within the danger area. What we wish to point out is that putting the line conductor underground at considerable expense, does not alter this question.

In conclusion, let it be said that the present opportunity seems specially made for the British Gas Traction Company to show what they can do with their gas-cars, say, upon the South London lines. There are gas-works in this region whence the necessary supply of compressed gas could easily be procured; and arrangements could be made for quietly putting a sufficient number of such cars in service to test the question of the suitability of the system under Metropolitan conditions. If the cars fail under this ordeal, we shall certainly not shrink from admitting the fact. So far as the British Gas Traction Company are concerned, it is "now or never" with them—a working service on the busiest London route, or a confession of failure.

#### CONFERENCE OF ITALIAN GAS MANAGERS.

At the meeting of the Société Technique du Gaz en France at Nice last April, the Committee appointed M. Godinet, of Lyons, to represent the Society at the congress of the Association of Italian Gas Managers to be held in Turin in the following June; also to visit the General Exhibition then being held in the city, and report on any matters of interest that might present themselves. He accordingly, accompanied by eleven other members who had received invitations, proceeded to Turin, where he received a cordial welcome from his Italian *confrères*. Their Society is by no means a newly-formed body—the last meeting being the twenty-seventh; nor is the number of members large. But there were about forty present at the various sittings, the proceedings at which, as well as at the social functions, which were graced by the presence of nearly as many ladies, were of an exceedingly pleasant character. M. Godinet returned highly gratified with his reception; and in a report which he has addressed to the President of his Society he gives an account of what he calls his agreeable and interesting mission. Some matters in this report may be briefly noticed.

The meeting extended over four days—from the 13th to the 16th of June; the technical business occupying three of them. Two important gas-works were visited—those of the Consumers' Company, of which M. Zina is the Engineer, and those of the Italian Company, which are under the direction of M. le baron Lucifero, a member of the French Society. One of the Turin Gas Companies invited the members to an excursion to Superga, with a luncheon, and the other gave them a banquet at the Exhibition; the two Companies uniting in arranging a farewell dinner at the Hôtel d'Angleterre. The rule with the Italian Society is that the oldest member shall preside at the meetings; but M. Roux, who, by virtue of seniority, should have occupied the chair, was unable to attend. His place was consequently supplied by M. le baron Lucifero and M. Zina; the secretarial duties being discharged by M. Kraft, Manager of the gas-works at Naples, and a member of the Société Technique. The sittings took place in the Board-room of the Consumers' Company.

With regard to the business, the first place in the programme was occupied by the subject of settings of inclined retorts. It was dealt with by M. Solanges, of Milan, and by M. Sospizio, of Trieste, both of whom have these settings in use, and therefore were able to give some working results. They expressed themselves as perfectly satisfied with the new arrangement, which, of course, requires fewer men. In Milan, the eight settings of nine retorts, 15 feet long, carbonize, at the ordinary working rate (six hours), 66 metric tons of coal per 24 hours with 14 men. In Trieste, the settings, though smaller than those at Milan, carbonize, in five charges per 24 hours, rather more than 19 cwt. of coal per retort; making for the six settings of nine retorts, 12 feet long, nearly 53 metric tons per 24 hours. M. Solanges exhibited a table containing the results obtained with inclined retorts at Geneva, Cassel, Vienna, Berlin, Brenton, and Dresden. It showed that the bulk of coal carbonized per man per day varies from 4.2 to 9 metric tons. The latter exceptional result is achieved in the gas-works at Brenton, where, in eight settings of nines, four men carbonize 36 tons in 12 hours. M. Godinet remarks that whoever furnished M. Solanges with his figures must have omitted to include a generator attendant, who is required just as much for inclined as for horizontal retorts. He questions whether the four men alluded to would have time and strength to do more than charge and draw. With five men, it would work out to 7.2 tons per man—a rather remarkable result, since with settings of horizontal retorts the quantity of coal carbonized per man rarely exceeds 2½ to 3 tons. According to the table referred to, the settings indicated give as an average 5½ tons per man per day. The retort labour would consequently be reduced to the extent of 50 per cent. Further, the table showed that the 66 settings of nines dealt with carbonized altogether 624 tons of coal per 24 hours; being about 9½ tons per setting, or a little over 22 cwt. per retort. This would yield an average of 10,600 to 11,000 cubic feet of gas. But M. Godinet



points out that some of the settings cited are forced, whereas others are worked much more easily. Thus, at Geneva, doubtless during the trial-period, only 7½ tons of coal were carbonized per setting; while in Berlin the quantity reached 12½ tons.

The power of settings of inclined retorts, therefore, varies considerably in different works. M. Godinet thinks there are two causes for this; the first being the length of the retorts, as it is evident that a retort 15 feet long is more powerful than one only 11 ft. 6 in. long. Then, as with horizontal retorts, apart from the temperature of the setting, there is the duration of the charge, the effect of which is very great. The table exhibited showed that six-hour charges give very inferior results to those obtained with four or five hour charges. In this case, 10 tons of coal were carbonized in 24 hours in settings of nine 11 ft. 6 in. retorts. M. Godinet regards all these trials as very interesting; and he thinks they should incite French gas engineers to seriously consider this essentially French question, which, curiously enough, as he points out, has been taken up and practically applied, not in France, but in other countries. Frenchmen are not altogether sure about the expense of keeping up these settings, whereas they know perfectly well that their first cost is high; and it is this that frightens them, not merely when it is a question of altering and extending existing works, but also when new ones or new settings have to be constructed. But he shows how easy it is to prove by figures that in large establishments where labour is dear the advantages of inclined retorts are very real ones.

While the subject of inclined retorts and the accessory appliances of carbonization was under discussion, M. Rouget gave an epitome of his communication to the French Society at Nice on the De Brouwer coal and coke conveyor, which was described and illustrated in the "JOURNAL" for June 21 last (p. 1469). This led to the consideration of the question of the mechanical storing of these two materials, though nothing new was brought out. The subject, however, in Italy as elsewhere, is engaging the attention of gas engineers. The programme would scarcely have been complete without some reference to water gas, and to the advantage that would accrue from the possession by gas companies of power to manufacture and distribute it. But it seems that, as in France, municipal authorities are fearful of extending the companies' privileges so as to include water gas as a branch of their business. M. Godinet regards this as being inimical to the interests of both suppliers and consumers. Carbonization of gas is a subject which occupies the attention of Italian gas engineers. They would very much like to have the carburating materials freed to a large extent of the duty now imposed upon them, but without reducing the taxes upon petroleum, which are heavier than those levied in France, and hinder, or at all events restrict, the employment of this article. They have not yet found, beyond the Alps, the means of realizing this alluring dream. The consumption of gas was touched upon by M. Wittmann, Manager of the Vesuvian Company at Naples, who introduced to the members the Greyson incandescent burner, which has been found to give such excellent results. A few remarks were made on the effects of electrolysis on gas-pipes and the precautions to be taken to prevent them. It appears that this trouble is less serious than it was feared it would be when the first electric lighting cables were laid; and M. Godinet suggests that this may possibly be due to the fact that the conductors are better insulated now than they were at the outset.

Legal questions affecting gas companies do not generally come up for discussion at gas managers' meetings; and, as far as the French Society is concerned, this is rendered unnecessary by the existence of a professional syndicate which deals with them. They, however, came to the front at the Italian meeting; and the cases cited are sufficiently curious to be briefly noticed. M. Wittmann, whose name has been already mentioned, told his colleagues that one of the towns lighted by his Company would not pay the gas bill; and he thereupon applied to a Court of First Instance for power to attach the municipal revenues. The Court decided that it could not grant it. He then took the case to the Court of Appeal at Naples, which gave him authority to take possession of the town and its revenues. The authority was most rigorously exercised as far as the money was concerned, and even some of the furniture at the Mairie was seized. Finding itself treated in this unceremonious way, the town is seeking to have the judgment quashed by a higher tribunal. Such cases as this are rare in France; but M. Godinet fancies something similar has occurred in Spain, where, by virtue of a royal ordinance, a company was authorized to seize the revenues of a town. Another rather curious judgment was given at Milan by a tribunal somewhat analogous to the French *Conseils de Prud' Hommes*. It was delivered in favour of the Gas Company as the result of a complaint made by some of the stokers in their employ, who, when they saw the success of the Coze settings, refused to go on with their work on the ground that it was particularly hard, and even dangerous. An inquiry was ordered; and it was entrusted to workmen employed in other industries than that of gas supply. The effect of the judgment of this tribunal was to reject the stokers' demands, and to declare that with the new settings not only was the work less severe than with horizontal retorts, but that the Company had actually adopted arrangements to ensure the well-being of the men. At the same time, the referees came to the conclusion that the temperature in the vicinity of the upper ends of the retorts was rather high; and they made the Company undertake to carry

out such a system of ventilation as would facilitate the work of the chargers.

The remainder of the report gives an account of the visits to works and to the Turin Exhibition. This may be left for notice on a future occasion.

### PERSONAL.

Mr. UTRICK A. RITSON, Coalowner, of Newcastle, has been appointed a Director of the Newcastle and Gateshead Gas Company, in place of the late Mr. George Armstrong. Mr. Ritson is also a Director of the Newcastle and Gateshead Water Company.

It may be remembered that on the recent rather sudden death of Mr. W. J. MOTT, the Gas Manager to the Selby District Council, a fund on behalf of the widow and family was started by the Chairman (Mr. T. Liversedge) and two members of the Council, who each contributed £5 thereto. We learn that the fund is now closed, and that the total amount contributed was £73.

At the meeting of the Institution of Civil Engineers last Tuesday, it was announced that Mr. T. HOLGATE, of Halifax, and Mr. J. TIMMINS, of Wigan, had been transferred from the class of associate members to that of members. The first ballot for the present session resulted in the election of 15 members and 72 associate members. In the first-named class were Mr. T. J. BUSH, Engineer of the Australian Gaslight Company; Mr. W. F. COTTON, jun., of the Alliance and Dublin Consumers' Gas Company; and Mr. E. A. HARMAN, Gas Engineer to the Huddersfield Corporation. Among the associate members were Mr. J. HUSBAND, Engineer and Manager of the Brentford Gas Company, and Mr. W. S. M'GREGOR, Gas Engineer to the Longton Corporation.

### NOTES.

#### Making the Heaviest and Strongest Concrete.

In the structural use of cement concrete, the requirement of lightness has been fairly satisfied by the employment of coke breeze for the bulk-material. It often happens that the very opposite quality, of extreme density and weight, is urgently required of the same material of construction. While the builder of fire-resisting houses wants to save all the weight he can, the engineer who wishes to obtain the heaviest possible bases for machinery objects to cement concrete as usually made, even of solid stone, on the score of its lightness. For breakwater work also, the lightness of cement concrete is a serious objection. Mr. James Christie, an American Engineer, suggests that this occasionally necessary quality of great weight and strength may be given to cement concrete by the expedient of mixing with it from one-third to one-half by weight of the whole mass, of iron turnings to which sal-ammoniac has been added at the rate of 1 lb. of the salt to 50 lbs. of iron. He says that this concrete will weigh 210 or 220 lbs. per cubic foot, and in one month will resist a crushing force of 3000 lbs. per square inch of surface, or six times the resistance of ordinary hard stone concrete. The experiment is worth further trial.

#### The Non-Porosity of Steel Plates.

One of the familiar myths of engineering relates to the alleged porosity of iron and steel under pressure, both to water and gases. Without pretending to deal with the subject generally, the facility of having heavy hydraulic power at disposal has enabled the Washington Navy Yard authorities to settle the question in a practical way as regards thin steel sheets. Accordingly, pieces of sheet steel of ¼ inch, ⅜ inch, ½ inch, and ⅝ inch thickness were subjected to a water pressure rising to 6000 lbs. per square inch; and percolation was never produced. Even a ⅜-inch rivet joining two ½-inch steel plates was found to be perfectly tight under the same pressure. These tests should help to dispose of some hoary old legends of water under high pressure being seen to spout in streams through solid metal. The same appliances were used to ascertain the friction of water under extremely high pressures; and it was found that there was no conclusive evidence forthcoming to show that the friction of water under high pressure is any greater than the friction of water not under pressure. It would appear to be evident, from experience with compressed gas cylinders, that gases cannot percolate through steel or wrought iron at practicable pressures.

#### The Newest Tests of Portland Cement.

The testing of portland cement, like many other operations of the kind, becomes modified in character from time to time. Not long ago the use of the "hot test" for cement was strongly advocated; and then it was contended that the admixture of sand with the cement was an indispensable preliminary to the attainment of results corresponding to actual working requirements. The very latest English views upon the subject are expressed by Mr. V. de Michele, in a recent letter to the "Engineer." The writer says that, following the German lead, it has become the practice of some English engineers to stipulate for the "sand test" of their cement. It appears, however, that this stipulation means practically the employment of a fine-ground cement. The finer the grinding of the cement, the better it stands the sand test. With this test, unfortunately, an additional element of error is unavoidably introduced; and for this reason



the majority of cement users have not entertained it. Mr. de Michele points out that, since fine grinding is the secret of success with sand tests, there is no necessity for using the sand in testing, as by the simple expedient of specifying the degree of fineness, coupled with the required tensile strength neat, more reliable results are obtained, and therefore better cement secured. The following test methods are advocated as adequate and conclusive. Gauge pats  $\frac{1}{8}$  inch thick on glass, one to every three briquettes, to be immersed in water immediately, and left there for seven days, when they should be absolutely sound. Tensile strength of neat cement, 400 lbs. per square inch at seven days, 450 lbs. at fourteen days. The briquettes to be gauged by a skilled man, with the minimum quantity of water, well rammed into the moulds. The average of three breakages to be taken; the load being applied as quickly as possible. Fineness to be shown by residue not exceeding 15 per cent. upon a 100 sieve made of No. 42 S.W.G. wire, shaken for five minutes. This specification appears to be the last word in cement testing.

#### A Preventive for the Acidity of Smoky Fogs.

An interesting suggestion, which is novel to us, has been offered by the "Ironmonger," with the object of preventing some of the worst effects of town fogs—those due to the acidity of the chief components of the fog, the products of the combustion of sulphurous fuels. It is remarked that the soot and tarry matters of our town fogs, which come from coal smoke, make everything dirty, and are the source of much discomfort. The acid of the fog, however, is even worse. It irritates the eyes, nose, and mouth of those who are compelled to live in the foggy atmosphere; while it tarnishes all the ordinary metals, and hastens the rusting of iron and steel. Even in a private house, with all doors and windows shut, the effect of a bad fog is sufficiently marked. Articles become filthy to the touch, and nickel and silver goods are tinted all the colours of a (dirty) rainbow. The effect on bright iron and steel is usually permanent. To the question whether anything can be done to prevent the corrosive action of the fog acids, our contemporary answers that the presence of a little ammonia vapour in the air at such times is extremely "grateful and comforting." Both on the person and on metals the effect of ammonia vapour during a bad fog is stated to be beneficial. It is, at any rate, easily tried. All that is necessary to this end is to scatter, say, a teaspoonful of the "liquid ammonia" of the druggists on the floor, where it will mix with the natural air currents. Enough has been used if the air of the place distinctly smells of it; and the supply can be renewed at intervals as found necessary. The liquid is, of course, quite harmless. If preferred, however, the solid carbonate of ammonia placed about in saucers will answer the same purpose. It is an experiment that cannot possibly do any harm, and might do a certain amount of good. The suggestion will probably be carried out in a good many ironmongers' shops when the next dense fog threatens to spoil the stock.

#### Effect of Subsidence Due to Coal Workings.

The above subject, in its relation to bridges and other structures, was dealt with by Mr. S. R. Kay, at the meeting of the Institution of Civil Engineers on the 29th ult. The author showed that subsidence always follows coal working where no pillars are left; and it is generally proportionate to the thickness of material excavated. The depth regulates roughly the duration of the movement. Subsidence may be modified by tight packing of the goaf, where no coal is left for support under the area to be protected. Faults are responsible for much of the damage resulting from coal working. In their absence, natural breaks and joints in the strata, within the limits of the dynamic effect of the subsidence, form the lines of weakness. Fractures seldom find their way to the surface from depths greater than 100 yards, unless the thickness of the seam is considerable, or a thick bed of rock intervenes. A series of levels, extending over five years, were taken by the author with reference to two separate colliery royalties under which the coal was being worked at depths of 120 and 330 yards respectively. They proved, in the former case, that subsidence closely followed the extraction of the coal, and continued for  $3\frac{1}{2}$  years, amounting to 70 per cent. of the thickness excavated; while in the latter case, it followed somewhat later, continued for four years, and amounted to 64 per cent. of the thickness excavated. The strata in each case were fairly level, and of the average coal-measure character. If the site of works be over a fairly large area of goaf, even settlement may be expected; and when complete, the surface will be left nearly as before, though at a lower level. Works should be placed away from goaf edges, if possible. A period of two or three years at least, after the coal is extracted, should elapse before commencing works; and more, if practicable, in the case of deep mines. Water-works and reservoirs, where certain heights above sea-level are to be maintained, should not be constructed in mining districts unless the suitability of the site outweighs the cost of protection.

**State Examination of Water in America.**—According to "Science," the State Legislature of Vermont has passed an Act providing for the equipment and maintenance of a State laboratory, which shall include in its work the chemical and bacteriological examination of water supplies. The sum of £1000 has been granted for its establishment, and £1600 per annum voted for current expenses.

## TECHNICAL RECORD.

### ACETYLENE.

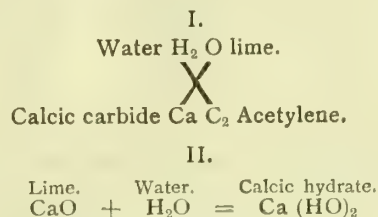
By VIVIAN B. LEWES, F.I.C., F.C.S.,

Chief Superintending Gas Examiner to the Corporation of London,  
Professor of Chemistry at the Royal Naval College, Greenwich.

[The Third of a Course of Cantor Lectures at the Society of Arts, delivered Dec. 5, 1898.]

Accustomed as I have been to chemical actions of all kinds, more especially in the development and use of gases, I shall never forget the impression made upon my mind when, in the autumn of 1894, I first generated acetylene by the action of water upon calcic carbide obtained from Mr. Willson in America. There was something almost "uncanny" in the development of this wonderful gas from the simple contact of the carbide with water; and I was the more impressed by it as I had spent several years in researches necessitating the making of considerable volumes of acetylene, and realized to the full the laborious and unsatisfactory nature of all the earlier methods for its production. It was with this carbide that I then made the experiments detailed by me in this room in January, 1895, when I showed you for the first time in this country the reactions which had caused me such keen delight, and also showed for the first time in any country how the gas could be consumed so as to develop to the full its marvellous illuminating power.

In the generation of acetylene from calcic carbide and water, all that has to be done is to bring these two compounds into contact, when they mutually react upon each other with the formation of lime and acetylene; while if there be sufficient water present, the lime combines with it to form calcic hydrate thus—



The wonderful simplicity of the reaction is its great beauty; and one would imagine that but little scope was afforded to the mechanical ingenuity of inventors in devising methods by which the necessary contact between the interacting bodies should be brought about. But a glance through the patent literature of the last few years, shows that where there is a will there's a way; and many of the weird devices protected under the name of acetylene generators, would lead one to suppose that the formation of this beautiful illuminant was one of the most complex problems ever submitted to the ingenuity of man.

There are manifestly two ways in which the carbide and the water can be brought together, either by adding water to carbide or carbide to water; while a slight amount of novelty can be introduced by allowing the water to rise in contact with the carbide from below—i.e., by adding the water to the bottom of the carbide instead of to the top. I showed these three methods of procedure when I first described acetylene, and at the time thought that the question of generators was practically done with. But within a few months the idea arose of making automatic generators, in which the space necessary for a small holder should be saved by making the apparatus only generate the gas as it was needed; and a multitude of devices for stopping the generation of the gas when the consumption ceased were designed and placed upon the market.

Unfortunately the designers of these machines, though gifted with much ingenuity and mechanical skill, had but little idea of the properties of the body with which they were dealing; and as a result many of the generators, if not actually dangerous, are so arranged as to produce the gas in anything but its purest form, while some give a far smaller yield of gas per unit weight of carbide decomposed than others constructed on more rational principles. The different forms of apparatus shown at the exhibition at the Imperial Institute, held during the past summer under the auspices of this Society, may be taken as representing the best types on the market; and when a few weeks hence the report of the Committee is published, much interesting matter will be found in it, as a uniform quality of carbide being used throughout the exhibition for over a month's continuous working, direct comparison between the performances of the various generators becomes possible.

In considering the various forms of apparatus, it will be well to divide them in the first place into two classes: (1) the automatic, in which the storage capacity for acetylene is less than the total volume of gas the charge of carbide is capable of generating, and which depend upon some special arrangement for stopping the action of water on the carbide when the consumption ceases; and (2) the non-automatic, with which there is a holder of sufficient size to contain the whole of the gas generated



from the charge of carbide which is used. Each of these classes may be subdivided under three heads—

- A.—Those in which water is, by various devices, allowed to drip or flow in a thin stream on to a mass of carbide; the evolution of the gas being regulated by the stopping of the water feed.
- B.—Those in which water in volume is allowed to rise in contact with the carbide; the evolution of the gas being regulated by the water being driven back from the carbide by the increase of pressure in the generating chamber, or (B<sup>2</sup>) by the rising bell of the gasholder drawing the carbide up out of the water.
- C.—Those in which the carbide is dropped or plunged into an excess of water.

The points to be attained in a good generator are—

- 1.—Low temperature of generation.
- 2.—Complete decomposition of the carbide.
- 3.—Maximum evolution of the gas.
- 4.—Low pressure in every part of the apparatus.
- 5.—Ease in charging and removal of residues.
- 6.—Removal of all air from the apparatus before generation of the gas.

When carbide is acted upon by water, considerable heat is evolved; and to determine what this amounted to, a good sample of commercial carbide, containing 92 per cent. true carbide, was experimented with as follows: A rough calorimeter was made by jacketing a beaker about 5 inches in diameter with cotton wool. This arrangement, though crude, answered its purpose well, as experiment showed that some hot water placed in it only lost 0.2° C. after standing for ten minutes in a room at 18.6° C.—a loss which could be neglected. One piece of carbide, the weight of which was known, was dropped into a litre (1000 grammes) of water at a known temperature in the beaker; and the moment that the evolution of gas ceased, the temperature of the water was taken. The results were as follows:—

| Grammes of Calci- carbide. | Rise in Temperature. | Corresponding Calories Liberated. | Calories Liberated per Gramme of Carbide. | Time of Reaction In Seconds. |
|----------------------------|----------------------|-----------------------------------|-------------------------------------------|------------------------------|
| 42.7 ..                    | 17.4° C. ..          | 17,400 ..                         | 407 ..                                    | 62                           |
| 28.9 ..                    | 11.4 ..              | 11,400 ..                         | 394 ..                                    | 91                           |
| 19.7 ..                    | 8.2 ..               | 8,200 ..                          | 416 ..                                    | 73                           |

which give as an average 406 calories liberated for each gramme of carbide.

Broken-up carbide, the pieces of which weighed from 1 to 5 grammes, was thrown into a litre of water in the beaker, in quantities of 30, 40, and 50 grammes respectively—

| Grammes of Calci- carbide. | Rise in Temperature. | Corresponding Calories Liberated. | Calories Liberated per Gramme of Carbide. | Time of Reaction In Seconds. |
|----------------------------|----------------------|-----------------------------------|-------------------------------------------|------------------------------|
| 50 ..                      | 17.6° C. ..          | 17,600 ..                         | 352 ..                                    | 248                          |
| 50 ..                      | 18.4 ..              | 18,400 ..                         | 368 ..                                    | 86                           |
| 50 ..                      | 18.3 ..              | 18,300 ..                         | 366 ..                                    | 123                          |
| 50 ..                      | 18.4 ..              | 18,400 ..                         | 368 ..                                    | 106                          |
| 40 ..                      | 15.6 ..              | 15,600 ..                         | 390 ..                                    | 109                          |
| 40 ..                      | 15.8 ..              | 15,800 ..                         | 395 ..                                    | 101                          |
| 40 ..                      | 15.0 ..              | 15,000 ..                         | 375 ..                                    | 196                          |
| 40 ..                      | 15.5 ..              | 15,500 ..                         | 387 ..                                    | 110                          |
| 30 ..                      | 11.7 ..              | 11,700 ..                         | 390 ..                                    | 76                           |
| 30 ..                      | 10.8 ..              | 10,800 ..                         | 360 ..                                    | 89                           |
| 30 ..                      | 11.8 ..              | 11,800 ..                         | 393 ..                                    | 114                          |
| 30 ..                      | 11.4 ..              | 11,400 ..                         | 380 ..                                    | 85                           |

or 377 calories liberated for 1 gramme of carbide.

The last experiment was repeated with carbide still more finely divided; and the results gave 384 calories for each gramme of carbide.

From these figures, it will be seen that, contrary to expectation, the smaller the carbide the less was the yield of heat; but the reason for this can soon be made evident. More time is spent in weighing out the finer carbide than in taking the weight of one large piece; and the larger surface presented by the small pieces causes greater decomposition by the moisture in the air than with the single lump. Hence the carbide is of poorer quality; and, moreover, the rapid evolution of gas in the case of small carbide prevents the water abstracting all the heat from it. Taking this into consideration, the 406 calories will most nearly represent the heat evolved by the decomposition of 1 gramme of good commercial carbide; and this would be equivalent to 414 calories for pure carbide. With this figure as a basis, it is evident that the action develops about one-twentieth of the heat evolved by the combustion of carbon. But the intensity of the temperature developed is a function of the time needed to complete the action; the decomposition of the carbide by water is extremely rapid; and the degree of heat attained varies with every form of generator. So that while the water in one form may never reach the boiling-point, the carbide in another may become red hot, and give a temperature of over 800° C.

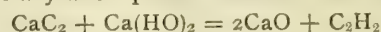
When water drips upon carbide, as in generators of sub-division A, the temperature rapidly rises until it reaches a maximum after about 18 to 25 minutes; the actual heat developed depending upon the rate of flow of the water and the way in which it is distributed over the mass. But it is quite possible with generators of this class to reach from 400° to 700° C.; and it is probable that in some parts of the mass the higher limit is nearly always attained—traces of tar being generally found in the residual lime—and in some cases it is in sufficient quantity

to make the lime yellow and pasty, while vapours of benzene and other polymerization products freely pass off with the gas.

Leaving the question of the temperature developed in this class of generator, another important point is the length of time over which generation of gas continues after the addition of water to the carbide has ceased. Makers of automatic apparatus of this type seem to think that, in order to stop the evolution of acetylene, all they have to do is to cut off the water supply. This would act very well if the generation of gas really ceased then. But this is not the case, as gas continues to be evolved, although with increasing slowness, for a considerable period after the cutting-off of the water. The length of time over which this after-generation extends will, of course, to a certain extent depend upon the amount of water added, the amount of carbide undecomposed, and the temperature of the carbide at the time when the water supply is stopped; while the generation will itself depend upon—

- (a) The dehydration of the calcic hydrate first formed.
- (b) The decomposition of water condensed from the gas present as the temperature of the generator falls.

As we have before seen, the first result of the action of water upon the carbide is the formation of quicklime and the evolution of acetylene; while if sufficient water be present, the lime takes up another molecule of water to form calcic hydrate. This molecule of water, however, at temperatures of from 420° to 430° C., is driven off from the calcic hydrate; and the affinity of the carbide for any water present causes the reaction—



A series of experiments was made by placing a known weight of carbide in a generating cylinder, running in a known volume and weight of water in a given time, and carefully measuring the volume of gas for the first ten minutes, and again when the action had practically ceased; and not more than 1 cubic foot of gas was evolved in ten minutes. The results so obtained show clearly that in any apparatus on this principle the cut-off should be so arranged that at least one-fourth of the total holder capacity is still available to store the slowly generated gas.

An important point was noticed in these experiments—viz., the large excess of water required to ensure complete decomposition of the carbide over and above the theoretical quantity—and the excess of water needed was largely dependent upon the form of generator employed. According to theory, 64 parts by weight of carbide require only 36 parts by weight of water to completely decompose them and convert the lime into calcic hydrate. This would mean that each pound of carbide needs a little under half a pint of water to complete the action; while in practice, owing to the evaporation due to the heat of the action, half the added water is driven off as steam with the acetylene, or left mechanically adhering to the lime. The smallest quantity likely to complete the action would be a pint to a pound of carbide; while in reality the only safe way is to add sufficient water to drown the residue. If this is not done, the lime forms so protective a coating to the carbide that small quantities often remain undecomposed; and if the residues are thrown into a drain or cesspool, the evolution of acetylene would give an explosive mixture which, on account of its low point of ignition, would be a serious danger.

The second subdivision of generators B, in which water rises to the carbide, is very popular; and over-heating can be avoided in them provided they are so arranged that the water is never driven back from the carbide, and if the charge of carbide used is not too great. Under these conditions, the slowly rising water is always in excess at the point where it decomposes the carbide, so that the evaporation, by rendering heat latent, keeps down the temperature; and though the steam so formed partly decomposes the carbide in the upper portion of the charge, the action is never sufficiently rapid to give any very great rise of temperature. In order to fulfil these conditions, it is necessary that there should be a holder of considerable capacity, and that the leading tube conducting the gas from the generator to the holder should be of sufficient diameter to freely conduct away the gas; the water being allowed at the same time to rise in the generator so slowly as to do away with any risk of over-generation. In the best generators of this class, these conditions are more or less approached; and it is unusual to find that the melting point of tin—228° C.—has been reached in the charge of carbide during decomposition.

Where appliances of this class are automatic, and have no rising holder to take the gas, it is found that they work satisfactorily when supplying the number of lights for which they were designed. But if they are overdriven, and the action becomes too violent, excessive heating takes place; while the turning off of the gas, and consequent driving back of the water from the carbide, also has a tendency to cause it. If, however, the water has risen sufficiently slowly, the carbide below the surface has been practically all decomposed, so that the heating only takes place over a limited zone.

The generators of sub-division B<sup>2</sup> are the worst offenders as regards excessive heating; the charge of carbide in some of them frequently becoming red hot, while the lime taken from them is highly coloured and often black from the formation of tar and carbon.

The moment acetylene is subjected to the action of high temperatures, changes of great complexity begin. These at first are purely synthetical. At temperatures which are comparatively



low, the acetylene gas begins to condense to benzene; as the temperature rises, the condensation of four molecules of acetylene yields styrolene; and a further increase in the temperature may cause the styrolene and benzene to interact, yielding anthracene and hydrogen. It is probably at this point that the brown tar vapours appear, while naphthalene also is formed. At this temperature, moreover, a fresh set of interactions starts. The nascent hydrogen combines with acetylene to form ethylene; and this body, under the action of heat, breaks down into methane and acetylene once more.

When the outer layer of carbide decomposes, the gas is evolved so rapidly that there is no time for the heat to act upon it. But as the decomposition spreads into the centre of the mass the acetylene generated has to pass through the external layers, which, as shown, may be at a temperature above the point of its decomposition; and it is under these conditions that a considerable volume of gas is lost, and the tar often found in the residue, or distilled into the generator and tubes, is formed.

In generators in which excessive heating takes place, the tar is likely to cause considerable trouble, as it is of a very viscous nature, and if it condenses in the delivery tubes causes the lime dust and carbon particles to collect and bring about stoppage. A still more important evil, however, is to be found in the alteration which takes place in the composition of the gas, and which reduces its illuminating value to a serious extent. Two samples of gas taken while the charge in one of these generators was over-heating, gave the following results on analysis:—

|                                  |       |    |       |
|----------------------------------|-------|----|-------|
| Acetylene . . . . .              | 70.0  | .. | 69.7  |
| Saturated hydrocarbons . . . . . | 11.3  | .. | 11.4  |
| Hydrogen . . . . .               | 18.7  | .. | 18.9  |
|                                  | 100.0 |    | 100.0 |

Such a mixture would only have about one-half the illuminating value of pure acetylene. The large amount of hydrogen present in these samples also shows that decomposition of some of the acetylene has taken place; and a considerable deposit of carbon is often found in the generator. At first sight, these results seem an absolute condemnation of the second subdivision of apparatus; and the rising bell which draws a mass of wet carbide above the surface of the water is bad from every point of view. But generators in which water rises from below, and so attacks the carbide, can be made safe if the arrangements are such that the water is never driven back from the carbide, and the bulk of carbide is sufficiently subdivided.

The generators of the third class are those in which carbide is allowed to fall into an excess of water; and these have many advantages. In such generators, as long as there is water present, it is impossible to get above a temperature of 100° C., unless lime sludge be allowed to collect at the bottom, when the carbide will get hot enough to sometimes melt zinc; while with a properly arranged tank the temperature never exceeds the air temperature by more than a few degrees. Under these conditions, the absence of polymerization, and the washing of the nascent and finely divided bubbles of gas by the lime water in the generator, yields acetylene of a degree of purity unapproached in any other form of apparatus. The one thing that has militated against this method is that it is not easy to design such a generator which shall be automatic; and as this seems to be the craze from which the generator makers are at present suffering, its advantages have been apparently overlooked by them, though fully recognized by all scientific men.

This form of generator, however, though exhibiting the great advantages enumerated above, has the drawback of being one of the least economical in the output of acetylene per pound of carbide used, as the gas, having to bubble through the water, is rapidly dissolved by it; while in an apparatus in which only the surface of the water touches the gas, the amount dissolved is comparatively small. The result of this is that with apparatus of this class, the generation rarely exceeds 4.2 cubic feet of acetylene per pound of carbide, instead of over 5 cubic feet.

As regards the complete decomposition of the carbide, it has been already pointed out that in generators of the first subdivision there may be a small quantity of the carbide left undecomposed if water enough to flood the residuum be not admitted; while in non-automatic generators of the second subdivision, this is practically impossible. In generators of the third subdivision, in which carbide drops into a large excess of water, it might be imagined that any carbide in the residue was an impossibility. But, in point of fact, this class is often the worst offender in that respect; as if the generation has been in action for some time, a thick sludge of lime collects at the bottom of the generator, into which the carbide sinks. A large lump of carbide will then often bake for itself so tough a layer of oil and lime that it resists the action of the water, and is found unacted upon when the generator is cleaned out; the usual explanation given by the generator maker being that it is crust present in the "bad carbide."

In a good generator, the maximum yield of gas should be evolved from the carbide. But a fact which the generator makers have entirely overlooked up to the present time is that if you take a number of different machines and supply them all with exactly similar carbide, no two will give the same yield of gas; the best generators giving volumes approximating to 5 cubic feet per pound of carbide, while the worst will give barely 4 cubic feet—a result as usual placed at the door of the carbide. The

causes which tend to diminish the volume of acetylene given off are—

- 1.—Undue pressure in the generator.
- 2.—The acetylene after generation having to pass through a column of water.
- 3.—Undue heating, causing polymerization.

The first of these is very noticeable, and is due to the increased volume of gas dissolved by water under pressure; as though 10 volumes of water at ordinary atmospheric pressure only dissolve 11 volumes of acetylene, at 2 atmospheres pressure it dissolves double the quantity. When acetylene is generated at or above the surface of water, but little dissolves at once—the top layer of water rapidly becoming saturated; but when the gas has to bubble up through a mass of water, as in generators of the third class, a heavy loss from solution takes place. The last cause has already been discussed, and is not so noticeable in its result.

The pressure in all parts of a generator should be as nearly as can be equal, and as low as possible; and this is best obtained by working freely into a gasholder of sufficient size. The Home Office fixed 100 inches of water as the limit of pressure permissible in generators; but I think myself it was a mistake to allow more than 20 inches, and I should certainly not advise the use of a generator which gave more than that amount.

Every part of the generator should be easily accessible, and complicated taps and valves should be avoided; while ease of charging and clearing should be attended to—ample room being provided in the generator for the increase in bulk which takes place when carbide is converted into lime. One pound of pure calcic carbide yields 1.15 lbs. of slaked lime (1 kilo of carbide yields 1156 grammes of slaked lime); and the volume this will occupy depends entirely upon the way the water is brought in contact with it.

In an automatic generator of the first subdivision, where water drips slowly upon the carbide in sufficient quantity to decompose it, but not to flood it, the lime swells up and occupies from 2 to 2.5 times the bulk of the original carbide. When, however, the water flows in more rapidly, the impact of the water beats down the lime and the space occupied is not so large. In generators of the second type, in which water rises from below, the weight of the undecomposed carbide above it presses down the lime below, and keeps it in a compact mass occupying about one-half more space than the carbide from which it was formed. In designing a generator of the third subdivision, the tank containing the water into which the carbide falls should be provided with a false bottom, so as to leave at least 8 inches to 1 foot of water below the point at which the carbide is decomposed, for the lime sludge to settle in; and experiments were made to see the rate at which the settling of the excess of lime took place. In these experiments, known weights of calcic carbide were dropped into a beaker containing a litre of water; and the results obtained were as follows:—

| Calcic Carbide. |    | Volume of Lime Paste Deposited during |          | Volume of Lime Paste Deposited during    |          |
|-----------------|----|---------------------------------------|----------|------------------------------------------|----------|
|                 |    | 30 Mins.                              | 90 Mins. | 30 Mins.                                 | 90 Mins. |
| Grms.           |    | c.c.                                  | c.c.     | Calculated for 1 grm. CaC <sub>2</sub> . |          |
| 50              | .. | 480                                   | .. 360   | 9.6                                      | 7.2      |
| 50              | .. | 470                                   | .. 340   | 9.4                                      | 6.8      |
| 50              | .. | 440                                   | .. 350   | 8.8                                      | 7.0      |
| 50              | .. | 470                                   | .. 370   | 9.4                                      | 7.4      |
| 40              | .. | 430                                   | .. 330   | 10.7                                     | 8.0      |
| 40              | .. | 420                                   | .. 320   | 10.5                                     | 8.0      |
| 40              | .. | 400                                   | .. 310   | 10.2                                     | 7.7      |
| 40              | .. | 410                                   | .. 320   | 10.5                                     | 8.0      |
| 30              | .. | 340                                   | .. 240   | 11.0                                     | 8.0      |
| 30              | .. | 320                                   | .. 220   | 10.3                                     | 7.3      |
| 30              | .. | 330                                   | .. 240   | 11.0                                     | 8.0      |
| 30              | .. | 330                                   | .. 240   | 11.0                                     | 8.0      |
|                 |    |                                       |          | Mean                                     | 7.6      |
| II.             |    |                                       |          |                                          |          |
| 50              | .. | 450                                   | .. 340   | 9.0                                      | 6.8      |
| 50              | .. | 440                                   | .. 330   | 8.8                                      | 6.6      |
| 50              | .. | 450                                   | .. 330   | 9.0                                      | 6.6      |
| 50              | .. | 440                                   | .. 320   | 8.8                                      | 6.2      |
| 40              | .. | 390                                   | .. 310   | 9.7                                      | 7.7      |
| 40              | .. | 410                                   | .. 310   | 10.0                                     | 7.7      |
| 40              | .. | 390                                   | .. 300   | 9.7                                      | 7.5      |
| 40              | .. | 390                                   | .. 300   | 9.7                                      | 7.5      |
| 30              | .. | 310                                   | .. 210   | 10.3                                     | 7.0      |
| 30              | .. | 300                                   | .. 240   | 10.0                                     | 8.0      |
| 30              | .. | 240                                   | .. 230   | 9.6                                      | 7.6      |
| 30              | .. | 300                                   | .. 220   | 10.0                                     | 7.3      |
|                 |    |                                       |          | Mean                                     | 8.6      |

After 30 minutes, the volume of lime was 10 c.c. per gramme of carbide; after 90 minutes, it was 8.1 c.c. per gramme. So that approximately, after an hour's standing, each kilo of calcic carbide will give 10 litres of lime sludge, or 1 lb. of calcic carbide will yield 8 pints, which can be got rid of by a cock at the bottom of the apparatus. The rapidity with which settling takes place is, of course, slightly affected by the form of apparatus.

Another requisite of a good generator, overlooked up to the present time, is that there should be an arrangement by which the air present in the generator can be rinsed out with some of the acetylene already made in the holder, or by some inert gas like carbon dioxide. I think this is a most important precaution, as recent researches by Mr. H. Gerdes show that, instead of acetylene requiring to be diluted with about twelve times its



bulk of air in order to obtain the maximum pressure on explosion, mixtures of equal volumes of acetylene and air give the most powerful result. It must be remembered that the temperature at which acetylene decomposes into carbon and hydrogen with evolution of heat is  $780^{\circ}\text{C}.$ ; but the temperature of ignition is  $480^{\circ}\text{C}.$ , and in such a mixture the degree of heat needed to cause explosion will more nearly approach the latter than the former temperature. It is quite conceivable that in working on a big scale, the carbide might easily reach the necessary temperature, while such a mixture of acetylene and air still remained in contact with it. Indeed, I have come across several cases of explosion which could only be explained by this.

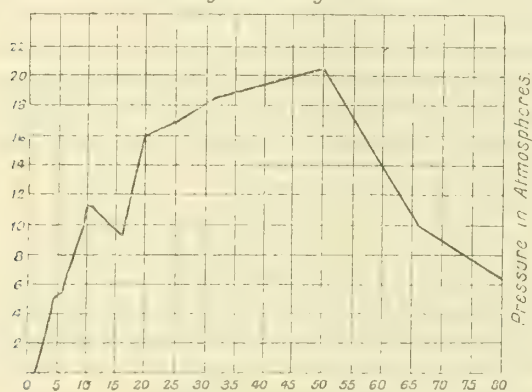
Working with 90 litres of the various mixtures in an explosion cylinder, and measuring the pressures by means of a manometer and indicator, the following results were obtained:—

*Pressures Given by Exploding Mixtures of Acetylene and Air.*

| Percentage of Acetylene. | Atmospheres Pressure. | Percentage of Acetylene. | Atmospheres Pressure. |
|--------------------------|-----------------------|--------------------------|-----------------------|
| 2.5 ..                   | 0.05 ..               | 11.1 ..                  | 11.1                  |
| 3.7 ..                   | 3.7 ..                | 12.5 ..                  | 10.6                  |
| 4.7 ..                   | 4.9 ..                | 16.6 ..                  | 7.2                   |
| 5.5 ..                   | 5.2 ..                | 20.0 ..                  | 16.0                  |
| 6.6 ..                   | 6.8 ..                | 25.0 ..                  | 16.9                  |
| 7.7 ..                   | 8.2 ..                | 33.0 ..                  | 18.4                  |
| 8.3 ..                   | 8.6 ..                | 50.0 ..                  | 20.3                  |
| 9.1 ..                   | 9.7 ..                | 66.0 ..                  | 10.0                  |
| 10.0 ..                  | 11.1 ..               | 80.0 ..                  | 6.3                   |

If these results be plotted out in a curve, it will be seen that there are two maxima of explosive force—

*Percentages of Acetylene.*



The first maximum of pressure occurs when completed combustion yields the greatest heat effect, and the acetylene is burnt to carbon dioxide and water vapour; and this mixture explodes with the greatest noise.

Mr. Gerdes explains the second maximum of pressure by the assumption that the carbon is gaseous at the moment of liberation; but I do not think this theory is tenable. If a mixture of equal volumes of acetylene and air be ignited in an open cylinder 18 inches high, a lurid disc of flame runs down the cylinder, and a vast cloud of carbon is given off; but no sign of anything approaching explosion occurs. If, however, this be done in a closed vessel, the very slowness of the combustion brings about the explosion, as the combustion of the portion of the mixture first ignited creates a pressure under which the remainder detonates at the temperature of combustion, and gives the high pressure noticed in these experiments.

In experiments which I have made, I have found it extremely difficult to ignite such a mixture of air and acetylene in a tube by means of an electric spark; but if a flask be employed, so that a considerable volume of the mixture be present, the spark at once causes a violent explosion—the finely divided particles into which the glass is blown being an ample proof of the explosive force having been of an extremely sharp character. The fact that a mixture of one volume of air and one volume of acetylene burns extremely slowly in an open cylinder, and also the fact that it is difficult to ignite by a spark the mixture in small portions, is no argument against the explosibility of the mixture; as if you take a mixture of carbon disulphide and nitric oxide in a short cylinder, it burns with simply a bright flash of light which is noted for its richness in actinic rays, whereas if a very long narrow cylinder be employed it burns down to a certain point and then detonates, blowing the cylinder to pieces—such phenomena being entirely due to the increase in rapidity of combustion, which finally terminates in an explosion wave.

A good deal of the trouble arising in generators is due to the irregular development of the acetylene, which at first comes off with tremendous rapidity, and then, as the exterior carbide becomes coated with lime, gets slower and slower; while the after cracking off of this coating then gives irregular rushes of gas. Many attempts have been made to get over this trouble, perhaps the most successful being the decomposition of the carbide by means of a solution of sugar, which has the power of dissolving the lime as it is formed, and so gives a uniform and less rapid evolution of gas. But it, of course, increases the expense, and could only be available in the generators of table and bicycle lamps, where cost is a secondary consideration.

Alcohol also, mixed with the water, tends to regulate the generation. The effect of various oils in regulating the evolution of the gas has been tried with a certain amount of success, as if the carbide be coated with oil, it is protected from the action of water all the time the oil is clinging to the material. In one form of automatic generator, a layer of light oil is placed on the surface of the water. As the water rises past the carbide, the oil rises with it, and the action of the water on the carbide commences a few minutes after the water has come in contact with it and has had time to displace the oil; while on cutting off the gas the water is again driven down, and as the oil on its surface comes in contact with the partially decomposed carbide it is supposed to coat it and stop the after-generation. With very small generators, working well within their capacities, this may be successful; but with any large charge of carbide, the heat remaining in the lumps of solid material would probably be sufficient to distil out some of the light oil employed.

In concluding this part of the subject, I can only say I believe that, as time goes on, the tendency on the part of acetylene consumers will be to use the simplest form of generator available, with a holder proportionate to the needed consumption.

Abroad a good deal of work has been done on the purification of acetylene; and though this is desirable with the smallest installation, it becomes imperative when small towns or villages are to be supplied with acetylene instead of coal gas. As was pointed out in the last lecture, the purity of the acetylene gas primarily depends upon the purity of the carbide from which it is formed; and as long as it is commercially impossible to use absolutely pure calcic oxide and carbon, so long will there be always present in this material calcic phosphide, aluminium sulphide, and magnesium nitride, which on the decomposition of the mass by water will yield a gaseous and unwelcome addition to the acetylene of phosphuretted hydrogen, sulphuretted hydrogen, and ammonia.

Phosphuretted hydrogen, when it burns in the acetylene flame, gives rise to phosphorus pentoxide, which escapes into the atmosphere in the form of white fumes; and though the quantity is so minute that it is invisible as it leaves the acetylene flame, still, when mingled in quantity with the air of an ill-ventilated room, it is the primary cause of the production of a light haze, which ever since the introduction of acetylene for illuminating purposes has been recognized as a serious inconvenience in connection with it. The atmosphere of a warm room always contains large quantities of water vapour, derived both from the respiration of the occupants and from the products of the combustion of the illuminating flame; and under ordinary conditions this moisture remains suspended in the atmosphere in an invisible state. But as soon as traces of phosphorus pentoxide escape into it, this substance having a marvellous affinity for water, causes a condensation of a portion of the water vapour, and converts it into phosphoric acid; so that a very small trace of phosphuretted hydrogen in the gas itself gives rise to an amount of haze totally out of proportion to the actual phosphorus present. Where there is a considerable quantity of acetylene consumed, and no proper method of changing the air of the room, this haze will often be found; and it is undoubtedly injurious to health. I do not myself think that the whole of the onus of the haze can be laid at the door of the phosphuretted hydrogen in the acetylene; but it undoubtedly plays an important part in this action, upon which I am at present experimenting.

The sulphuretted hydrogen formed by the action of water on the aluminium sulphide in the gas is objectionable, not so much because it renders the smell of the acetylene offensive—a function which I look upon as a safeguard—but because in its combustion in the acetylene flame it forms sulphur dioxide, which, in ill-ventilated apartments, will absorb moisture and oxygen from the air, and will in this way become converted into minute traces of sulphuric acid which, concentrating themselves upon any cold surface in the room in the form of impalpable moisture, give rise to corrosion of metals and in time destruction of the binding of books, though the effect is but small upon such fabrics as have not the power of absorbing moisture or condensing it from the atmosphere. The chief objection to the third impurity present in the acetylene gas—ammonia—is that it leads to rapid action upon the brass gas-fittings, and is also an important factor in producing explosive compounds of acetylene with metals, though the experiments of Mr. Gerdes have shown that this is not a very real danger. It is quite clear, however, that acetylene, if it is to be used on a large scale as a domestic illuminant, must undergo such processes of purification as will render it harmless and innocuous to health and property. The sooner it is recognized as absolutely essential to purify acetylene before consuming it, the sooner will the gas acquire its deserved meed of popularity; while I shall be able to show next week that many other troubles will at the same time be overcome.

The only one of the impurities which offers any difficulty in removing is the phosphuretted hydrogen. There are three substances which can be relied on to remove this compound. The three methods are to pass the gas to be purified either through acid copper salts, through bleaching powder, or through chromic acid; and in experiments with these various bodies, it is found they are all effective in also ridding the acetylene of the ammonia and sulphuretted hydrogen, provided only that the surface area presented to the gas is sufficiently large.

The method of treating the gas with acid subsalts of copper has just been patented by Herr A. Frank, of Charlottenberg, the

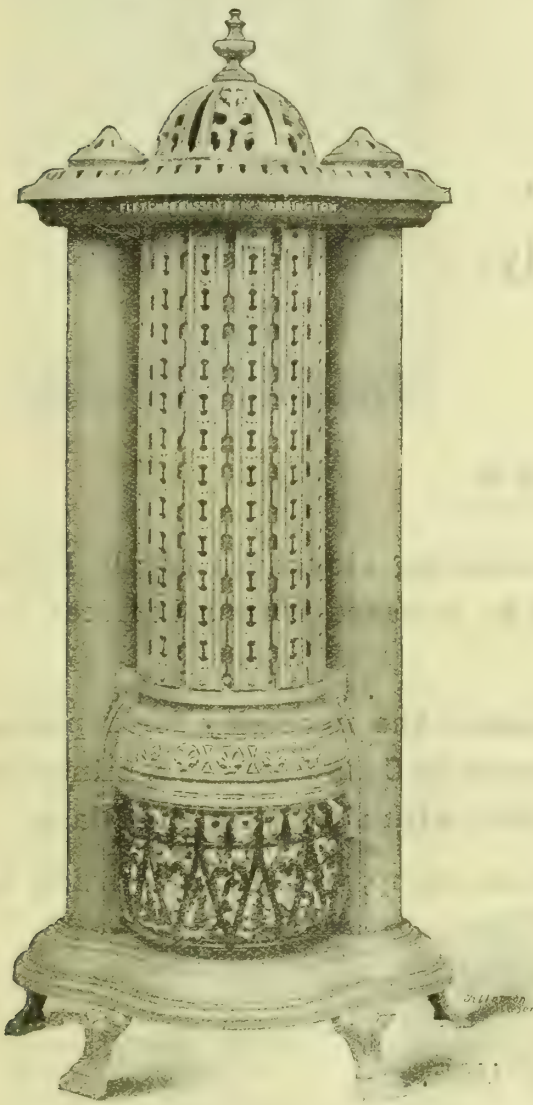


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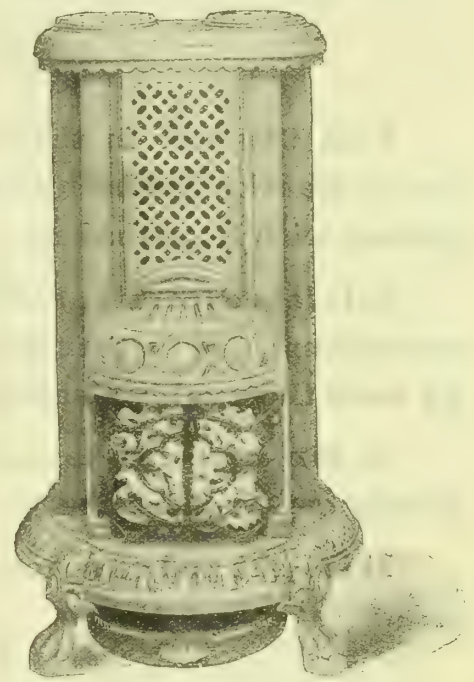


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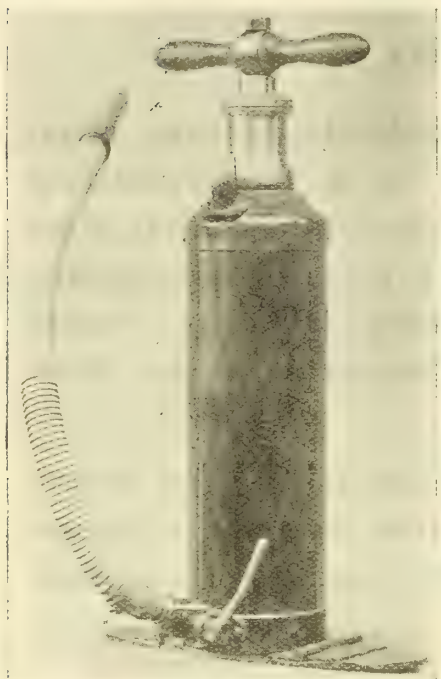


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celebrated gas engineer, who found that a concentrated solution of cuprous chloride in an acid is the most effective metallic solution to be employed; and this is absorbed by Kieselschur, and forms the purifying material. Where the production of acetylene is going on on a small scale, this method of purifying is undoubtedly the most convenient one, as the acid present absorbs the ammonia, and the copper salt converts the phosphuretted and sulphuretted hydrogen into phosphates and sulphides. The vessel, however, which contains this solution has to be of earthenware or porcelain, on account of the free acid present. The gas must be treated after purification, to remove traces of hydrochloric acid; and this is done with lime.

The second process is one patented by Dr. Ullmann, of Geneva, who utilizes chromic acid, which oxidizes the phosphuretted and sulphuretted hydrogen, and absorbs the ammonia; while the third process owes its inception to Lunge, who recommends the use of bleaching powder for the purification of acetylene. But Dr. Wolff has found that when this is used on a large scale there was a risk of the ammonia present in the acetylene forming traces of chloride of nitrogen in the purifying boxes; and as this is a liquid which detonates with considerable local force, it occasionally gives rise to explosions in the purifying apparatus. If, however, the gas be first passed through a scrubber so as to wash out the ammonia, this danger is got rid of; and Dr. Wolff employs purifiers in which the gas is washed with water containing calcic chloride, and is then passed through bleaching powder solution or other oxidizing material.

The form of apparatus employed in the generation of acetylene has a remarkable influence upon the proportion of sulphuretted hydrogen and ammonia present in the gas, though it affects but little the quantity of phosphuretted hydrogen. A long series of experiments which I have made shows that when the acetylene is generated in machines of the third subdivision, the ammonia is entirely eliminated; while the passage through the lime water reduces the amount of sulphuretted hydrogen present to a mere trace (which may be neglected) but has little or no effect upon the phosphuretted hydrogen.

Analyses given by Dr. Wolff of acetylene generated from American, German, and Swiss carbide as at present made, give the following results:—

|                         | American. |    | German. |    | Swiss. |
|-------------------------|-----------|----|---------|----|--------|
| Phosphuretted hydrogen. | 0.05      | .. | 0.03    | .. | 0.03   |
| Sulphuretted hydrogen . | 0.08      | .. | 0.07    | .. | 0.10   |
| Ammonia . . . . .       | 0.08      | .. | 0.07    | .. | 0.11   |
| Hydrogen . . . . .      | 0.09      | .. | 0.07    | .. | 0.16   |
| Nitrogen . . . . .      | 0.42      | .. | 0.20    | .. | 0.34   |
| Oxygen . . . . .        | 0.87      | .. | 0.55    | .. | 0.63   |
| Acetylene . . . . .     | 98.41     | .. | 99.01   | .. | 98.63  |
|                         | 100.00    | .. | 100.00  | .. | 100.00 |

While analyses which I have lately made from the ordinary commercial English carbide, and from the pure carbide made in France in the Herolt furnace by the tapping process, are as follows:—

|                              | English. |    | French. |
|------------------------------|----------|----|---------|
| Phosphuretted hydrogen . . . | 0.138    | .. | 0.045   |
| Sulphuretted hydrogen . . .  | 0.064    | .. | 0.048   |

On taking a sample of English carbide, and decomposing it by the dripping process, there is found 0.138 per cent. of phosphuretted hydrogen and 0.064 per cent. of sulphuretted hydrogen; while if this carbide is allowed to fall into water, the acetylene so generated contains 0.126 per cent. of phosphuretted hydrogen, and the sulphuretted hydrogen is practically eliminated. When the carbide is dropped into a solution of sugar, the same result is obtained, and no traces of sulphuretted hydrogen can be detected in the gas so generated.

#### AMERICAN GASLIGHT ASSOCIATION.

The Twenty-Sixth Annual Meeting at Niagara Falls, N.Y.

(Concluded from p. 1295.)

A paper entitled "Notes on Mains and Mainlaying," was read by Mr. Walton Forstall, of Philadelphia. The exigencies of modern street traffic, the use of larger service pipes, and the decreased cost of iron, combined to render heavy sections of cast-iron pipe the cheaper in the end. The smallest size service he laid was 1½ inch, and the largest 4 inch; all above this size being treated as mains. Where practicable, the hole for the service was always full sized; a split sleeve or a tee-piece being used on small mains. But if this could not be done, a 3-inch main was not tapped for a connection larger than ¾ inch; and a 4-inch main, for more than 1 inch. Special arrangements were made with a view of reducing the number of sizes of tees, sleeves, &c., that had to be kept in stock, and also in providing for possible future enlargements. In connecting up mains, saddle-pieces, sleeves, or tees were used, according to the size of the branch as compared with that of the stem. Small mainlaying work could be done by the works staff; but large jobs necessitated the services of contractors, either for the excavating only or for the whole job. When the contractor was called in, there should be a clear understanding as to the extent of his responsibilities. The new work should be carefully and systematically tested for soundness by applying air pressure up to 2 lbs. per square inch, and going over each

joint with soapy water; and in contract work the company should provide an adequate number of inspectors. The contractor's sole idea was profit; and he was apt to neglect the comfort or convenience of the public, and thus land the company in popular disrepute. The specification should be so drawn as to enable the company to exercise control in this matter; and the author added, as an appendix to his paper, a set of specifications as used for about 80 miles of pipe let by contract. These provided the usual powers of control on the part of the gas company's engineer, and also enabled him to call for the removal of any employee who might, in his opinion, be incompetent, negligent, or otherwise conducting himself in a manner prejudicial to the interests of the company. All materials delivered to the contractor were accepted by him as sound; and if subsequently found to be cracked or defective, they had to be replaced at his expense. The location and levels of the trench were to be fixed by test-holes, carried sufficiently in advance of the work to avoid delay. All spoil was to be so placed as to cause the least possible inconvenience to traffic; and bridges over the trench were to be provided where necessary. The mains were to be laid on undisturbed earth at a clear depth of 3 feet below the surface; and where the trench was cut in solid rock, they were to be blocked up 4 inches clear from the bottom of the excavation—the 3 feet depth being observed as before. The contractor was to afford every facility for testing the work under not less than 2 lbs. per square inch pressure to the satisfaction of the engineer; and the depth of lead in joints, and all other details, were fully set forth. Payment was to be made every fortnight to the extent of 90 per cent.; the balance being retained for twelve months as a security for the contractor preserving the trenches in proper repair for that period. For several reasons, however, the author preferred that the work of mainlaying should be carried on by the permanent staff of the company, under the direct control of the engineer. But in this case it was necessary to keep a close oversight of costs, as foremen accustomed to small jobs were apt to be satisfied with a great deal less than an attainable day's work; and it was necessary to make them understand that their value to the company depended upon the cost per foot-run of main laid. Specials should be fitted with all socket-ends, as spigot-pieces were always accumulating; and for reducing, a bushing, consisting of a socket cast eccentrically inside a plug in such a manner as to preserve the level, was recommended. It was preferable that the socket should be actually inside, and not an outside attachment to the end of the plug. For obtaining a record of already existing mains, there was nothing like the service cards and street information cards; but with new work it was possible, by having a series of section maps on a large scale, each numbered and located on a key map, to preserve a record of the position of every joint. Sketches showing levels and other details could also be taken; and in one case these were all executed on tracing cloth, from which prints were taken for daily use—the originals being safely stored in fire-proof quarters. The author described a method by which he had been able to connect up a 24-inch pipe to a plug on a 36-inch pipe, without interfering with the supply of gas in the latter. The outline of the 24-inch hole was drilled out in the plug with small holes, as close together as was safe. There were also two segmental lines dividing the disc into three equal parts. A chain being firmly secured to each of the three portions, a 24-inch flange-piece, valve, and short socket-piece were fixed in place; the valve being open, and the chain threaded through. A disc was then secured to the open end, having a hole in the centre, through which the chain was threaded, and three other small holes, through which bars long enough to reach the drilled segments were passed. By means of a sledge hammer, the 24-inch disc could be knocked in one segment at a time, the bars withdrawn, and the segments pulled through the valve by the chain, leaving all clear. The valve could then be closed.

The President having invited discussion, Mr. Shattuck agreed with the new heavy sections proposed, so far as small sizes of main were concerned; but for sizes over 24 inches, he thought the Society of Gas Lighting standard was ample. He objected to the use of split sleeves, service sleeves, and saddle-pieces, on the ground that they were quite as much trouble to fix as an ordinary branch-piece, and not so simple or effective. He described a new form of mainlaying derrick, by means of which one man could raise or lower a 24-inch pipe. Mr. Littlehales thought the difficulty of making absolutely tight joints was not generally realized. The fire-test was worthless for locating leakages, and soapsuds not infallible. Trouble was caused by a desire for too quick, or too cheap, work. He inquired the smallest leakage per mile of main, and said the quantity stated as a percentage of the total gas sold was utterly misleading. One omission in the specification quoted was no mention of removal of ashes, or substitution of soil for ashes where met with. Ashes were very destructive; pipes laid in them were speedily pitted. He exhibited a model of a home-made pedometer, comprising a bicycle wheel and an old discarded meter-index. Mr. Jenkins objected to wrought-iron service-pipes of more than 3 inches diameter. He thought the opening in the main should always be as large as the service-pipe; and the question of attention to the convenience of the public was a very important point. Mr. A. S. Miller criticized some of the author's conclusions; and he especially objected to tying the



contractor down too tightly. This individual naturally expected to make a profit; and his side of the argument should receive consideration. Mr. J. J. Humphreys, junr., believed in the soap-bubble test for joints, and the hammer test for soundness of castings.

Mr. Walton Forstall, in replying, said it was understood that good work should not be sacrificed for the sake of speed, and ashes were not mentioned in the specification because they did not exist in the districts concerned. As to leakage, he was satisfied with anything under 100,000 cubic feet per mile of main per annum.

Mr. H. L. Rice, of Norfolk (Va.), contributed the results of some tests on a gas-engine used for driving the fan for the air-blast of a water-gas plant. He had a No. 6 Sturtevant blower, which could be operated either by a Sturtevant upright steam-engine or by a 25-horse power Westinghouse gas-engine. The steam-engine was rated at 15-horse power; and the gas-engine had its speed reduced from the normal rate of 350 to 275 revolutions per minute, so as to make it about 16-horse power. Steam was also required for the blast, in addition to that used for the steam-engine; and the method of working was to carefully weigh the boiler fuel when the steam-engine was in use, and again when the gas-engine was running. The average of several tests showed that the cost per 1000 cubic feet made was about 0.75d. in the first case and 0.63d. in the second. The gas-engine saved 0.12d. in cost of fuel, and used 15 cubic feet of gas to do so. Therefore 1000 cubic feet of gas was only equivalent to about 8d. in value of the fuel, which consisted of half screenings and half coke or coal. In a working day of 10½ hours, he made 48 runs and blows, yielding 168,000 cubic feet of gas. During this time, the gas-engine used 2400 cubic feet of gas, and was blowing for one-third and running idle for two-thirds. It consumed 340 cubic feet per hour when at work, and 170 cubic feet when idle; and the consumption could not be reduced below this figure. Nearly one-half of the gas was therefore consumed in keeping the engine running idle, which was a great disadvantage to the gas-engine, as the steam consumption could be cut much lower during the runs.

Mr. A. E. Forstall, of Montclair (N.J.), read a paper entitled "Can We Make All Our Business Pay?" He said that at first little attention was paid to reducing the cost of manufacture or developing business; but the need for economizing at the works, so as to deliver gas into the holder at the lowest possible cost, soon became apparent. It was only lately, however, that the need for attention and systematic working in the sales department had been recognized. There were many points in connection with the selling of gas that would repay careful attention. All lines of business were not actually profitable; and some might be conducted at a loss. If such was the case, the question was how to convert the losing lines into profitable ones. He supported this argument by summarizing a contribution to the "JOURNAL OF GAS LIGHTING" by Mr. Norton H. Humphrys, entitled "Both Sides of the Ledger," and went on to say that the key to the solution of the problem was furnished by a paper read before the Association in 1891 by Mr. Walton Clark, entitled "Meter-Rents: A Question of Equity and Policy." Mr. Walton Clark advocated a fixed charge per consumer, sufficient not only to cover the maintenance of the meter, but also that of the service, the cost of establishment, rental-clerks, collectors, &c., as it was more equitable to make these expenses a charge per consumer than a charge per 1000 cubic feet of gas sold. Every gas company had a number of small and irregular consumers on their books, who were really served at a loss. Electric light companies had met the difficulty by a system of minimum charges; and gas companies should follow a similar plan. Applying these arguments to his own undertaking, he found that a fair fixed charge per meter per annum would be: 3-light, 9s. 4d.; 5-light, 10s. 6d.; 10-light, 12s. 1d.; 20-light, 13s. 9d.; 30-light, 15s. 10d.; 45-light, 21s. 3d.; and 60-light, 25s. 10d. This would enable him, while retaining the present rates of profit, to sell gas at 6d. per 1000 cubic feet. The effect of applying such a system would be that consumers of less than a certain quantity of gas per annum would pay more; while the others would pay less. The increased charge to very small users would be so great that they might prefer to close their accounts; but this would not be a matter for regret, seeing that they were a source of loss. About 63 per cent. of his consumers would find their charges increased; but with nearly half, the addition would be trifling. The effect of the increase might be also minimized by introducing the system concurrently with an all-round reduction in price. One difficulty would be that in some cases the increased cost to the small consumer might exceed the limits fixed by law. It might be argued that the gas company had no right to charge for what was not used; but if electric light companies had the power to make a minimum charge of 4s. per month, he thought the sauce for the electric goose was also applicable to the gas gander. His proposition was not perfect, as it did not recognize the difference between day and night consumption, or summer and winter business; but he presented it as an advance, on the lines of equity and policy, upon the plan of a fixed charge per 1000 cubic feet.

Some other subjects were then discussed, and attention was next directed to the Question-box. The first item was the suggestion that 3-light meters should be provided with the same size union as 5-light ones. The idea was generally approved, though

it was pointed out that considerable expense would be involved in regard to replacing the large number of 3-light meters at present employed. Mr. Harbison thought this object could be met by discontinuing the use of the 3-light size; and this brought several members to their feet, to speak in favour of the 3-light meter. Attention was next directed to the best method of separating oil vapours from water gas without the use of water, and to the effect of treatment with water on the candle power. Mr. A. S. Miller had tried a scrubber packed with slats 1 inch square and a similar distance apart; but this was only partly successful. He next tried the Pelouze-Audouin condenser, as well as some special designs of scrubbers; but without success. He then found out that the vapour was completely removed by passing the gas through a pipe packed with shavings; and he had just ordered six scrubbers, each 10 feet diameter and 24 feet high, to be packed with shavings. In his experience, the loss of illuminating value by the scrubbing process was about 2 per cent. If a purifier-box was packed with shavings in the same way as with oxide, the tar would soon get through; but if the layers were so boarded over as to cause the current of gas to travel horizontally through a considerable thickness of shavings, the result would be a success. The shavings would pass 35,000 to 40,000 cubic feet of gas per bushel before requiring renewal. Mr. Egner had used with success a layer of shavings at the bottom of each purifier. Mr. Knapp gave details of the manner in which he had employed shavings packed in scrubbers, and said the effect on the illuminating value of the gas was *nil*. Some trouble was caused by back-pressure at times; and this was remedied by turning on a jet of steam. He had also removed oil vapour by means of a centrifugal fan, and believed that it would be possible to make an apparatus on this principle that would not only take out all the tar, but also act as an exhaustor.

After dealing with some more questions, the meeting closed with the usual votes of thanks.

### THE ESTIMATION OF HYDROGEN, MARSH GAS, AND NITROGEN IN MIXTURES OF GASES.

#### A Fractional Combustion Method.

Herr E. Jäger, Chemist to the Municipal Gas-Works at Charlottenburg, has described in a recent number of the "Journal für Gasbeleuchtung," a new method for the volumetric analysis of the residual gases which remain when the other constituents of illuminating gas have been absorbed in the ordinary course of a gas analysis by the customary absorbents. Instead of adding air or oxygen to the residual gases and exploding the mixture, Herr Jäger proposes to use a method of fractional combustion, which is described in the following abstract translation of his paper in our German contemporary.

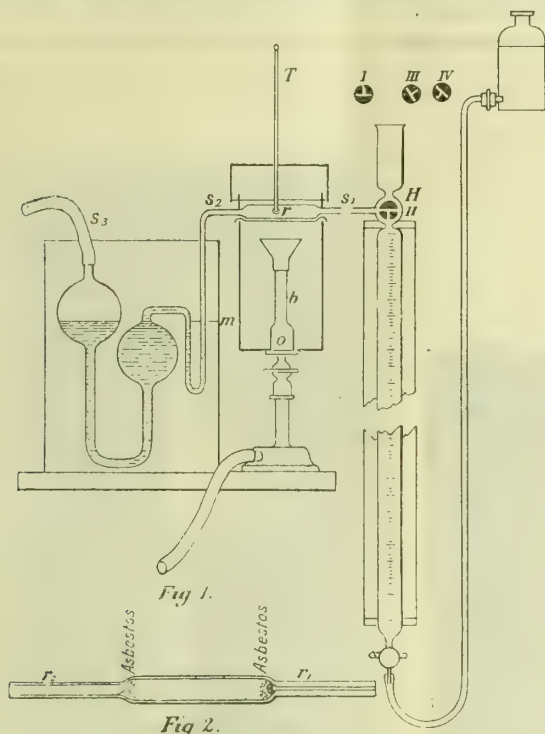
The methods hitherto generally adopted in technical gas analysis for the volumetric determination of the hydrogen, marsh gas, and nitrogen are based almost without exception on the principle of adding to the gas under examination an excess of air, with or without an addition of detonating gas, and, after combustion, observing the contraction, and the amounts of carbonic acid and of residual nitrogen. From the results of these observations, the proportions of hydrogen, marsh gas, and nitrogen in the gas are calculated. But a large amount of air, and a comparatively small amount of gas, have to be used in this method of determination; and unless the gas is confined over mercury, and readings of the barometer and thermometer are made with great precision, considerable errors are liable to be introduced, and the results, especially so far as the nitrogen is concerned, are often quite unreliable. In order to work with a greater amount of gas, and thereby facilitate its measurement with precision, and permit the use of water as the confining liquid, the author has endeavoured to use copper oxide as a means of supplying oxygen for the combustion. Fresenius and Stöckmann had previously employed cupric oxide for the estimation of hydrogen and marsh gas. They led several litres of the gaseous mixture over red-hot cupric oxide, and calculated the amounts of hydrogen and marsh gas from the weights of the products obtained. The use of cupric oxide gives a means of burning the gas without mixing air with it; and therefore the whole bulk of the gaseous residue which remains after the usual absorbents have been applied to illuminating gas can be used for the estimation, instead of merely a fractional part of it, as in the ordinary methods of analysis.

Cupric oxide, especially when it is in powder, is reduced by hydrogen at temperatures considerably below incandescence. But marsh gas is not consumed so readily as hydrogen; and advantage is taken of this fact. Trials showed that when a mixture of hydrogen, marsh gas, and nitrogen was passed slowly to and fro over cupric oxide heated to 250° C. (482° Fahr.) two or three times, the whole of the hydrogen was burnt; while the marsh gas—and, of course, the nitrogen—remained unaffected. The contraction produced by this treatment will give directly the amount of hydrogen burnt. If the cupric oxide is then heated to incandescence, and the remaining mixture of marsh gas and nitrogen is passed over it, the marsh gas is burnt; and on passing the gas into a Hempel pipette charged with solution of caustic potash, the observed contraction due to the absorption



of the carbonic acid produced by the combustion, will be equal to the volume of marsh gas in the mixture. The volume of residual gas will be that of the nitrogen in the mixture.

The necessary apparatus for the determination is shown in the annexed figure. H (fig. 1) is a Bunte burette, which by an alteration in the three-way cock, the nature of which is quite clear from the illustration, is adapted for coupling up with a Hempel gas-pipette. It is connected with the combustion tube *r*. This tube is shown, one-third its natural size, in fig. 2. The end *r*<sub>1</sub>, which is connected with the burette, terminates in a capillary; but the other end, *r*<sub>2</sub>, is sufficiently wide internally to admit of the introduction of the powdered cupric oxide. A granule of cupric oxide is first introduced, in order to prevent the asbestos fibre which follows blocking the capillary. About 3 grammes of powdered cupric oxide are then added, and fill the tube to within a short distance of *r*<sub>2</sub>, which is plugged with



asbestos fibre. The filling of the tube can be performed in about 2 minutes; and after a combustion has been made, the oxide can be emptied into a crucible, gently ignited while it is stirred, and returned to the tube for further use, when thus re-oxidized. The re-oxidation can in this way be performed more rapidly than in the tube itself. The combustion-tube is placed in a small oven, made of iron-plate, which is supported by the burner *b*. Through the top of the oven, a mercury thermometer, graduated up to 360° C. (680° Fahr.), is inserted, so that the bulb is near the combustion-pipe.

The solution of caustic potash rises in the capillary of the Hempel's pipette to the height *m*; and while the three-way cock is in position I, atmospheric pressure prevails in the combustion-tube. Joints made at *s*<sub>1</sub> and *s*<sub>2</sub>, by means of flexible tubing, are rendered completely gas-tight by being bound with copper wire. To test the soundness of the joints, the cock is turned to the position III; and the operator blows vigorously through the flexible tube attached at *s*<sub>3</sub>, and closes that tube by compression between the fingers, so that there is a pressure within the apparatus. He should be unable to raise the seal more than a few centimetres above *m*, and the level should remain unchanged until he removes the pressure, whereupon the seal should return to its original position. When the apparatus has thus been proved to be sound, the three-way cock is turned to the position IV; and the burner is lighted and the tube raised to a temperature of 250° C. (482° Fahr.). The cock is thereupon turned to the position II, and the gas is passed through the cupric oxide, at the rate of about 100 c.c. in 8 minutes. If, as is usually the case, no difference is observed between the volumes of the gas after the second and third passage through the oxide, the combustion of the hydrogen may be considered finished. After the gas has cooled, the contraction which has taken place is observed. The contraction needs correcting, because, firstly, the reduced copper occupies less space than the cupric oxide, and, secondly, the oxygen in the air present in the tube and the capillaries takes part in the combustion, and disappears. The first of these reductions of the volume is very trifling, and in ordinary cases may be ignored. Thus, supposing 100 c.c. of marsh gas were burnt, 1.43 grammes of cupric oxide, occupying a volume of 0.24 c.c., would be reduced to 1.14 grammes of copper occupying a volume of 0.13 c.c. The diminution of volume would therefore be 0.24 - 0.13 = 0.11 c.c. In most cases, however, mixtures of marsh gas and hydrogen in which the latter preponderated would be under examination; and hydrogen reduces only about a third the amount of cupric oxide which is reduced by the same

volume of marsh gas. The diminution of volume in such cases falls to a few hundredths of a cubic centimetre, and is thus negligible.

The second of the reductions of volume mentioned is of greater importance. For practical purposes, a simple combustion made with each apparatus will give once and for all the necessary correction. Thus, in one experiment, the combustion tube and the connecting capillaries were filled with air, and 95.0 c.c. of pure hydrogen and 5.1 c.c. of nitrogen were enclosed in the burette. The contraction on combustion amounted to 95.8 c.c., showing that it was 0.8 c.c. greater than the quantity of hydrogen present. This difference must consequently be the amount of oxygen which was present and entered into combustion. In another experiment, the combustion-tube and the capillaries were filled with nitrogen, and 95.6 c.c. of pure hydrogen and 4.0 c.c. of nitrogen were enclosed in the burette. The contraction in this case was 95.6 c.c., or precisely the volume of the hydrogen present. Another experiment shows the manner in which the correction can be most easily ascertained. In the burette were enclosed 94.4 c.c. of pure hydrogen and 5.3 c.c. of air; and the contraction, after combustion, was 96.2 c.c., of which 94.4 c.c. was due to the hydrogen, and 1.06 c.c. to the oxygen of the air enclosed in the burette. The balance—0.74 c.c.—is the correction; and this agrees closely with that found in the first experiment.

That it is only the hydrogen which is attacked when a mixture of hydrogen and marsh gas is passed over cupric oxide heated to 250° C., is shown by the following results of a trial: There were measured into the burette 37.15 c.c. of pure hydrogen and 55.75 c.c. of almost pure marsh gas. The mixture was passed four times through the cupric oxide in the tube heated to 250° C. The time occupied in each passage through the oxide was some 8 minutes. The total contraction after each passage was: (1) 35.40, (2) 37.70, (3) 37.90, (4) 37.95. The necessary correction was 0.80 c.c.; and, therefore, the volume of hydrogen found was 37.95 - 0.80 = 37.15 c.c.

The combustion-tube was then heated to bright redness, and the passage of the gas through it continued until no further contraction was observed. The volume of methane found was 54.35 c.c.; and a residue of nitrogen, amounting to 1.40 c.c., was shown to be present. This experiment proves that only the hydrogen is consumed at 250° C., and that the two gases may be thus burnt quantitatively in succession.

The burette used should, if possible, be graduated throughout its length in 0.1 c.c. divisions. In analyses of illuminating gas, the whole of the residue which remains after the absorption of carbonic acid, hydrocarbons, oxygen, and carbonic oxide is treated by this method. When small quantities of hydrogen and marsh gas in generator gases are determined by this method, it is advisable that the cupric oxide used should contain some reduced copper; otherwise the oxygen in the air in the tube may be more than is sufficient to burn the small quantities of hydrogen and marsh gas. If, however, some reduced copper is present, the ordinary correction for the contained air may be applied quite correctly in the usual manner. If the gas under examination contains a large proportion of nitrogen, it is especially necessary that the gas should be passed very slowly through the combustion-tube. This caution applies more particularly to the combustion of the methane.

The method may be very readily applied to the simple determination of the nitrogen in coal gas or water gas. This determination is often of great value in the practical working of plant. Into the burette 100 c.c. of the gas are taken; and the combustion-tube is straightway heated to a red heat, and the gas is passed through it. The whole of the gas is thus burnt; and carbonic acid originally present in it, as well as that formed by the combustion, is absorbed by the solution of potash. Finally, nitrogen only will remain, and, after cooling, the volume of the residue is observed. If this volume is found to be, say, 0.6 c.c., then the correction 0.8 c.c. is added to it; and the percentage of nitrogen in the gas is thus found to be equal to 1.4.

The method of estimation described in this paper appears from the examples quoted to give very satisfactory results; and as it can be easily carried out, it seems to be well worthy of commendation.

**Detection of Poisoning by Acetylene Gas.**—According to an abstract in the "Journal of the Society of Chemical Industry" of a communication by Signor Vitali to the "Boll. Chim. Farm.," in all cases of acetylene poisoning, the acetylene should be sought for in the blood and the lungs. It both cases it may be isolated by reason of its great solubility in acetone. The lungs are cautiously evacuated, and the gases passed through acetone. In the solution, the acetylene may be detected by ammoniacal silver nitrate, ammoniacal copper solution, &c. The blood is agitated with acetone and the mixture heated, when the acetylene passes over with the acetone vapour, and may be detected in the distillate. If the blood is no longer fresh, carbonates and sulphuretted hydrogen are precipitated by iron sulphate, so that they may not interfere with the reactions. As acetylene is contaminated with phosphorus and sulphur compounds, these also occur in the acetone solution, and may, after oxidation with chlorine water, be detected without difficulty as phosphoric and sulphuric acids.



## CLAY'S NEW ANTI-VIBRATORY GAS-FITTINGS.

Numerous appliances have been introduced to neutralize the effect of shock or vibration on the mantles of incandescent gas-burners; and a simple, but very effective, anti-vibrating fitting, designed by Mr. W. R. Clay (of Messrs. Clay and Walmsley), of Bolton, has been already noticed in the "JOURNAL." Recently, reference was made to further improvements which Mr. Clay was introducing in these fittings; and we now give illustrations, with descriptive particulars, of his latest inventions in this direction.

Mr. Clay's first invention, it may be briefly stated, consisted practically in forming a thin metal tube, conveying gas to the burner, into a resilient coiled spring, which, under conditions which would have proved destructive to an incandescent burner fixed

in the ordinary way, effectually prevented it from any appreciable shock. This anti-vibratory fitting enabled the incandescent gas-light to be used under circumstances in which previously its adoption had been abandoned, owing to the frequent destruction of the mantles; but its extreme sensitiveness to the least vibratory wave was found, under certain conditions, to be rather a defect, as, owing to the lightness of the incandescent burner, and the consequent lack of inertia, the result was that when once the fitting was agitated, the state of motion was kept up for a considerable time. Mr. Clay has now overcome this disadvantage by an arrangement for supplying the necessary amount of inertia which the burner lacked, and has applied a method of ballasting the fitting by attaching a heavy body to the base of the burner, as shown in fig. 1. In this way, jerky movements have been rendered impossible; and it has proved a very successful modification in bringing the coiled pipe anti-vibrator more nearly to perfection.

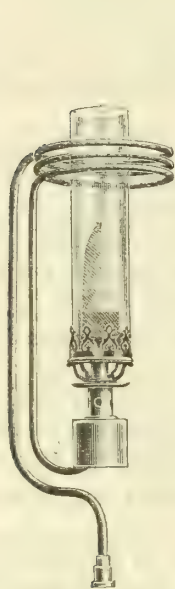


FIG. 1.

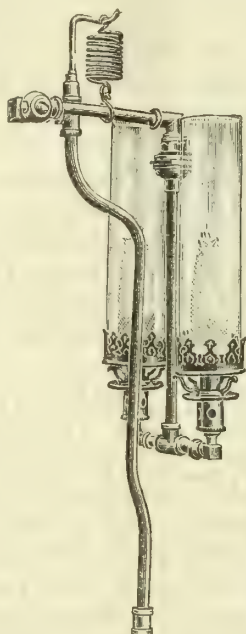


FIG. 2.

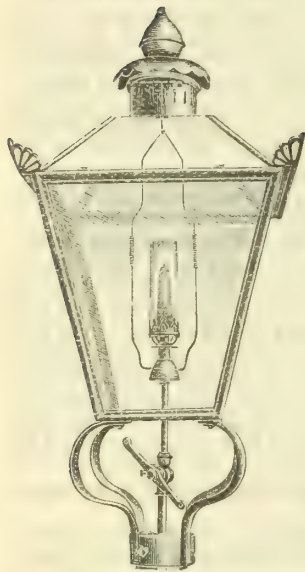


FIG. 3.



FIG. 4.

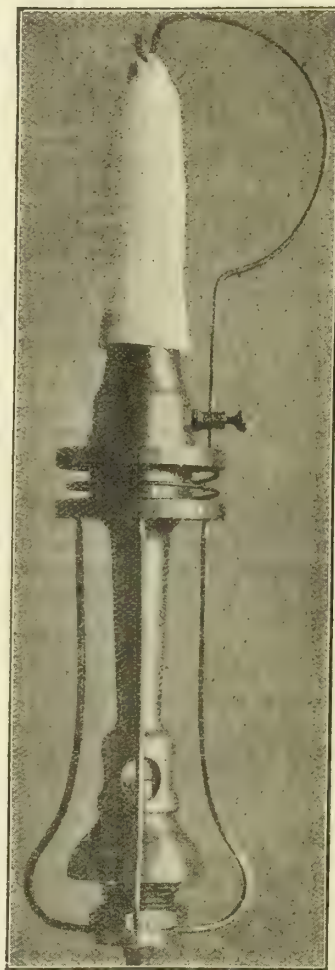


FIG. 5.

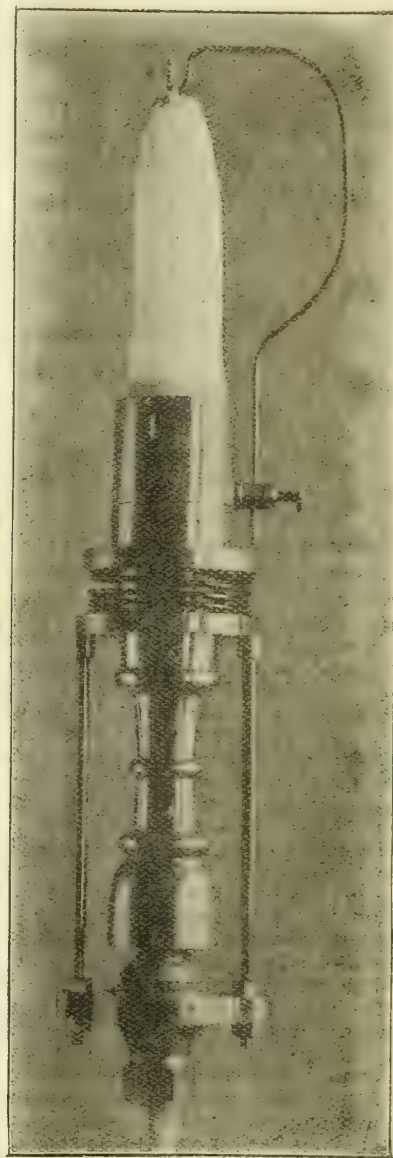


FIG. 6.

Mr. Clay, however, has not been content with this improvement on his first invention, but has branched out into quite new lines, in introducing further developments for the protection, in a variety of ways, of mantles from destructive shock; and we give several illustrations of his new arrangements. Fig. 2 shows a cantilever anti-vibrator in a form applied to a couple of incandescent lights; but made in a number of designs for different requirements; and the illustration furnishes a sufficiently clear indication of its construction to dispense with further explanation. The most important, however, and the latest, of Mr. Clay's inventions is what he has termed his new patent "Floating Bunsen" anti-vibrator, in which no pipe of any kind need be used—that is to say, as part of the apparatus. One form in which a simple arrangement of this appliance may be used is that of a street-lamp, shown in fig. 3, for the purpose of suspending thereon one of the ordinary "C" burners, though any other kind of incandescent gas-burner can be similarly treated. This form of anti-vibrator consists simply of a wire frame, at the bottom of which is

attached a cone; the frame being also provided with sensitive springs to give the resilient effect. In order to adapt this anti-vibrator to an incandescent burner, the nipple of the burner is screwed on to the existing gas-pipe in the lantern, while the bunsen from which it is taken is screwed on to the cone. If, however, there should be any objection to this method of suspension, the burner may be supported in the manner shown in fig. 4, where the bunsen tube is fitted with springs upon which rests a heavy body carrying the gallery portion of the burner. A further design is shown in fig. 5, whereby a high-power burner of the Denayrouze type may be rendered shock-proof when supported. Mr. Clay has also designed a high-power burner (fig. 6) in which the bunsen is absolutely disconnected from the gas-supply pipe; and he is arranging cluster burners in which one bunsen tube and mixing chamber will supply from three to almost any number of mantles; but for cases where it is desired to have only a few incandescent, a floating bunsen cluster burner is being devised, whereby this



may be easily accomplished. In every instance, bye-passing of the gas is readily provided for.

Mr. Clay claims for his inventions that they are absolutely fireproof; dispensing altogether with the rubber attachment in some fittings of this class which is so much condemned by fire insurance companies; while their lasting properties are assured, not only by their simplicity of construction, but by the fact that they are made from a special mixture of copper which is claimed to be practically unperishable.

#### BRITISH ASSOCIATION OF WATER-WORKS ENGINEERS.

A Special and a General Meeting of this Association was held last Saturday, at the Westminster Palace Hotel—the PRESIDENT (Mr. W. Matthews, M.Inst.C.E., of Southampton) in the chair. There was an excellent attendance.

#### SUBSEQUENT COUNCILS AND TERM OF OFFICE.

The Special Meeting was held to consider a proposal to substitute a new rule for Nos. 30 and 31. It was adopted, but will not come into operation until after the next annual meeting. The new rule provides that the Council shall consist of the President, Past-Presidents, two Vice-Presidents, Honorary Secretary and Treasurer, and ten ordinary members. Excepting the Past-Presidents, all will go out of office each year at the annual general meeting, but will be eligible for re-election. Voting-papers are to be sent to each member fourteen days before the winter general meeting; and nominations for vacant offices are to be sent to the Secretary thirty-one days before that meeting. Two Scrutineers are to be appointed at the meeting to examine and report upon the voting-lists; and the result of the voting is to be declared by the Chairman. Every Past-President at the expiration of five years from the termination of his Presidency is to go out of office, but will be eligible for re-election to the Council in the ordinary way.

#### CONFIRMATION OF MINUTES.

At the Ordinary Meeting, the business was commenced by the SECRETARY (Mr. W. H. Brothers) reading the minutes of the annual meeting held at Southampton in May last; and they were confirmed.

#### ADDITIONS TO THE ROLL.

The Scrutineers (Messrs. C. Sainty and T. L. Hughes) reported that their examination of the balloting lists for new members and associates showed that the following had been unanimously elected:—

*Members.*—Mr. J. R. Downes, of Redhill; Mr. W. A. Humphrey, of York; Mr. J. Powell, of East London, Cape Colony; Mr. F. W. Talbot, of Farnborough; Mr. W. A. Valon, of Ramsgate; and Mr. C. L. N. Wilson, of Bilston. Mr. J. H. Teague, of Lincoln, was transferred from the associate to the member class.

*Associates.*—Mr. J. H. Parkin, of Kendal; and Mr. H. C. Raws-thorne, of Bolton.

#### WATER SUPPLY FROM THE LOWER GREENSAND AT LEIGHTON BUZZARD.

Mr. H. BERTRAM NICHOLS, Assoc.M.Inst.C.E., read a paper on the above subject, and it produced a long and interesting discussion. The principal portions of the paper and a report of the criticisms upon its contents will be given in another issue of the "JOURNAL."

A hearty vote of thanks was accorded to the author; and this concluded the proceedings.

**Water Supply for Lincolnshire Villages.**—At the monthly meeting of the Sleaford Rural District Council on Monday last week, Dr. Giles reported outbreaks of typhoid fever at Helpringham and Billingham; the latter being due to polluted water. Complaints were received that Billingham, with 1200 inhabitants, had no proper public water supply. Eleven tenders were received for carrying out the Great Hale water-works scheme; that of Mr. Skinner (Heckington), for £635, being accepted. The Council resolved to borrow £1000 to carry out the works. Dr. Ashby reported that he had analyzed the Great Hale water, and found it perfectly pure.

**The Ashburton District Council and the Gas-Works.**—Opposition of a somewhat unexpected character has been displayed to the proposal of the Ashburton District Council to buy the local gas-works. As the result of negotiations the Council decided to give the Gas Company £2500 for the works, and, on the advice of Mr. H. A. Willey, to spend £900 upon improvements and extensions. Application has been made for permission to borrow the sum of £3400. A public meeting to consider the scheme was held yesterday week. The Portreeve (Mr. J. H. Foaden), who presided, expressed the opinion that the Council had acted in the interest of the town; and Mr. J. P. Tucker, the Chairman of the Gas Committee, contended that the works would yield a profit. Mr. Michelmores considered that the Council were paying too much. Fifty years ago, he said, the capital of the Company was £1400; and now, after all this time, they were to be paid £2500 for the works. Mr. Millman, while not entirely opposed to the purchase, criticized its terms, and suggested that the Council should revise them. Mr. Lamason contended that the works were dilapidated, and that, owing to their position, they were incapable of extension; while the fact that the Company had no Act of Parliament should be considered. A resolution was passed approving of the action of the Council, but expressing the opinion that the amount to be paid was excessive, and demanding a poll of the town on the question.

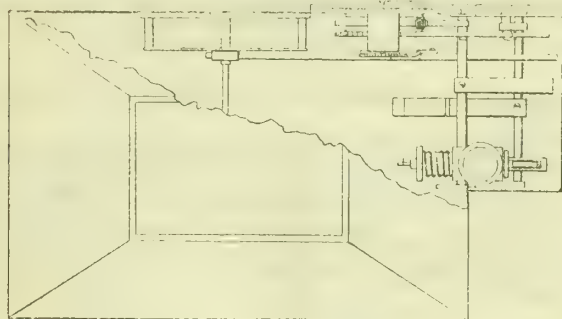
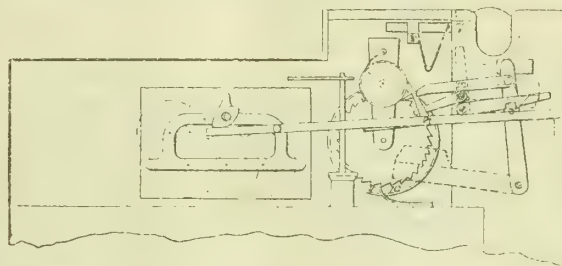
## REGISTER OF PATENTS.

**Producing Acetylene.**—Goulding, F., of Great Harwood. No. 18,128; Aug. 3, 1897.

There is attached to the outer end of an arm projecting horizontally from the upper part of a gasholder bell the top end of a vertically disposed pipe, which passes through a stuffing-box in the bottom of a cistern containing water automatically supplied to it through an ordinary ball-tap; the vertical pipe being continued downwards, so as to enter a stand-pipe of somewhat larger diameter, and open to the air at its upper end. The vertical pipe has a small hole drilled into it, so placed that, when the holder drops, the hole sinks below the water-level in the cistern, and so admits water into the pipe to find its way into the generating chamber; but when the supply of gas to the holder causes the bell to rise, the supply of water to the calcium carbide is stopped, and the generation of the gas ceases until water is again admitted. The stand-pipe into which the vertical sliding pipe from the water-cistern is introduced communicates with the interior of the generator; a back-pressure valve being employed for the purpose of preventing any escape of gas from the generating chamber into the water-pipes.

**Prepayment Meters.**—Harrison, H. T., of Victoria Street, Westminster. No. 25,336; Nov. 1, 1897.

This invention relates more particularly to meters so constructed that it is only necessary to insert a coin in order to obtain its equivalent in gas—the turning of a handle, or the pulling of a knob or trigger, or other operation at the time of inserting the coin, being dispensed with.



As shown in the engraving, the coin is caused by its periphery to bear against and move idly to one side a lever, which, after the passage of the coin, returns under the action of a weight or spring to its original position. In this way, it actuates to a predetermined extent the apparatus for controlling the delivery of the gas.

In connection with the coin-lever, there is a locking device adapted to be operated by the coin so as to unlock the coin-lever and permit it to be operated as described. But, to prevent the coin being fraudulently withdrawn from the coin-shoot after being used to operate the lever, there is provided at a point between the free end of the lever and the outer end of the shoot, a stop device which moves and permits a coin to enter, but will prevent it being pulled out again.

**Producing Acetylene.**—Arkell, G. E., of Cullingworth, and Bailey, J. W., and Clapham, J., of Keighley. No. 26,269; Nov. 11, 1897.

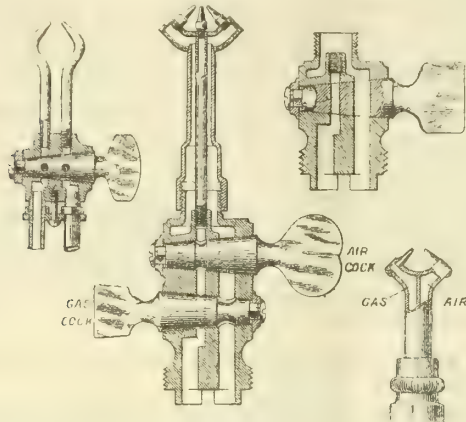
The main features of novelty in this generator are the arrangement whereby the water employed for removing the impurities from the gas is afterwards used for hydrating the calcium carbide; and the means whereby the flow of water for acting upon the carbide is regulated and controlled. These objects are attained by employing at least three vessels or containers, fixed at different levels, and connected by pipes and valves; and a carbide holder and regulator. The acetylene as generated passes through the regulator and forward into the holder, which rises and transmits motion to the valves until the gas within it is reduced. It then descends, on which it again operates the cocks, and more gas is generated. These simultaneous operations of the valves insure the regulator or intermediary vessel being kept supplied with an approximately even quantity of water; and by the gas being conducted through this vessel, it is constantly meeting fresh water so as more thoroughly to free it from impurities and better cool the gas before it enters the holder. All the impurities thus collected by the water are allowed to flow back into the generator, so as to be carried away with the spent carbide or refuse.

**Burning Acetylene and Other Rich Gases.**—Fraser, A. C., of Brooklyn, U.S.A. No. 27,016; Nov. 18, 1897. Date claimed under International Convention, April 19, 1897.

This invention provides for making a mixture of acetylene or other rich gas with air or oxygen. The admixture takes place in the flame by conducting the gas and air under equal or proportionate pressures to the burner, and discharging them therefrom in minute jets directed so as to impinge upon one another, and "thereby spread the gas and air into an extremely thin film of mixed gas and air." By this means, the patentee claims to attain "not only the advantages of the fish-



tail burner in spreading the gas into so thin a film as to afford a large surface for contact with the surrounding air, but also the same advantage as if the acetylene and air were previously mixed together, while avoiding the danger that is inseparable therefrom of forming an explosive mixture in the storage vessels and pipes."

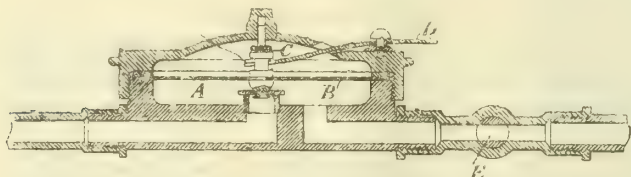


In one arrangement of burner, there are (as shown) two ducts or conduits (one for gas, the other for air), terminating in jet-apertures which are directed to impinge at a suitable angle, as in a fish-tail burner. The ducts are put into communication (through a cock) with two pipes—one communicating with the acetylene supply, and the other with the air; and the relative pressures may be controlled or governed in any suitable way whenever either is in excess of a proper ratio between the two. Another construction of burner has a plurality of jet-apertures, preferably three, of which the two outer ones discharge jets of air against each other, while the middle one discharges gas in a stream between the air jets.

An important advantage resulting from this improved burner is said to be that the burner-tip is kept cool by the jets of air, so that it is always below the igniting temperature of the acetylene. The carbonization of the latter so as to choke its jet-orifice is thus prevented. In fact, says the patentee, the issuing jets of air serve to cool the acetylene, and prevent it quickly rising to igniting temperature, with the result that the gas does not ignite immediately at the nozzle, but at some distance beyond the burner-tip. Especially with a tri-jet burner is the gas efficiently cooled between the two converging jets of air, which serve to blow the flame away from the burner-tip, and thus prevent the gas igniting at or close to the jet-orifice.

**Self-Closing Gas-Burner Valve.**—Thorpe, T., of Whitefield. No. 27,214; Nov. 20, 1897.

This valve (for use chiefly on the gas-piping between the main or service supply-cock and the gas-burner) has for its chief object to prevent the escape of gas at the burner upon the turning on of the supply, in the event of the burner-tap being inadvertently left open at the time of the turning off of the supply. Its secondary object is to provide a valve which is self-closing with the turning off of the supply of gas to it, and which is opened at will and remains so when there is the usual pressure of gas in the supply-pipe.



The valve-chamber A has an inlet from the gas-pipe and an outlet to the burner; the former being of the same size as the bore of the burner-cock, and arranged preferably in the centre of one of the sides of the chamber. The side of the chamber opposite to the inlet or valve seating is formed of a flexible diaphragm B of considerable area compared with the inlet-orifice. It is under a slight pressure from a spring C (or its equivalent), so that the diaphragm, which has a valve-face connected to it, rests over the orifice formed by the seating, and a considerably greater pressure than exists in a gas-pipe is required to lift it. The diaphragm is provided with means by which it, and the valve carried by it, can be drawn away from the orifice. To this end, the piece forming the valve-face is also made with a neck, above which is mounted the spring, held in position by a screwed nut. A finger D has its inner end formed to grasp the neck, and is arranged at its outer end to come in contact with a cam on the tap E, the turning of which raises or lowers the finger.

With this apparatus, the gas can be turned off at the meter while the burner-tap is open; and the diaphragm or valve will be pressed against the orifice by the spring or weight. There being no pressure inside the chamber, and the orifice being small, it remains closed when the meter-tap is again turned on, so that no escape of gas takes place through the open tap. When the gas is to be lit, it is necessary to draw the diaphragm back by means of the finger D, when the gas pressure, acting upon the whole area of the diaphragm, prevents the closing of the orifice as long as the gas is turned on at the meter.

**Nozzles for Bunsen Gas-Burners.**—Seiler, M., of Berlin. No. 27,720; Nov. 25, 1897.

This invention of "gas-nozzles for bunsen burners" (more especially of the kind employed for the incandescent light) has for its object to facilitate the regulation of the flow of gas to the burner by the insertion in the nozzle proper of a small valve as near the top as convenient, and provided on both sides with flat surfaces, in such manner that, when the valve is turned, equal channels are formed on both sides of the valve, allowing two uniform gas-streams of comparatively small diameter to pass. The gas on entering the nozzle is retarded in speed; and in consequence of the larger surface of the nozzle, it expands and mixes thoroughly and

violently with the air. The air and gas mixture thus obtained enters the burner at the right speed, or, more precisely (as the patentee points out), at a reduced speed, and thus produces the required blue flame.

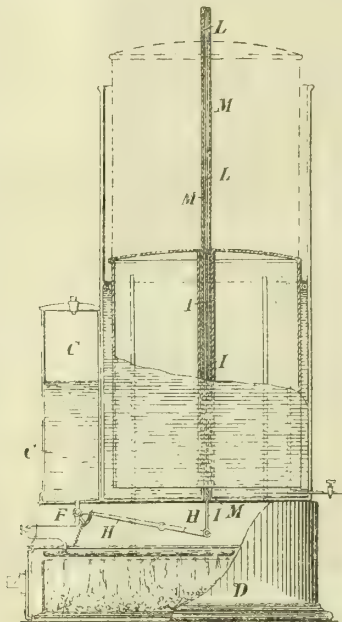
**Gas-Mantles.**—Smith, W. B., of Chelsea, S.W. No. 29,767; Dec. 16, 1897.

The patentee points out that in patent No. 2110 of 1890 is described "an ordinary incandescent or non-conductor, coated with an oxide or oxides that are better heat conductors;" but instead of coating the ordinary incandescent with the heat conducting oxide, he proposes to mix or combine the two together and spread the mixture upon a framework made of the ordinary incandescent or non-conductor, or "of a substance that may be a greater or less conductor of heat." By the words "ordinary incandescent or non-conductor," he means oxides of aluminium, magnesium, potassium, and silicon—one or more of these being used. By "heat conducting oxide or oxides," he means the oxides of chromium, cobalt, and tungsten. One or more of these oxides, or their suitable salts, are mixed with one or more of the ordinary incandescent oxides or the suitable salts "without or with other refractory substances used in incandescent mantles." The patentee also proposes to make mantles from a solution containing a mixture or compound of aluminium and chromium salts or oxides, with or without other refractory substances used in incandescent mantles. In mantles where thorium oxide is used, he also employs chromium oxide either in the manner already described (the thorium oxide being treated as the ordinary incandescent) or as in patent No. 2110 of 1890.

**Producing and Storing Acetylene.**—McConechy, J., of Glasgow. No. 30,585; Dec. 28, 1897.

In this apparatus there is an arrangement of a vertical lever working in a central passage or opening formed in a gasholder, which, when the holder falls to a certain determinate level, is acted upon by a bridge-piece, formed at the top of the holder, so as to operate certain levers in order to admit a supply of water to the gas-producer.

In the engraving, a pressure-pipe connects the reservoir C with the gas-producer D, so that the pressure in both vessels is the same. This causes the flow of the water. The lever H, which connects the upright or vertical lever I, operates the stopcock F, by means of a quadrant; or the arm of the valve may be formed with a toothed quadrant, engaging with a corresponding quadrant formed at the end of the lever. The



lever I (which is pivoted to H) passes up the central opening or tubular passage formed at the holder, and terminates with a rounded head or button, which is engaged by a bridge-piece formed at a central point of the dome of the holder when the holder is at nearly its lowest position. The bridge-piece works in a groove or longitudinal slot L, formed on either side of a funnel M, which rises centrally out of the bottom of the tank, and is so constructed that the groove or slot L is always above the level of the water in the tank, and therefore the water is not capable of escaping by this passage. When the valve F or the accumulator C has been turned on by the fall of the holder, and the quantity of water admitted to the producer has been such as to generate a sufficient volume of gas to raise the holder, the water is turned off by the action of a powerful spiral spring drawing down the quadrant, and at the same time raising the vertical lever I ready to be again acted upon by the fall of the holder.

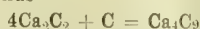
**Treating Carbide of Calcium.**—Yvonneau, C. E., of Paris. No. 30,833; Dec. 30, 1897.

The patentee describes a novel manufactured product termed "safety carburet," consisting of a homogeneous mixture of a glucose and a fatty body at a temperature of about 100° C. in certain proportions; such mixture being combined with an alkaline-earthly carburet reduced to small fragments, and raised to a temperature of about 300° C. The whole is then heated for a period of time sufficiently to form a paste which may be moulded and compressed into solid bodies, which are covered with a "hydrofuge" substance. To prepare the carburet, 16 parts of glucose or a similar body and 4 parts of a fatty substance (such as any suitable oil) are heated in a receiver by steam to about 100° C., and mixed so as to form a perfectly homogeneous product. Next there is heated in a suitable receiver 80 parts of calcium carburet, previously broken into pieces of from about 2 to 4 mm. each, to a temperature of about 300° C. Then the small fragments of carburet thus heated are transferred to a mixture of glucose and oil, or similar bodies, having undergone the treatment



described in the first place, which mixture is maintained in a state of ebullition at a temperature approximating 100° C.

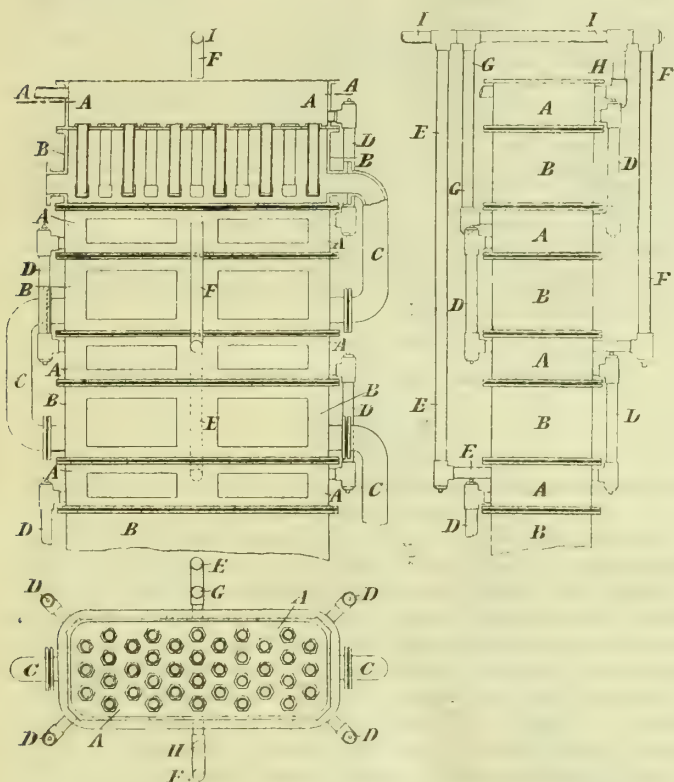
The fragments of heated carburet combine chemically with the mixture previously prepared; and there sets in a keen reaction which gives rise to a new body, the chemical formula ( $\text{Ca}_4\text{C}_9$ ) of which differs from that of ordinary calcium carburet in that it contains a larger proportion of carbon. The reaction which takes place in the process of forming this body may be accounted for by the partial decomposition of the saccharine matters and oil at a high temperature; the intensity of the reaction having the effect of partly dissolving the sugar molecules into carbon, which becomes fixed in the nascent state upon the calcium carburet already formed. Thus—



Being in the condition of a paste, this product may be moulded and compressed into any desirable form; and it is then steeped in a liquid so as to become covered with a coating which, when dry, will form a sheath enveloping each fragment and protecting it from the action of moisture.

**Sulphate Plant on the Continuous System.**—Carr, I., of Widnes' No. 16,978; Aug. 6, 1898.

The object aimed at by the patentee is "to utilize and apply to a fuller extent, in the process of the manufacture of sulphate of ammonia, the heat of the hot waste gases from the saturator—that is, to utilize such heat in the superheating of the ammoniacal liquor prior to its entrance to the stills of the plant, and to economize fuel and plant." The superheater is so arranged that "practically the whole of the heat of the waste gases may be utilized in the superheating of the liquor, as well as obviating the necessity of the use of large or additional condensing plant in order to cool the waste gases prior to their treatment in the oxide purifiers or sulphur recovery kilns."



In the engravings, A are the upper or liquid chambers of a pair of chambers; and B are the lower waste-gas chambers. C are the pipes connecting the successive chambers B together in a pile; and D are the pipes connecting the successive chambers A. The number of chambers and size of superheater are considerably larger than those commonly employed. Thus a large heating surface and action are provided; and the gas is given off not only in the uppermost liquor chamber A, but also in the second, or second and third, or others, of these chambers, and taken away from each of them by a separate take-off pipe. For instance, as shown, the superheater is so arranged that gas which may be generated in the upper four of the liquor chambers of the pile is taken off by providing the pipes E, F, G, and H, which lead into a common main-pipe I communicating with the stills. Hence, in action, any gas that may be given off in the fourth liquor chamber from the top is freed from the liquor, and passes away by the pipe E to the still, without interfering in any way with the upflow of liquor through the connecting branches D. In the same way, the gas generated in the other three chambers above is provided for and carried off.

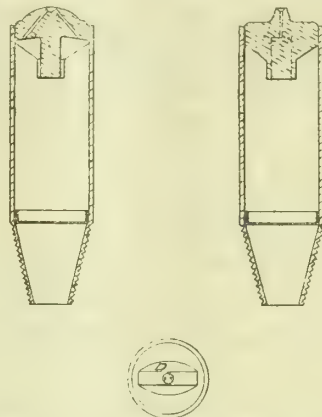
The liquor is heated in pipes fixed in the diaphragm between the chambers A and B; the ends being closed by caps. With the pipes arranged as shown, a large surface is exposed to the action of the heating gases as they pass through the chambers B. The pipes for relieving the chambers A, and the liquor flow pipes D, are so arranged, as regards the levels at which they lead into and out of the chambers, that the gas alone can pass off, while the liquor keeps in the correct course of flow from tier to tier to the final outlet.

It will, says the patentee, be seen that "by employing a superheater having a comparatively large number of chambers or a large heating surface, the whole heat of the waste gases from the saturator can be transferred to the liquor being supplied to the stills, and thereby a saving in fuel for volatilizing or distilling it is effected; also by reducing the temperature of the waste gases, the necessity of employing additional condensing plant is obviated." A further effect is obtained—namely, that by the long and continuous heating afforded by the apparatus, it is

suitable for the decomposition and conversion to ammonia of a portion of the cyanides in ammoniacal liquor, when the latter has previously received an admixture of alkaline solution.

**Gas-Burners.**—Bray, G., of Leeds. No. 21,197; Oct. 8, 1898.

This invention relates to union-jet burners, designed for burning acetylene gas. As ordinarily constructed, these burners would be of such diameter as to interfere with the combustion of the bottom portion of the flame, and allow of carbon being freely deposited thereon; while the comparatively large area of the top of the burner would prevent that free access of air to the bottom of the flame which is necessary to the satisfactory combustion of acetylene gas.



To avoid these defects, the patentee proposes the form shown—a burner having raised on its surface a narrow ridge, on the apex of which is formed the small cup, within which the holes are pierced or drilled which convey the jets of gas to the point where they unite to form the flat flame. Such a burner raises the flame above the main portion of the top of the burner, and permits more free access of the atmosphere to the under part of the flame, and thereby to a large extent prevents the deposit of carbon on the top of the burner, and admits of the carbon that is deposited being easily removed. Also, "by permitting more free access of the atmosphere to the under part of the flame, the edges of the flame are made thinner and more luminous, and have less tendency to smoke."

#### APPLICATIONS FOR LETTERS PATENT.

- 25,030.—BINGHAM, C., "Carbureting." Nov. 28.
- 25,044.—MILNE, J., and O'CONNOR, H., "Coin-freed gas-meters." Nov. 28.
- 25,051.—GILLESPIE, C. A., "Combined pressure or vacuum registers and electric alarms." Nov. 28.
- 25,079.—CRAWFORD, M., "Burners for heating and lighting." Nov. 28.
- 25,118.—THWAITE, B. H., "Treatment and utilization of coke-oven gases." Nov. 29.
- 25,158.—SHILLITO, T. R., "Recovering sulphuric acid and sulphuric anhydride from gases." A communication from The Actiengesellschaft für Zink-Industrie vormals Wilhelm Grillo and Max Schroeder. Nov. 29.
- 25,160.—BARNETT, C., "Production of acetylene gas." Nov. 29.
- 25,163.—NODDER, J. & T. H., "Locking cocks or taps." Nov. 29.
- 25,168.—LANGHAMMER, A., "Automatic cutting-off valves." Nov. 29.
- 25,199.—RAMMOSER, A., RÖHRS, E., and RÖHRSON, H., "Automatic igniters for incandescent and the like gas-burners." Nov. 29.
- 25,209.—PILOUS, E., OTTERMANN, G., and NAUHEIM, E., "Producing gas from town refuse and sweepings." Nov. 29.
- 25,227.—THUBRON, D., "Generators for acetylene gas." Nov. 30.
- 25,258.—HARRISON, P., "Generators for acetylene." Nov. 30.
- 25,268.—RAMMOSER, A., RÖHRS, E., and RÖHRSON, H., "Process for producing automatically igniting mantles for incandescent burners." Nov. 30.
- 25,277.—BOULT, A. J., "Manufacture of water gas." A communication from G. Nicolini. Nov. 30.
- 25,291.—AUBERTIN, N. A., "Acetylene gas apparatus." Nov. 30.
- 25,297.—BUCHER, P., "Apparatus for generating acetylene gas." Nov. 30.
- 25,298.—WOODWARD, J., "Unloading, heaping, stocking, or storing and loading coke, coal, and other materials." Nov. 30.
- 25,317.—DILLBERG, G., "Acetylene and similar gas-generators." Nov. 30.
- 25,339.—REDMAN, T., "Atmospheric gas-burners." Dec. 1.
- 25,368.—WATTS, C. J. & C. E., "Acetylene lamp or generator." Dec. 1.
- 25,369.—BOULT, A. J., "Compressed gas-lighting installations." A communication from L. H. Karger. Dec. 1.
- 25,382.—ROBERTS, G., "Taps or cocks." Dec. 1.
- 25,449.—RODWELL, W. J., "Generation of acetylene." Dec. 2.
- 25,452.—SMITH, H. E., and DOMAN, W., "Acetylene gas-generators." Dec. 2.
- 25,493.—HADDAN, H. J., "Regulating the gas generation in acetylene or the like lamps." A communication from A. Frank. Dec. 2.

**Grand Junction Water-Works Company.**—In the report of the Directors of this Company, to be presented at the meeting to-morrow, they state that during the half year ending the 30th of September there was considerable progress both in the number of houses laid on and in the quantity of water supplied by meter for trade purposes, with the satisfactory result that the water-rental shows an increase of £3482 over the corresponding period of 1897. The Directors recommend a dividend at the rate of 7½ per cent. per annum on the £50 "A" shares, on the £25 "B" and "C" shares, and of 7 per cent. per annum on the £50 "D" shares, together with interest and dividend, in accordance with the conditions of sale, on the 600 new £50 "D" shares offered to public auction on the 18th of May last.



## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

## The Carburation of Coal Gas.

SIR,—While thanking Mr. Young very much for his last letter on this subject, I am afraid I cannot accept his theories of scrubbing the gas, and criticisms on the process as being correct, because they are not borne out by the practice; and I still think that if Mr. Young saw the apparatus at work, his views would be considerably modified. Nearly all the points raised in Mr. Young's letter are dealt with in the paper read before the Institution of Gas Engineers in 1897, regarding which I also would refer Mr. Young to Appendix VIII., on the "Solubility of Naphthalene."

I was not aware of the Beilby process. But it is, of course, common knowledge that passing coal gas through, or washing gas with, petroleum will deprive it of some of its hydrocarbons; and a spray, however fine, will have proportionate effects. But a mist or fog, produced as in our process, is quite a different matter, as experience has proved; and whether those engaged in the gas industry credit the suggested theory of artificial vapour tension or not, it is none the less true that similar effects are produced, and I cordially invite Mr. Young to investigate it here for himself. It also may be that the mist or fog acts in some way as a lubricant on the sides of the mains.

The broad facts remain that suitable oils such as we use, if sprayed or squirted into the gas, not only would lower the quality, but have no effect on naphthalene, except locally; whereas the same oil, if converted into mist, travels with the gas through the whole canalization, without deteriorating the gas, and prevents naphthalene depositing. Similarly, other lighter oils which are eminently suitable for carbureting purposes, are of no use when employed for our process of carburation. The results show that, although the process is applied to the gas in motion, little of the scrubbing effect expected by Mr. Young is experienced in actual practice; and I believe the result may partly be expressed in his words, that the part of the mist which is put "into the gas in a sufficiently fine state of mechanical division to accompany the gas through the burners and add to its luminosity, is greater than the illuminating value of the hydrocarbons (naphthalene, &c.) which have been removed or dissolved from the gas by the less perfectly atomized portion of the mist." The only qualification I should wish to add to this is that experience has shown that, if hydrocarbons are precipitated, the amount is too small to be evident.

Hastings, Dec. 10, 1898.

CHAS. E. BOTLEY.

## Prepayment Meters.

SIR,—Mr. Nasmith's letter in your issue of the 29th ult., and Mr. Marsh's in yours of the 6th inst., are both on one subject, and may be replied to together.

I at once express my regret to these gentlemen that, quite inadvertently, I omitted to mention their patents. As a matter of fact, I intended to say very little about automatic meters and the many patents; but the subject grew, and suggestions were made as to the advisability of extending the scope of the articles to include a brief notice of the various early-pattern meters. I felt that, as regarded master patents, I was perhaps "Rushing in where angels feared to tread;" and so it appears, from the letters under review. My omission will perhaps be condoned, however, when I remind Mr. Nasmith that I sent him a proof of the article in question; and he assisted me by correcting the spelling of his name, and pointing out that Wallace's patent did not contemplate or cover the supply of gas.

I am glad to have this opportunity of thanking Messrs. Nasmith and Marsh, and many private friends, for their appreciative remarks respecting my humble efforts; and I should like to again point out that the articles have been chiefly compiled from public references, either at gas managers' or gas companies' meetings, and consequently do not mention the practice of many towns whose enterprise in the direction of free slot-cookers is worthy of emulation.

It has been suggested that the articles should be reprinted; and in the event of this being done, I hope to give a fairly complete survey of the practice throughout the country.

E. W. T. RICHMOND.

132, Queen Victoria Street, E.C., Dec. 7, 1898.

## The Purchase of Coal and Reduced Production of Gas at Rotherham.

—The coal contracts question again cropped up at last Wednesday's meeting of the Rotherham Town Council. It may be remembered that at the July meeting there was a rather prolix discussion on the subject, which ended in the Council purchasing a quantity of coal for gas-making purposes beyond the recommendations of the Gas Committee. Last Wednesday, Mr. Gichard was anxious for an explanation as to why the make of gas per ton of coal in October was 10,297 cubic feet, as against 11,390 in the corresponding month of last year. To this Mr. Gummer replied that it was partly owing to the introduction of new men who did not understand the machinery, and partly to the Corporation having bought coal on other than commercial principles. Alderman Mill regarded the latter statement as a serious reflection on the members of the Council, and thought it should be withdrawn. Mr. Gummer said he had nothing to withdraw. People would not purchase in private business what they did not require. Alderman Mill considered this remark cast a serious reflection on the whole Council, and put Mr. Gummer's judgment as being superior to that of the majority of the members. The Mayor (Mr. F. Mason) did not agree with Mr. Gummer as to the purchase of the coal being otherwise than upon commercial principles. Mr. Gummer might not concur in the decision of the Council; but he (the Mayor) felt sure that every member of the Corporation dealt with the business of the town in the same manner that he would in his private capacity. As Mr. Gummer was entitled to hold to his own opinion, he (the Mayor) could not call upon him to withdraw. Mr. Copley expressed the hope that a better production of gas per ton of coal would be obtained in the future when the men got into the work. Mr. Hirst was much amused at the way in which the various members of the Gas Committee flattered themselves in regard to the conduct of the business of the department. He wished they would let the town have better gas and less talk. The subject then dropped.

## LEGAL INTELLIGENCE.

## SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Wednesday, Dec. 7.

(Before Lords Justices A. L. SMITH, RIGBY, and COLLINS.)

Southwark and Vauxhall Water Company v. Hampton Urban District Council—The Rating of Reservoirs.

This was an appeal by the defendants from the judgment of Justices Wright and Darling, on the 10th of March last; the question being as to whether a large reservoir belonging to the Company was "land covered with water" within the meaning of section 211 of the Public Health Act, 1875, and therefore entitled to be rated only at one-fourth of the net annual value. The Justices of Middlesex held that the reservoir ought to be rated at the full value; and from this decision the Company appealed to the Queen's Bench Division, who held, on the authority of several decided cases, that the reservoir was "land covered with water." (See "JOURNAL," Vol. LXXI., pp. 656, 724.)

Sir EDWARD CLARKE, Q.C., and Mr. COURTHOPE MUNROE appeared for the District Council, the present appellants; Mr. CRIPPS, Q.C., and Mr. RYDE represented the respondents.

Sir E. CLARKE occupied the whole of the afternoon with his argument, and was followed next morning by Mr. MUNROE; their endeavour being to show that some of the previous cases were decided on a different Act of Parliament, while others had been impugned to some extent by a more recent decision in the House of Lords.

Mr. CRIPPS did not address the Court for more than a few minutes; the point of his observations being that the cases cited on the other side had no bearing on the real question at issue, which was simply whether a reservoir was or was not "land covered with water."

Mr. MUNROE having added a few words in reply,

Lord Justice A. L. SMITH, in giving judgment, went through and commented upon the cases cited, and said there were three decisions as to what was meant by "land covered with water" given before the Act of 1875 was passed; and it must be assumed that the Legislature, in that Act, intended the same meaning to be attached to them. A Court of Law could not assume that some different meaning was intended. The appeal must therefore be dismissed, with costs.

Lords Justices RIGBY and COLLINS concurred; the latter adding that not only did he agree that they ought to follow previous decisions, but did not see how any other conclusion could have been come to under the plain terms of the Act of Parliament.

## HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, Dec. 9.

(Before Mr. Justice ROMER.)

The Best Incandescent Gas-Share Syndicate, Limited, v. The Incandescent Gas-Light Company, Limited.

This action and a cross-action—the first being to restrain threats by the Incandescent Gas-Light Company, and the second by the latter Company to restrain infringement by the former—came before the Court on a motion by the Best Syndicate to rescind an order made in chambers staying the action for infringement until the Syndicate had delivered twelve mantles, such as they proposed to manufacture, to the Incandescent Company for the purpose of analysis. It should be added that the motion was brought on some time ago in the ordinary way; but, as it appeared to involve rather intricate questions, his Lordship directed it to be placed in the list of non-witness actions, and it was only reached to-day.

Mr. BOUSFIELD, Q.C., and Mr. FROST appeared for the Best Syndicate; Mr. WALTER (in the absence of his leader, Mr. FLETCHER MOULTON, Q.C.) for the Incandescent Gas-Light Company.

Mr. BOUSFIELD commenced by giving a résumé of the numerous proceedings which had been taken, as reported from time to time in the "JOURNAL." The Incandescent Gas-Light Company issued circulars setting forth that anyone except the Sunlight Company making or selling incandescent mantles not of their manufacture were infringers, and would be proceeded against. The Best Syndicate started an action, and moved before Mr. Justice Stirling to restrain the issue of such threats; they having purchased a patent taken out by Mr. S. H. Crocker for the manufacture of mantles of thorium and scandium, which they alleged would not infringe the Welsbach patent. When the motion came before Mr. Justice Stirling, the Incandescent Company at once said they would commence an action for infringement; and thereupon the threats action was stayed. The action for infringement was before Mr. Justice Romer; and the threats action had been transferred, so that both should be before the same Judge. The plaintiffs in the infringement action had applied for an order that the Best Syndicate should supply them with twelve mantles such as they proposed to make and sell, for the purpose of analysis. But the defendants said they could not do so, on the grounds that they had not commenced the manufacture, and could not until the action had been tried; and that it was impossible to obtain pure scandium (which was the important ingredient) at any reasonable price, unless a large quantity, such as would be required for manufacturing purposes, were ordered. They offered, however, to furnish twelve mantles if the plaintiffs would undertake not to raise any objection on the ground of casual impurities being present. This offer was not accepted; the argument being that, if an effective mantle were made at all under Crocker's patent, its success would be due to the presence of some of the substances coming within the Welsbach patent, which it might be alleged were mere casual impurities. After considerable discussion had taken place,

Mr. S. H. Crocker, the patentee, was called as a witness, and stated that it was impossible to obtain scandium free from traces of other earths in such small quantity as would be required to make a dozen mantles.



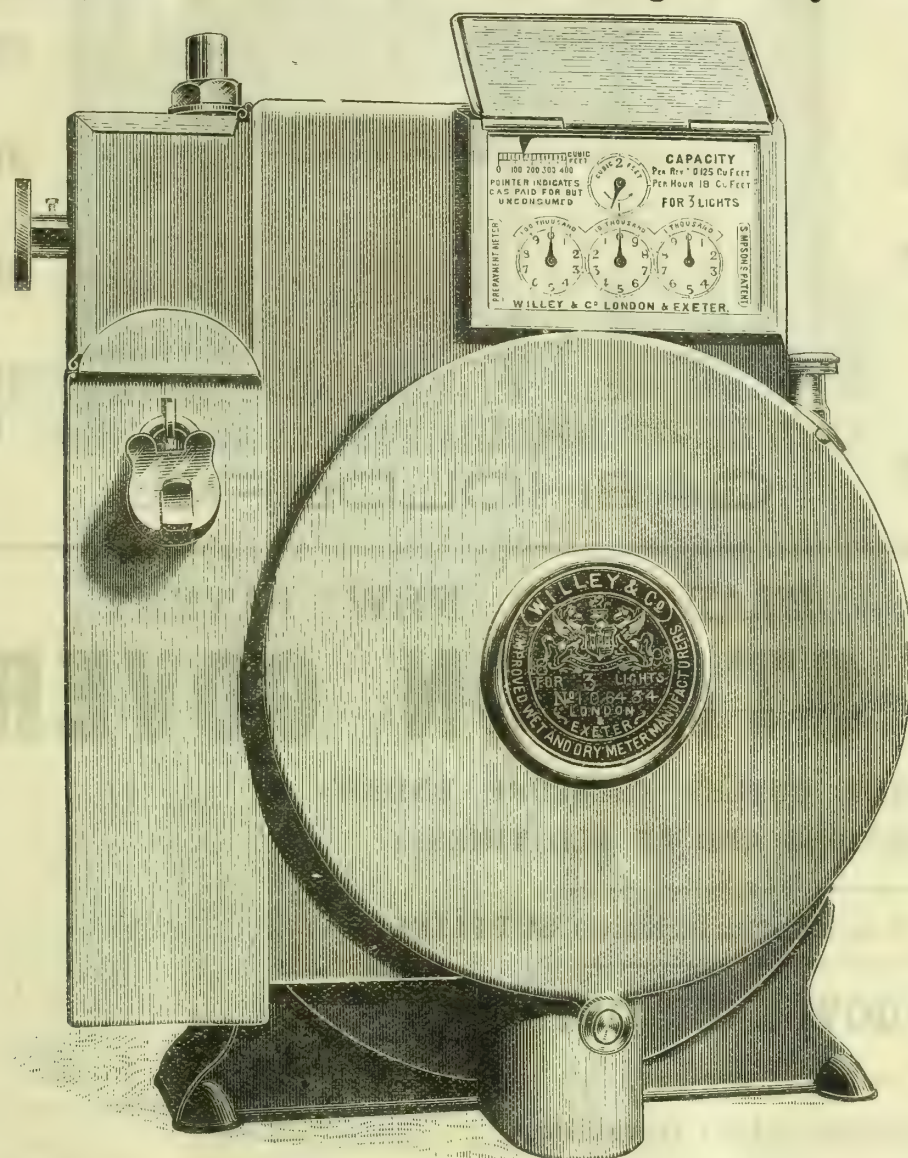
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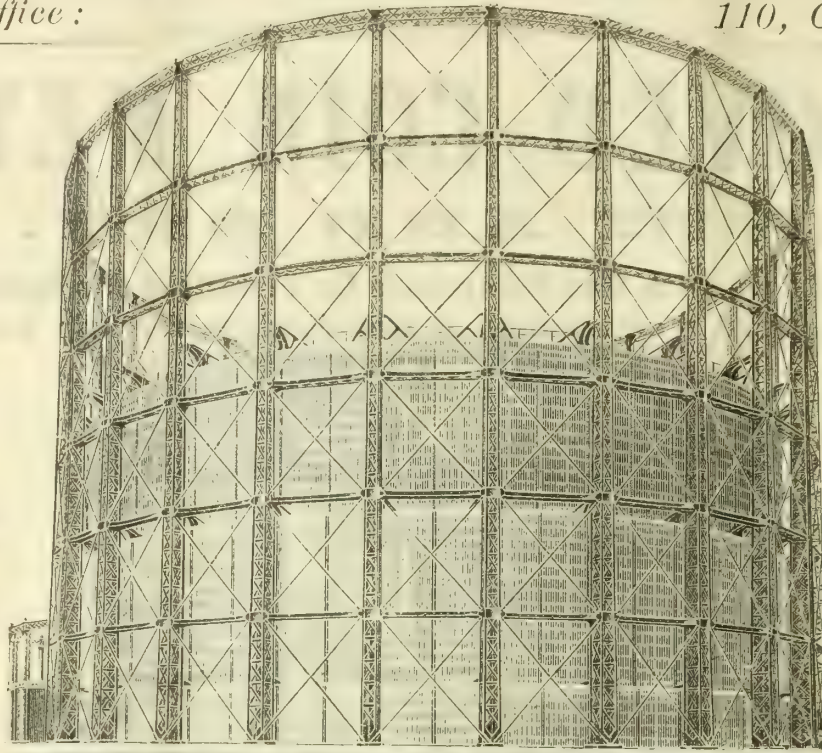
TOWER  
SCRUBBERS.

WECK'S  
PATENT  
CENTRE-VALVE.

CONDENSERS.

TAR PLANTS.

SULPHATE  
OF  
AMMONIA  
PLANTS.



GASHOLDERS.

WASHERS.

WASHER-  
SCRUBBERS.

CLAUS' SULPHUR-  
RECOVERY PLANT.

CENTRE & FOUR-  
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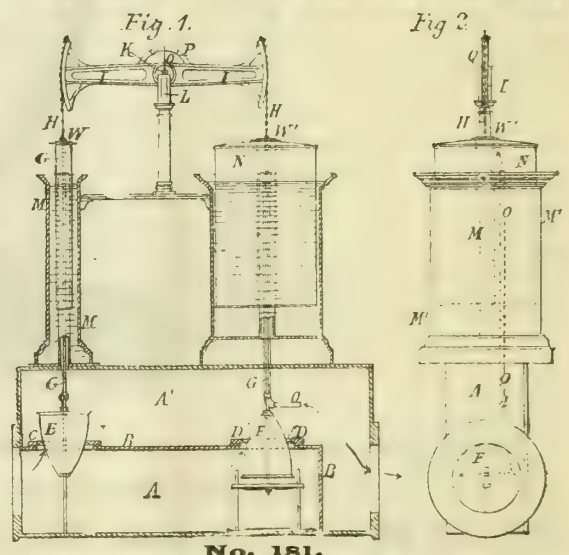
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In cross-examination, witness said he had never made pure scandium, but had heard of its being done. Professor Clève had given the atomic weight of scandium, which he could not have done without having prepared scandium oxide. He was not aware that pure scandium could be purchased anywhere. He could manufacture mantles under his patent at a reasonable cost, if he could procure pure scandium.

Mr. Justice ROMER said, upon this evidence, he would discharge the order in chambers staying the action for infringement until the mantles were furnished, but would give the plaintiffs in that action leave to amend, in case it might be necessary. If the action were not now prosecuted with due diligence, the Best Syndicate might apply again. Meanwhile, the application for leave to go on with the threats action would stand over; and the costs of both applications would be costs in the actions.

#### RAILWAY AND CANAL COMMISSION.—Tuesday, Dec. 6.

(Before Mr. Justice WRIGHT, Right Hon. Sir F. PEEL, and Right Hon. Viscount COBHAM.)

##### Hackney Vestry v. East London Water-Works Company.

This was an appeal by the plaintiffs from the Registrar disallowing certain interrogatories.

Mr. BALFOUR BROWNE, Q.C., Mr. FREEMAN, Q.C., and Mr. BEVEN appeared for the plaintiffs; Mr. PEMBER, Q.C., Mr. CRIPPS, Q.C., and Mr. H. SUTTON represented the defendants.

Mr. BALFOUR BROWNE said he did not propose to read any portion of the interrogatories, which were very numerous and searching; but he should contend that the principle on which the Registrar had acted was a wrong one. The application was made under the Metropolitan Water Companies Act, 1897, section 1 of which provided that any water consumer or any local authority might complain to the Railway and Canal Commission that any of the Metropolitan Water Companies had "failed to perform some statutory duty;" and the Commissioners, if satisfied of such failure, might order such Company to fulfil the duty, and, if they thought fit, impose a penalty. The "statutory duty" alleged by the Vestry in the present case was to supply water under the constant service system. In answer to this, the defendant Company said that by their Acts of Parliament they were excused from giving such supply in the case of "unusual drought or other unavoidable cause or accident." The Registrar took the view that all the interrogatories were beside the matter, because the Company alleged "unusual drought or other unavoidable cause or accident;" and that the only issue was whether there was such a drought. The plaintiffs pointed to various matters which, if the Company had done them in proper time, would, they said, have avoided the necessity of a breach of the statutory duty to give a constant supply; and the Company were bound to do everything reasonable to enable them to perform their duty. The word "drought" was very indefinite. Drought might exist for five days or five months; but supposing it existed for five days, and immediately before it came on the Company let the whole of the water in their reservoirs run to waste, so that they were unable to perform their statutory duty, it was clear that, by neglect or default, they had put themselves in a position in which they could not perform it, so that the plaintiffs were entitled to ask the Court for an order compelling them to perform their statutory duty. The Registrar seemed to think that the only question was: Was there a drought? He ventured to think this was not sufficient. The words "unusual drought" were coupled with "or other unavoidable cause or accident." One could not avoid a drought, but could avoid the consequence of a drought; and this was a part of the statutory duty of a water company. As a matter of fact, they knew now that the defendant Company were providing more storage for the very purpose of having sufficient water to meet the requirements of a drought extending over a longer period than they were lately able to tide over. The question was whether the plaintiffs were unreasonable in saying that the defendants ought to have provided for the drought of 1898. When the case came on for hearing, the plaintiffs would show that, after the experience of 1893, the Company ought to have provided such storage as would have enabled them to tide over the dry season of 1898. After undue delay, the Company went to the New River Company and other Companies, and obtained water which they had been supplying ever since. In conclusion, he submitted that the plaintiffs were entitled to interrogate on the issues raised by them.

Justice WRIGHT said the view of the Court at present was that, in so far as the interrogatories went to the question of what storage capacity the Company's reservoirs had, what arrangements had been made with other Companies, and facts of that kind, they ought to be allowed; but the bulk of them appeared to be oppressive. If Counsel for the Company objected to answer these points, the Court would hear them; if not, the Court did not desire to do so.

Mr. SUTTON observed that the Registrar, after going through the interrogatories, thought that out of the 500 questions asked only about 10 could be properly put; and therefore he, acting on rules which were perfectly understood, disallowed them all. In each interrogatory there were about 14 questions. He did not say that there might not, here and there, be a proper question which should be answered.

Justice WRIGHT asked whether the parties were willing that he should go through the interrogatories and strike out what was immaterial.

Mr. SUTTON said he should be perfectly willing to leave the matter to his Lordship.

Mr. BALFOUR BROWNE also assented to this course being followed. In reply to his Lordship, he said he did not insist on the first 15 interrogatories.

Justice WRIGHT said, after looking at the interrogatories, he was not surprised that the Registrar took the course he did.

#### Vestries' Liabilities for Public Lighting.

In the Queen's Bench Division of the High Court of Justice last week, Mr. Justice Wills and a Special Jury had before them the case of *Thurrold v. The Vestry of St. George's, Hanover Square*, in which the plaintiff sought to recover damages for injuries to himself and a horse and hansom cab through the alleged negligence of the defendants. The plaintiff was driving a fare to Hyde Park Gardens on the 8th of March, about

8 p.m. When in Belgrave Square, he passed on the right-hand side of a refuge with the intention of going along Grosvenor Crescent; but just at that point his fare told him to go by way of Wilton Crescent. Thereupon he turned sharp to the left; and in doing so he drove very near the refuge, and the cab was upset by a heap of sand and gravel lying there. The gas-lamp near the spot was out at the time; and while it was admitted that the lamp was not under the control of the Vestry, the plaintiff contended that if they put the heap in the road they did so at their peril. The sand, which was required for wood paving, was now put in a tin bin on the pavement; and plaintiff said that there would have been no accident if this precaution had been adopted before. For the defendants it was contended that the plaintiff must show that the accident was brought about substantially by their negligence, and by that alone. Under the Metropolitan Management Acts, the Vestry had the duty of lighting the streets. They had made a contract with the Gas Company to do the lighting; and through no fault of either the Vestry or Company the lamp went wrong. It was submitted that there was no negligence in a gas-lamp being out for an hour; the defect having been remedied as quickly as possible. It was the duty of the Vestry to maintain the streets, and they had put the gravel where it could be most easily got at. Mr. Justice Wills said the question was whether the Vestry had taken all reasonable precautions to render the heap safe. If the place was not a fit one, there was carelessness. If the place was a fit one, but was not properly lighted, it was a question of negligence. He did not think the Vestry were in any better position by giving the lighting contract to the Gas Company. It was the duty of the Vestry to light the heap, and want of light was evidence of negligence. The Jury found that there was negligence on the part of the defendants, and that the plaintiff was not guilty of contributory negligence. They assessed the damages at £70. Upon these findings, judgment was entered for the plaintiff.

#### When Oil-Engines become Gas-Engines—Curious Patent Action.

The case of *The Valveless Gas-Engine Syndicate, Limited v. Day*, before the Court of Appeal last Wednesday, raised a curious point respecting patents. The defendant Day patented a gas-engine in 1891, and sold his rights to the plaintiff Syndicate by an agreement under which he also undertook to assign to them any improvements he might make on the patent. Plaintiffs claimed that an oil-engine patented by Day in 1895 should be assigned to them, as being an "improvement" on their gas-engine; but at the trial Mr. Justice Bigham gave judgment for the defendant. (See "JOURNAL," Vol. LXXI., p. 662.) The plaintiff Syndicate appealed. Lord Justice A. L. Smith, in delivering judgment, said beyond all doubt the chief mechanism of the gas-engine had been utilized for the oil-engine, with such modifications as the introduction of an oil-spray in place of gas necessitated. The introduction of an oil-spray to the engine was an improvement so far as that the engine could then be used in places where gas could not be obtained. Lord Justice Collins concurred. Lord Justice Rigby, however, dissented, holding that the oil-engine was not of the type to which the gas-engine patent alone applied, and the oil had no relation to it. Accordingly, by a majority, the appeal was allowed.

#### Theft from a Prepayment Meter.

At the Manchester City Police Court last Wednesday, James Furlong, a man of respectable appearance, was charged with stealing 4s. 1d. from a penny-in-the-slot gas-meter belonging to the Manchester Corporation. The meter was fixed in a house in Wardlowe Street. The prisoner, ascertaining that the people who lived in the house were out, borrowed the key, which had been left with a neighbour (to whom he stated that he was a Corporation collector), broke open the meter, and took the money. When he returned the key, the neighbour asked for an official receipt; and as he was not able to give it, a policeman was fetched. It was stated by the prisoner that he had a sickly wife and a number of children. He was sentenced to one month's hard labour. Incidentally, it was mentioned that there are 26,000 prepayment meters in use in the city, about ten of which are robbed every week.

**Street Lighting at Plymouth.**—In view of the early completion of the electric light works, the Corporation of Plymouth have taken over from the Gas Company the maintenance of the street-lamps and their lighting and cleaning. It has been decided to place the supervision of the whole of the lighting, whether by gas or electricity, with the Electric Lighting Committee; and Mr. J. H. Rider, the Electrical Engineer, will be the Lighting Superintendent.

**The Transfer of the Filey Gas and Water Works to the Urban District Council** has been completed, and the last payment to the Company made. When this was reported at last Tuesday's meeting of the Council, the Chairman (Mr. Maley) said he considered that it was one of the best investments on the part of the town that they had ever made. Messrs. Smith and Towse also spoke in congratulatory terms of the step that the Council had taken, and predicted that Filey would benefit through the undertaking changing hands.

**Opposition to the Bedworth Gas Scheme.**—Last Tuesday, a meeting of ratepayers, convened by the Bedworth Parish Council, was held to consider the advisability of taking steps to oppose the application for extended powers about to be made by the Bedworth Gas Company. Mr. W. Johnson, who presided, said gas had had its day in Bedworth, and the Council could set up an installation for supplying electric light at an initial outlay of £1500. Coventry was about to erect auxiliary gas-works at Foleshill, and that city might be induced to supply Bedworth more cheaply than the Bedworth Gas Company were doing. Mr. Brock-Harris assured the meeting that it would be ridiculous for Bedworth to attempt to set up an electric light station unless the parish was prepared to spend double or treble £1500. Mr. W. Linney moved a resolution authorizing the Council to obtain professional advice and assistance in the matter, and to charge the same on the rates. This was agreed to; and it was decided to seek the assistance of the Warwickshire County Council and Foleshill District Council in the matter.



## MISCELLANEOUS NEWS.

### BIRMINGHAM CORPORATION GAS AND WATER SUPPLY.

#### Progress of Prepayment Gas Consumption—The Recent Drought—The Welsh Water Scheme.

At the Meeting of the Birmingham City Council last Tuesday—the LORD MAYOR (Mr. Alderman Beale) in the chair—the reports of the Gas and Water Committees, noticed in the "JOURNAL" last week, were under consideration.

Mr. J. H. LLOYD, the new Chairman of the Gas Committee, in moving the adoption of their report, expressed regret that they had lost their Chairman owing to his disfranchisement, through gross carelessness in the preparation of the list of burgesses. Mr. Pollack, he said, had for 17 out of the 23 years the gas-works had been owned by the Corporation, taken the deepest interest in the work of the Committee; and for 15 years, except during his mayoralty, he had been the Chairman. During this time the output of gas had practically doubled, the works had been re-organized, and great progress had been made in every department. The consumption of gas continued to increase. For the half year ended Sept. 30, 1897, it was 13½ per cent. over the same period in 1896; and for the half year ended Sept. 30 last it was 3½ per cent. over 1897—being an increase equal to 8 per cent. in the two years. He referred at some length to the extension of the Salfley works, as detailed in the report, and as recently described in our columns (*ante*, p. 866); remarking that the total expenditure involved was about £470,000. He then alluded to the explosion which occurred at the works on the 13th ult., when two men were badly injured—one subsequently dying at the General Hospital. He praised the action taken by Mr. Morrison, the Superintendent of the works, on that occasion; and remarked that he had distinguished himself in a similar manner in December, 1889, when two men were killed. In recognition of Mr. Morrison's bravery, the Committee had awarded him £25. On the advice of the General Purposes Committee, they had not insured against accidents under the Workmen's Compensation Act; but the Committee had made a grant of £237 16s. 6d. to the personal representatives of the man who died. The prepayment-meter system was increasing in popular favour. In March, 1896, there were 1350 of these meters in use; in March, 1897, the number had increased to 2000; and by March 1 last the total had gone up to 3600. There were now 5200 at work, and 1000 orders were on hand. It was not unreasonable to suppose that by March 31, 1900, the number of prepayment meters in operation would be 10,000.

Mr. HENNESSY expressed an opinion that the price charged for the hire of prepayment meters and fittings were excessive.

Mr. TOLLER said he could not see why Mr. Morrison should receive £25 in recognition of his bravery on the occasion of the accident, while the workmen who assisted only received £10 between them. He disapproved of the Committee making grants of this kind when accidents occurred, because it might be an incentive to cause accidents. Accidents in the gas-works could always be produced; and if a manager was to be paid £25 for every accident that occurred, he would say, "The more accidents, the more money I get." (Cries of "Oh, oh," and "Shame.") He considered the Council should do what they could to prevent accidents; and there was no doubt that if the machinery had been in proper working order this particular accident would not have occurred. He proposed, as an amendment, that £25 be distributed among the workmen instead of the £10 proposed by the Committee.

Mr. JEPHCOCK seconded the amendment.

Mr. LLOYD, in reply, said the charge for the hire of prepayment fittings was very low, and he did not think it could be reduced. With regard to Mr. Morrison, the £25 was paid in consideration of his having saved the department so much by the prompt action he took. He (Mr. Lloyd) was surprised that any member of the Council should have suggested that such a man as Mr. Morrison would wish to have further accidents with the view of getting more money. If Mr. Toller would withdraw his amendment, the Committee would inquire into the matter, and ascertain what the men had done; and if it was thought they had done something for which the Committee could reasonably give them more than £10, they would do so.

Mr. TOLLER withdrew his amendment; remarking that it was not his intention to say the Manager would wish to have more accidents.

The resolution was then put and carried.

Alderman LAWLEY PARKER, in moving the adoption of the report of the Water Committee, referred to the heavy expenditure necessitated for the provision of temporary works until the Welsh water scheme was completed. These works, details of which he gave, would require an outlay of £18,688. Referring to the bursting of a main at Whitacre in September last, he remarked that, though the fracture was a serious one, the main was repaired in 48 hours, and without any interference with the supply except in the local district. That the work was expeditiously done was shown by the fact that in 1894 a similar fracture took ten days to repair. Turning next to the recent drought, he said that the period of dry weather was necessarily an anxious time for the Committee. They had the greatest continuous drought they had ever experienced, so far as he knew; and, moreover, the rainfall for the last five or six years had been below the average. The reservoir at Shustoke was so low that if the drought had continued for another 20 days they would have been without any available supply from that source. The Committee had, therefore, to carefully consider their position; and it became a question whether they should not limit the supply by making it intermittent. In view of the fact, however, that very great inconvenience would be caused, especially to the small consumers and manufacturers, it was decided to go on for another ten days, and to rely upon the consumers doing all they could to lessen the quantity of water used. For the most part, they loyally helped the Committee, especially after attention had been called by the Press to the serious position of affairs; and there was a sensible diminution in the quantity of water used. There were, of course, some instances in which selfish consumers used the hose and spray on their lawns, and wasted the water at night; but, as a rule, the consumers were economical. Happily, before ten days expired the rain came—not in copious quantities at

first, but sufficient to prevent any further inroad upon the small storage at Shustoke. Some people then thought the Committee were easy in their minds; but this was not so. There had been seven weeks of more or less broken weather; but now the water in the Shustoke reservoir was 3 ft. 7 in. below its normal level. During the recent wet weather, they had only regained something like 1½ inches per day; so that nothing short of two or three wet weeks would restore the supply. Not a word too much had been said in the desire to impress upon consumers the necessity for the strictest economy. They had been within measurable distance—a short distance—of water famine; and no one knew what this meant except those who experienced it. Unless they had a more plentiful water supply, or were able to add to the water they already obtained from the wells, during the next four years, they would be in very dire straits. The Committee had seen during the past year more strongly than ever the necessity for the Welsh scheme; and they longed for the day to come when they would be able to draw water from the Principality. With regard to the Elan supply, the aqueduct was making progress, and all the contracts were let except one. He had made a somewhat pessimistic speech; but there was a brighter side. The half-year's accounts showed favourable figures, and the increased rental was still well maintained; and if this continued, they would have a substantial provision towards the additional charge for interest and sinking fund on the extra capital likely to be expended in carrying through the scheme.

The report was adopted.

### GAS v. ELECTRICITY FOR LIGHTING PUBLIC INSTITUTIONS.

The above subject has lately been ably dealt with by Professor Carlton Lambert, M.A., of the Royal Naval College, Greenwich, in an article contributed to "The Hospital." The author's name is well known to many of our readers as a lecturer on gas subjects; and therefore his remarks claim attention. As they are addressed to persons concerned more or less with the management of large public institutions, he begins by pointing out that the importance of a system of artificial lighting which shall be at once efficient, economical, and healthy, makes a study of the relative advantages of gas and electricity, in the light of modern developments, one of great interest to them. He goes on to say that were it not for the invention of Dr. Welsbach, who, in 1887, taught us how to obtain from a cubic foot of gas eight times as much light as we had been accustomed to get from our open burners, gas, as an illuminant, would have been "almost entirely out of the field at the present day." Be this as it may, there can be no doubt that, as Professor Lambert says, the Welsbach mantle has "effected a great revolution in artificial lighting, and has made gas absolutely unapproachable at present by its competitors as a cheap illuminant." He then proceeds to describe the mantle, and to give the results obtained with one of the ordinary "C" type; pointing out, however, that the Welsbach Company's new burner does very much better. His laboratory is at present lighted by one of these burners, which gives a light of 110 standard candles with a consumption of 4.8 cubic feet of gas per hour—an efficiency ten times as great as that of good ordinary fishtail or batswing burners. The meaning of this is that, with the South Metropolitan Company's gas at 2s. 3d. per 1000 cubic feet, he is getting light at the rate of 110 candles for nearly 7½ hours for one pennyworth of gas. Of course, as he is careful to point out, in a practical estimate of the cost of Welsbach lighting under everyday conditions, it will be necessary to make some deduction from these figures, and allow, not only for renewal of mantles, but for a gradual decline in their illuminating power. Assuming a lamp to be lighted for 1500 hours per annum, it is a good rule, he says, to allow for three mantles for this period, and to take the average life at 500 hours. During this time it is safe, in his experience, to expect an average efficiency of quite 14 candles per cubic foot of gas; so that one may rely upon getting a mean of 50-candle power at the cost of 3.6 cubic feet of gas per hour.

With these preliminary observations, Professor Lambert proceeds to cite a case to prove the advantages of the incandescent gas system. At the Yarrow Convalescent Home, Broadstairs, of which he is a Trustee, the building was originally planned for an electric light installation; but inquiry having shown that the use of the incandescent gas-light would result in a large annual saving, the electric scheme was abandoned, the engine, dynamo, and accumulator rooms were otherwise utilized, and 156 Welsbach burners were fitted up. During three years to the 30th of September last, accident and decay of the mantles had been covered by 704 renewals, or less than two per burner per annum. In the same period, the expenditure on other upkeep was less than 4d. per burner per annum. The dining-hall for 100 children and attendants, which has an area of 64 by 27 feet, has four triple gas-pendants with 12 Welsbach lamps and "Cosmos" opal shades. Three burners are found to illuminate the entire hall sufficiently for ordinary purposes, and usually no more are lighted. Under these circumstances, we are not surprised to learn that the economy and general results of the Welsbach lighting have given great satisfaction to the Trustees.

Professor Lambert says that careful domestic arrangements have probably made these results exceptionally favourable; and therefore, in the general estimate of the comparative cost of gas and electric domestic lighting which he is about to give, a somewhat larger cost of upkeep is assigned to the Welsbach system than has been incurred at the Yarrow Home. He then proceeds as follows: London experience of electric lighting, where the current is retailed at about 6d. per unit (1000 watt-hours), shows that a glow lamp absorbing 64 watts gives, when new, a maximum light of 16 candles. In consequence, however, of the gradual deposit of carbon from the filament upon the glass, the light value falls off, and an average of 14 candles is as much as should be expected during the useful life of a nominal 16-candle glow lamp. We will give the advantage, however, to the electric lamp, and credit it with 16 candles. When treating of the old system of open gas lighting, it is assumed that the best No. 5 Bray burners are used, giving, with London gas, an efficiency of 2½-candle power per cubic foot. This is a very generous estimate; the average efficiency of open burners in practice being more commonly 1½ to 2 candles, and the smaller sizes even less. With this explanation, the following table will give the relative cost, at London prices, of lighting an institution requiring a total light of 4000-candle power for 1500 hours annually with electric incandescent lamps, Bray burners, and Welsbach lamps.



*Electric Incandescent Lamps.*

|                                                                                         |      |
|-----------------------------------------------------------------------------------------|------|
| 250 16-candle lamps, each absorbing 64 watts; cost of current, at 6d. per unit. . . . . | £600 |
| Renewal of lamps, 500 per annum, at 1s. 6d. each . . . . .                              | 37   |
| Total . . . . .                                                                         | £637 |

*Open Gas-Burners.*

|                                                                                                                                             |      |
|---------------------------------------------------------------------------------------------------------------------------------------------|------|
| 320 Bray's "Special" burners, each giving 12½-candle power for 5 feet of gas per hour; cost of gas, at 2s. 6d. per 1000 cubic feet. . . . . | £300 |
|---------------------------------------------------------------------------------------------------------------------------------------------|------|

*Welsbach Incandescent Burners.*

|                                                                                                                                     |     |
|-------------------------------------------------------------------------------------------------------------------------------------|-----|
| 80 "C" burners, each giving 50-candle power for 3½ cubic feet of gas per hour; cost of gas, at 2s. 6d. per 1000 cubic feet. . . . . | £54 |
| Renewal of mantles (240) and extra upkeep, 3s. 6d. per burner per annum . . . . .                                                   | 14  |
| Total . . . . .                                                                                                                     | £68 |

The writer acknowledges that economies can, of course, be effected in electric lighting by the use of 8-candle lamps in places where only a little light is required, and also by making the most of the facility afforded for turning the current on and off as required. But he says these advantages are almost entirely met in the Welsbach system by the new small lamps now being supplied, which burn only 1 to 1½ cubic feet of gas per hour, and by the almost universal use of the bye-pass burner. Making all due allowance, however, for some advantage which electric lighting certainly possesses in these and other respects, he thinks we cannot help being impressed by the broad deduction from the above table, that electric lighting is twice as dear as the old gas system, and nine times as dear as the Welsbach system. When the new incandescent burners are commonly adopted, the advantage of the latter system will be further enhanced.

Dealing further with the question, Professor Lambert endeavours to meet the cases of provincial institutions which have no access to public electric mains; and he gives the following estimate representing the cost of laying down an electric generating plant and installation of 300 16-candle lamps, and the annual outlay for the maintenance of the light, together with the cost of an equivalent of gas lighting:—

*ELECTRICITY.**Outlay on Plant.*

|                                             |       |
|---------------------------------------------|-------|
| Gas-engine, 35 brake horse power . . . . .  | £300  |
| Dynamo, 25 kilowatts . . . . .              | 160   |
| Accumulators . . . . .                      | 350   |
| Lamps, switches, wire, fitting, &c. . . . . | 275   |
| Total . . . . .                             | £1085 |

*Annual Expenditure (1500 Hours).*

|                                                         |      |
|---------------------------------------------------------|------|
| Renewal of lamps, 600, at 1s. 6d. . . . .               | £45  |
| Depreciation and upkeep, 10 per cent. on £810 . . . . . | 81   |
| Labour . . . . .                                        | 40   |
| Gas and oil . . . . .                                   | 110  |
| Interest on plant, 4 per cent. on £810 . . . . .        | 32   |
| Total . . . . .                                         | £308 |

*GAS (WELSBACH INCANDESCENT BURNERS).**Annual Cost for Equal Light.*

|                                             |     |
|---------------------------------------------|-----|
| Gas at 2s. 6d. per 1000 cubic feet. . . . . | £65 |
| Renewals of mantles, &c. . . . .            | 17  |
| Total . . . . .                             | £82 |

If current had been supplied from electric mains at 6d. per Board of Trade unit, the annual cost of electric lighting, including lamp renewals, would have been . . . . . £763

Having disposed of the objections raised to gas lighting that it causes vitiation of the atmosphere, and that the Welsbach system is trying to the eyes, Professor Lambert enumerates the chief instructions given to those who manage the Welsbach lights at the Yarrow Home, attention to which has, he says, conduced to the satisfactory results obtained there. They are as follows:—

- 1.—Do not leave the gas-tap full on, but turn it back until the best light is shown. The gas-flame should just fill the mantle. Any more gas burnt gives less light, and is only wasted.
- 2.—If a black deposit of carbon should form at the top of the mantle, this is either due to a dirty burner or to too much gas being burned. Turn the gas down till the flame only fills one-half of the mantle, giving very little light; the deposit will, in a few minutes, disappear by oxidation.
- 3.—When lighting a burner at the top of the chimney, wait a few seconds after turning the gas on, and before applying the light; this prevents shock to the mantle.
- 4.—Burners, especially in dusty rooms, sometimes get clogged by dirt and give poor light. When this is the case, carefully remove the mantle from the rod; take off the gallery, and blow vigorously through the gauze, or scrub it with a brush. Remove any dust also from the gas-nipple by blowing through the air-holes at the bottom of the burner; replace and re-light. This almost invariably results in a great increase in the light.

The article concludes with the following extract from the report, recently issued, of the Richmond Public Library Committee, who, upon the advice of the writer, have substituted incandescent burners for the regenerative lamps previously in use. He thinks it should encourage those who are contemplating the installation of Welsbach lights: "The adoption of the incandescent system of gas lighting referred to in last year's report has quite satisfied all expectations as regards increased cleanliness, superior quality of the light, greater purity of the atmosphere, and reduction in the amount of gas consumed. The saving in expense by the new system during the year 1897-8 amounted to £21 13s. 4d., or 32 per cent. of the previous year's cost."

**The New Water-Works for Todmorden.**—At a recent meeting of the Todmorden Town Council, it was decided to proceed at once with the construction of new water-works for the borough on the recently acquired site at Gorpley, in the Dulesgate Valley; and Mr. G. F. Deacon was appointed the Chief Engineer.

## SALES OF STOCKS AND SHARES.

The largest room at the Auction Mart, Tokenhouse Yard, was filled to overflowing last Tuesday, when Mr. Alfred Richards, in accordance with instructions received from the Directors, offered for public competition £187,500 of ordinary stock of The Gaslight and Coke Company, issued under the provisions of the Company's Act of 1876, and of the Capital Consolidation Act of last session. The standard dividend on this class of stock will be 4 per cent. per annum, subject to the sliding-scale, under which, at the present price of gas, the authorized rate of dividend payable is £4 18s. per cent. per annum. The stock was put up in lots of £5, £50, £100, £250, £500, and £1000; and the whole of it was disposed of in less than an hour and a quarter. The highest price realized was £116 10s., and the lowest £110 10s., per £100 of stock—the average being £111 0s. 2d. On the day of the sale, the Company's old stock was quoted on the Stock Exchange at £285 to £290; but this was with the accrued dividend. As the new stock is not to be paid for in full or to carry dividend until the 1st prox., a full six months' interest should be deducted from the old stock in comparing the prices of the two. Deducting £6 2s. 6d., from the middle price gives (say) £281 7s. 6d.; yielding about £4 7s. per cent. for the stock carrying 12½ per cent. The proportionate price for the new stock would be about £112 13s.; and consequently the average realized at the sale, which was only about a point and a half below the market price of the day, may, in view of the large amount of capital being raised, be regarded as very satisfactory.

On Monday afternoon last week, Mr. M. Stainton sold by auction £8000 of new stock of the South Shields Gas Company. It was put up in lots of £100 each; the highest price realized being £212 5s., the lowest £207, and the average £208 10s. 11d. The sale produced £16,683 15s. Last Tuesday, Messrs. Kidwell and Son sold at Rochester 500 £5 shares in the Brompton, Chatham, Gillingham, and Rochester Water Company, at prices ranging from £10 6s. to £10 4s. each. The shares were a portion of the additional capital authorized by the Company's Act of the present year; the maximum dividend on them being 7 per cent. At the same auction, 29 fully-paid £5 "A" shares in the Company, bearing 10 per cent. dividend, fetched prices ranging from £15 5s. down to £15 per share. The sale of the second 1500 £5 shares of the 1898 issue of the new ordinary 5 per cent. capital of the Portsmouth Water Company took place last Tuesday evening, at the Southsea Sale Rooms of Messrs. Love and Cooper. The shares were offered in lots of five, the opening bid for which was £6 per share. The first five lots brought £7 5s. per share; then there was a drop to £7, followed by an increase to £7 2s. 6d., and again a run upon £7—about 60 lots being disposed of at this figure. The 141st lot went for £6 17s. 6d., and then £6 15s. was accepted; but the last 120 lots brought only £6 12s. 6d. The average for the whole was £6 17s. per share; and the total proceeds of the sale amounted to £10,240. On the following day, Mr. R. Reid disposed of 3000 £20 shares (7 per cent.) in the Eastbourne Water Company; being a further portion of the additional capital required for the works now in progress. The first 40 lots, consisting of five shares each, fetched £20 per share; and then the price gradually rose. But it declined afterwards to £22; the whole of the remaining lots being rapidly disposed of at par. On Thursday, two £100 debentures of the Wellington (Salop) Gas Company were sold for £150 each, which is regarded as a record price. Some 10 per cent. shares in the Salisbury Gas Company were recently sold for £26 each; and some 7 per cent. shares for £17 apiece.

## ELECTRIC LIGHTING NOTES.

The Hastings Town Council have received sanction from the Local Government Board to borrow £58,000 for purchasing the undertaking of the Hastings Electric Light Company, Limited.

Colonel A. J. Hopper held an inquiry at Rochdale last Wednesday respecting an application on the part of the Corporation to borrow £30,000 for electric lighting purposes. There was no opposition.

The Stockton Corporation last Tuesday ordered an application to the Public Works Loan Commissioners for a loan of £28,482 for the purposes of electric lighting, at 2½ per cent. interest, with the repayment extending over 25 years.

Wigan will soon be in possession of an electric lighting undertaking. The Town Council having made up their minds on the subject, it is, according to Alderman Holmes, the intention of the Electric Lighting Committee to proceed with the installation as speedily as possible.

For the purpose of increasing the generating power at their central electricity station and providing new cables, the Birkenhead Corporation are seeking the sanction of the Local Government Board to the borrowing of an additional £15,000. An inquiry into the proposed expenditure was held last Thursday by Major-General Crozier; and there was no opposition.

The report comes from Cardiff that some of the Borough Magistrates and the Coroner had experience last Tuesday evening of the vagaries of the electric light. While a Police Court was sitting at the Town Hall, and the Coroner was holding an inquiry in another part of the building, the light suddenly failed, and business had to be suspended till the fitful current returned and once more dispelled the darkness.

At the meeting of the Aberystwyth Town Council last Tuesday, Mr. R. Peake presented the report of the Public Lights Committee, which recommended the Council to enter into an agreement for two years with the Electric Light Company to supply electric energy for the lamps of the town at a yearly sum of £17 17s.; and that a penalty of 1d. per minute be enforced in the case of failure of the light. The report was adopted.

The Canterbury Town Council last Wednesday resolved to apply to the Local Government Board for a loan of £12,000 to cover the increased expenditure already incurred in connection with their electric lighting works and proposed extensions of the plant. Regarding this additional loan, the "Kent Herald" is not in the least surprised that it is required, as from the outset our contemporary has maintained that the scheme could not be carried out for the sum originally applied for.

According to the report of the Electrical Engineer, the demand for electricity in Exeter is increasing in a compound ratio, while the delay in



obtaining machinery and other requisites makes it difficult to keep pace with it. Instructions have accordingly been given to the City Surveyor and the Engineer to consider and report upon the different methods by which the capacity of the works can be increased. As there is a proposal to establish a municipal system of electric tramways in the city, the ultimate extension of the electricity works promises to be considerable. A company had been in negotiation with the Corporation, with the object of securing consent to their purchase of the existing horse tramways, and the fitting of them for electric traction. The Corporation came to the conclusion, however, that they ought to do this work themselves; and they will oppose the application of the company for a Provisional Order, and endeavour to acquire the tramways at the earliest possible date.

A memorial, signed by upwards of 5000 ratepayers and others, has been addressed to the Lord Mayor and Corporation of the City of London in support of the application made to the Board of Trade for a Provisional Order enabling the Charing Cross and Strand Electricity Supply Corporation, Limited, to supply electric energy within the City of London. The grounds for the memorial are set forth as follows: (1) That monopoly of supply by any one company is adverse to the interests of the ratepayers and the public. (2) That the rate charged for the supply of electric energy by the Corporation is very considerably less than that charged within the City by the present Supply Company. (3) That the service of the Corporation is a more economical, steady, and efficient service. (4) That the low-tension distributing system is a safer one for many reasons, among others the avoidance of fireproof transformer rooms or apparatus on the premises supplied with energy. (5) That the low-tension direct-current system appears, *inter alia*, to be the best adapted for arc lighting and motive power purposes. The memorial is signed on behalf of 29 banks, 81 insurance companies, and 82 newspaper offices.

A statement was laid before the Torquay Town Council last Tuesday of the cost of the electric light undertaking. The Corporation borrowed the sum of £22,300; but the expenditure was £24,867. Of this sum, however, £920 was spent in anticipation of future extensions, so that the actual cost of the existing works was £23,946, or £1646 in excess of the money borrowed. In explanation of the excessive expenditure, Mr. W. H. Trentham, the Consulting Engineer, wrote that the expenditure on mains would have been only £5000, or £381 less than the estimate; but as the work proceeded, the Committee authorized extensions which cost £589. Instead of 70 arc lamps, 52 were fitted; and this item was reduced by £437. The cost of the machinery at the station was increased by £840, mainly because of the change in the site; and this also increased the cost of building alterations from £750 to £1865. By this change, however, the capacity of the works can be increased by two-thirds without further expenditure upon buildings. Mr. Trentham pointed out, in conclusion, that the cost per kilowatt is only £53—"a much lower figure than in any other public works in the kingdom, in some of which the capital outlay has been very extravagant." The Council decided to defer the discussion of the report until March; it being thought unfair to the Electric Lighting Committee to review the matter now. One of the members intimated, however, that this decision would not prevent him putting a series of questions on the subject when the Council next met.

According to the "Financial News," there has been a remarkable growth in the electric lighting industry in Germany. From certain statistics just to hand, Germany boasts of 23 industrial or financial companies in connection with electricity, the capital of each of which amounts to at least 1,500,000 marks. The most important possesses a capital of 47,000,000 marks, while that of six others varies between 24,000,000 and 40,000,000 marks, five others range between 10,000,000 and 16,000,000, and eight control from 3,000,000 to 8,000,000 marks. Among the last mentioned, the Union of Berlin have just decided upon the increase of their capital from 3,000,000 to 18,000,000 marks. The share capital of these 23 concerns is 354,000,000 marks, out of which a sum of 317,000,000 marks has been paid up. But, with the debenture capital amounting to 102,160,000 marks, and the reserve funds of 36,564,714 marks, it can be stated that a total amount of 493,000,000 marks is invested in the great German electrical enterprises, not taking into consideration the numerous minor companies. The last dividend declared by 20 of these ventures has varied between 5 per cent. (minimum) and 15 per cent. (maximum); the average being 9 per cent. The following figures show the development of this branch of industry in Germany within recent years: Of the 23 great companies already mentioned, four were promoted from 1883 to 1890, seven from 1892 to 1894, four in 1895 and 1896, seven in 1897, and this year one with a capital of 1,600,000 marks. Such a rapid development naturally created great competition, which has brought about speculation to so serious an extent that German economists fear a crisis, and a subsequent reaction upon the economic life of the country.

At last Wednesday's meeting of the Leeds City Council, what is all but the final step was taken for the acquisition of the local electric supply on behalf of the inhabitants. The Parliamentary Committee recommended that, under the authority of the Leeds Order (No. 2) 1898, the Corporation create Leeds Corporation Irredeemable Stock to the amount of £217,420, bearing dividends at the rate of 5 per cent. per annum—such stock being sufficient to produce by the dividends thereon the annuity referred to in section 59 of the Leeds Order, 1891, and to be issued or transferred to the Yorkshire House-to-House Electricity Company in satisfaction of the said annuity. On this being done, it was anticipated that the undertaking could be transferred as from Thursday next, the 15th inst. The Company's expenditure on capital account up to December last was £157,000; and since that time £60,000 odd had been spent on the same account. The Corporation were compelled under their Act of Parliament to pay the Company all their capital expenditure, less such sum as the Government Auditor might set aside for depreciation, which would amount to several thousand pounds. This was a bargain made by the Corporation some years ago, and the present Council could not help carrying it out. The recommendation was adopted, as was also a motion authorizing the Parliamentary Committee to raise and pay all additional moneys which might be or become payable by the Corporation to the Company in connection with the agreement (dated the 8th ult.) between the Company and the Corporation for the purchase by the Corporation of the Company's undertaking, and in all other respects to carry out and complete the terms of the agreement with such modifications (if any) as they might deem expedient.

In direct opposition to the advice of the Lighting Committee, to whose consideration the matter had been referred, the Penzance Corporation

decided yesterday week to oppose the application of Edmundson's Electricity Corporation for a Provisional Order, and undertake the business of providing electric light themselves. The Committee appear to have been afraid that other and more urgent schemes, including the provision of a better water supply, would render it impossible for the Corporation to embark in the immediate future upon so large an enterprise as that of erecting electric light works. They were also of opinion that the clauses which the Company offered to insert in the Order, if they were unopposed, were exceptionally fair, and that at any rate, the Company might well be left to bear the risk of the first seven years. The majority of the Council, however, took the line that the Corporation ought to do the work themselves. It was suggested that a refuse destructor might be combined with a scheme of electric lighting, and a saving of £200 effected in the cost of disposing of the refuse. Another reason for the Corporation undertaking the supply of electricity was that the amount paid for public lighting would go to the credit of the Corporation, and give them at the same time a means of opposing the monopoly of the Gas Company, who were said to be charging an excessive price. One of the members thought the Corporation ought to purchase the gas-works as well as establish the electric light. It seems, however, to have been considered sufficient to undertake one of these things at present. The recommendation of the Lighting Committee that the application of Edmundson's Company for a Provisional Order should be assented to was rejected by 12 votes to 3. The Town Clerk said the Company had informed him that if the Corporation did not assent they should still deposit the Order, and fight it to the bitter end.

There was an abnormally large attendance of members at the fortnightly meeting of the Winchester Board of Guardians on the 3rd inst., when an important resolution concerning the use of gas or electricity in the workhouse was brought forward. A month ago, the Board decided, by the narrow majority of two, to introduce electric light. At the subsequent meeting, however, one of the country members (Mr. Shepherd) stated that he had only received his *agenda* a few hours before the meeting, and was unable to put off another engagement in order to attend and oppose the adoption of electricity. He therefore gave notice that he would, at the next meeting, move that the resolution passed at the meeting on the 5th of November should be rescinded. Considerable indignation was accordingly felt by the members of the Visiting Committee, who had made elaborate arrangements for the adoption of electricity, and who, it was thought by some, had exceeded their duty by inviting tenders for the work before their recommendation had been adopted. A good deal of feeling was displayed on both sides; and the discussion which took place at the meeting on the 3rd inst. was of the liveliest character. Mr. Shepherd, in moving his resolution, commented upon the manner in which the whole thing had been worked. He then alluded to the reduction the Board had effected in their gas bill the previous year by the adoption of incandescent burners; and said the inmates of the house, especially the sick and infirm, would never get used to so cold and miserable a light as that afforded by electricity. Mr. Simpkins, in seconding the motion, remarked that 9d. per unit for electricity, which the Board had decided to pay, was far too expensive. Last year, through the adoption of incandescent burners, they had saved considerably; and their last annual gas bill only amounted to £56. He had been told on good authority that the electric light would cost at least £100 a year; and, in addition to this, they would have to expend between £20 and £30 annually for the supply of gas to the engine and for disinfecting purposes. Mr. Easter pointed out that electricity had a tendency to make the atmosphere stagnant, while warmth from gas-burners caused a circulation of the air, and thereby promoted ventilation. He considered electricity was an experiment; and what right had they, he asked, to risk public money in an experiment before it had been found successful. Mr. Marks championed the cause of electricity, and offered to lend the Board £166 (the initial cost of the installation), if they would agree to give him half the savings effected in cleaning and decorating during the next ten years. Other members having spoken, the Chairman closed the discussion with a few remarks in favour of the adoption of electricity. On being put to the meeting, the motion was carried by 22 votes to 18; five members not voting.

#### METROPOLITAN WATER SUPPLY COMMISSION.

Thirty-ninth Day—Monday, Dec. 5.

(Viscount LILDAFF, Chairman, Sir JOHN E. DORINGTON, Bart., M.P., Sir G. B. BRUCE, M.Inst.C.E., Major-Gen. A. DE COURCY SCOTT, R.E., Rt. Hon. J. W. MELLOR, Q.C., M.P., Mr. A. DE BOCK PORTER, C.B., and Mr. R. LEWIS.)

The Commission sat at the Guildhall, Westminster.

The following are the Counsel engaged: Mr. POPE, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., for the New River and the Southwark and Vauxhall Companies; Mr. LITTLER, Q.C., and Mr. LEWIS COWARD for the Kent Water Company; Mr. PEMBER, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. RICKARDS for the Chelsea Water Company; Lord ROBERT CECIL for the Hertfordshire County Council; Sir JOSEPH LEASE, Q.C., M.P., for the Kent County Council and Kent Local Authorities; Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN, Q.C., for the London County Council; Sir R. NICHOLSON for the Middlesex County Council; and Mr. GABRIEL P. GOLDNEY (Remembrancer) for the Corporation of the City of London.

Mr. R. Middleton, cross-examined by Mr. BALFOUR BROWNE, said the places he had supplied with water were Honiton, Dauntsey, in Wilts, Rushton, and three county asylums near Hitchin; and at Huntingdon he had been engaged in altering the scheme. He had never constructed a large reservoir, nor such a masonry dam as was contemplated on the Upper Wye. Also he had never constructed a conduit, though he was now engaged on one. He had not had large experience in the transfer of water-works from companies to local authorities; having only once acted as arbitrator or umpire. Mr. Hunter and Mr. Fraser were responsible for the inception of the Staines scheme.

Mr. BALFOUR BROWNE: Was not the design of the Staines scheme as laid before Lord Balfour's Commission to take 300 million gallons a day



from the river, but to leave a minimum flow of 200 million gallons a day over Teddington Weir, if Nature would give it?

Witness: As regards leaving the 200 millions, yes. As to the 300 million gallons, they went up to that, but not over.

Is it not the fact that Lord Balfour's Commission did not commit themselves to the sufficiency of the 200 million gallons over Teddington Weir?—They did not say anything about it.

Were not all the floods exceeding 2300 million gallons to be rejected?—For sixteen days.

You have told the Commission that in your view any such rejection is not essential?—Yes.

So that you differ from the scheme as submitted to the Royal Commission?—I do. The total storage at Staines, according to Messrs. Hunter and Fraser, is to be 18,000 million gallons, in nine separate reservoirs; and a supply of 300 million gallons a day is contemplated.

In this scheme, was not the 300 million gallons a day to include the 130 million gallons which we roughly call the authorized draft of the London Companies?—That I am not clear about. I do not think there is anything specific on the subject in the report.

After further discussion, and a reference to the report of Messrs. Hunter and Fraser, witness said he thought it must have been included, if the minimum at Teddington was to be 200 million gallons. All the water dealt with in these reservoirs would be subjected to the processes of filtration and subsidence. Subsidence, however, was not necessary all the year round; and it would not take place when the water was delivered straight from the filter-beds.

Mr. BALFOUR BROWNE: Is it a fact that all your tables proceed upon the supposition that 35 gallons per head per day will be sufficient?

Witness: Yes.

Are you aware that in the Balfour Commission report the idea was that the average in 1931 would be only 29·73 gallons per head per day?—I do not think so. I have never understood it so.

If you look at paragraph 62 of the Commission's report, I think you will find it is so—the estimated daily supply per head in 1931?—Those are the Companies' estimates.

Mr. BALFOUR BROWNE: I am going to show that the Companies were wrong. This is what the Commission took from the Companies, as what would be required in 1931.

Mr. POPE: The Commission gave 35 gallons per head.

Mr. BALFOUR BROWNE: Now I want to show that the Commission and Mr. Middleton, in taking 35 gallons, are adopting too small a figure. The Companies at that date took a much smaller figure even than you take now—viz., 29·73 gallons. Are you aware that since the report was published in 1893, the Chelsea Company have increased their consumption by 9·6 gallons per head, the Kent Company by 1·51, the Lambeth Company by 3·18, the New River Company by 0·93, the Southwark and Vauxhall Company by 11·29, and the West Middlesex Company by 5·61?

Witness: It is quite possible; but I have not the figures before me.

Was not the average of the whole Metropolis in the year 1897 35·42 gallons per head actual consumption?—I daresay it was.

Sir G. BRUCE: Plus waste.

Mr. BALFOUR BROWNE: Plus waste. But when we deal with the consumption per head, we always include the figure of waste.

Witness: We are obliged to.

Mr. BALFOUR BROWNE (to witness): What is the good of assuming that in 1931 the consumption will only be 35 gallons per head, when we find that in 1897 it was half a gallon more, and increasing, as I have shown you, in all these different Companies?

Witness: I think, as Lord Balfour's Commission said at the time, they erred on the side of liberality in using the figure of 35; and that estimate errs still on the side of liberality.

What is the good of liberality, when we find the actual consumption is more than what they called liberality?—I think it is more than it ought to be.

Is the tendency to increase the amount per head?—I think the tendency was to increase the amount per head as regards the use of water.

And if my figures are accurate (that the Chelsea Company have in six years increased their consumption by 9·6 gallons per head, and the Southwark Company by 11·29) this tendency is shown to be towards a very rapid increase indeed?—I do not think that is a necessary proof, because the years have been ones where the consumption of water would be likely to be high. Also it may be simply that there has been a very large amount of waste in a particular district.

Do you know anything of the waste in these two Companies?—Not as to that of the Chelsea Company. With regard to the Southwark and Vauxhall Company, I think it is matter of common knowledge that they had a very leaky main.

Do you not think it would be more safe to take as the actual consumption 40 gallons per head?—No, I think 35 gallons is ample.

Now as to the total quantities required. In 1891, according to Lord Balfour's Commission, there were 171,163,383 gallons supplied to London?—I will take that.

Then in 1897 the consumption was 202,102,554 gallons?—Yes. The 171 millions was a correction made by myself of the return of the Companies of 182 million gallons. The difference was allowance for slip and short stroke of the pumps.

That shows an increase in six years of close upon 31 million gallons?—Yes.

If the rate is maintained in 1931, the consumption would be 518 million gallons a day, as against 415 million gallons a day which was the calculation of the Balfour Commission?—That may be perfectly true. But while the arithmetic of the calculation is accurate, the figure is based on the difference between the first and the last of the six years. Very often there are jumps in a particular year. In the six years named, however, the constant supply has been more extensively introduced; and this would affect the quantity consumed very considerably.

The Southwark and Vauxhall Company stated before Lord Balfour's Commission that their average daily consumption in 1931 would be 30,386,425 gallons. Do you follow this?—I do.

Before Sir Joseph Pease's Committee, which sat in 1896, when the Company asked for further powers, they said that in 1931 the average daily consumption would be, not 30 million gallons, but 63,362,840 gallons. Do you remember that?—I do not remember the figures; but I daresay you are perfectly right.

Therefore in regard to this one Company alone Lord Balfour's Commission proceeded upon half the quantity of water which the Company five years afterwards said they would require?—I do not think Lord Balfour's Commission proceeded on any such basis. The Company stated the figure; but clearly Lord Balfour's Commission did not accept it.

Take the Lambeth Company. Did they say their requirements in 1931 would be 28,411,025 gallons?—Yes.

Their average daily supply in September last was 31,891,317 gallons, according to the Water Examiner's report?—Yes; but I must at once say that the supply of one month has nothing whatever to do with the question. I want the average figure for the year, not for one month.

The New River Company said before the Royal Commission that in 1931 they would require 47,250,000 gallons. Is it not a fact that before Sir Joseph Pease's Committee in 1896, they said that in the year 1915, or 16 years earlier, they would require 77,923,000 gallons?—That is so, I believe.

Therefore, so far as these Companies are concerned, they underestimated at the time of the Royal Commission what they would require in 1931?—They over-estimated it on the latter occasion.

Mr. BALFOUR BROWNE: The over-estimate came five years later, when they were applying to Parliament for fresh powers.

Mr. PEMBER: That is what seems to me to throw suspicion on it.

In further cross-examination, witness agreed that a table put in by Sir A. Binnie showed that between 1867 and 1891 there was a total increase in the amount of water supplied of 73·59 per cent., but this introduced, among other things, the great frost. Taking the rate of increase at 2·32 per cent. per annum, and commencing with the year 1896, when the supply was at the rate of 198 million gallons a day, the requirements in 1931 might be 441 million gallons, as against 415 million gallons estimated by the Balfour Commission. But the year 1896 was not a fair one to take, because it included the great frost, when the consumption was far too large. He preferred the figures used by Lord Balfour's Commission. The Auditor in 1891 stated that the amount that had been expended by the Water Companies was £15,000,000 odd. Since 1891, there had been a further outlay of £6,320,000—or an increase of 41 per cent. Of the latter sum, £1,250,000 in respect of the Staines scheme, and £650,000 for the Southwark and Vauxhall Company, were to be used to bring the supply up from 130 to 185½ million gallons. No more water would be obtained by the expenditure of the other 4½ millions; but a good deal more would be delivered. The money was not to bring in more water; but to enable the Companies to deliver up to their capacity. The works were perfectly efficient; but they had to extend them to meet increasing demands. All the Companies, except the Kent, had been to Parliament in the last three sessions asking for further works and powers, on the ground of pressing necessity. Witness believed that the amount of 420 million gallons calculated as being available by the Balfour Commission could easily be increased.

Mr. BALFOUR BROWNE: Is it not a fact that the 52 million gallons (part of the 420 million gallons) which were to be derived from the Lea has been broken down, as regards the East London Company, on four separate occasions since the report?

Witness: The 52½ million gallons were to be furnished with proper storage; but the storage has not been provided. When it is, the quantity will be available. The storage of the East London Company was in 1891 only 610 million gallons; and to-day it is 1210 million gallons. Yet the worst breakdown of the Company was the last.

Cross-examination continued: In 1897, they got power to provide a further 1015 million gallons storage, which would raise their storage capacity to 2225 million gallons. He could not say whether, with this storage capacity, supplying 32½ million gallons a day (their average for the past six years), and giving 5,400,000 gallons a day for the navigation of the Lea, their reservoirs would have been empty on July 3 last. If this would have been so, he should think the storage contemplated in 1897 would have been insufficient. Witness, however, believed that Sir A. Binnie a short time ago said the East London Company had plenty of storage. He (witness) agreed that if the figures given were correct, the Company had not sufficient storage in 1891, because they increased it. He was rather doubtful about the reservoirs being empty on July 3 last, because he thought Counsel had ignored the supply the Company derived from wells. The Company before the Balfour Commission said they could obtain 11 million gallons daily from wells; but in August last, when at their wits end for water, the total so obtained was 9,553,000 gallons. The water, however, was available though they had not the machinery to raise it. The New River Company also told Lord Balfour's Commission that they could obtain from their existing wells and springs 34 million gallons a day. The greatest quantity obtained was 26,977,000 gallons in September last. Here also the water was available, though the machinery to take it out was not. Pumping from wells in the Lea Valley had a very limited effect upon the flow of the Lea. The water-level of London in the chalk was falling at the rate of 12 to 18 inches per annum. This was because more water was taken out than could get in, owing to the slipping of the clay over the chalk. The effect of this slipping was to some extent to retard the flow of the water in the chalk, and throw it out where the pressure occurred. If they relieved the slipping, by making underground channels or pumping, to some slight extent they could facilitate the water in getting out of the chalk. The ground east of the Lea basin and north of the Thames, as regarded well-sinking, might be ignored in any inquiry into the future water supply of London. He agreed that the rest-level of the Lea Bridge well was 10 feet, and of the Walthamstow well 15 feet, below Ordnance datum; but he doubted whether the rest-level at the South end of the Lea Valley was depressed by exhaustive pumping under London. If the figures given indicated the true rest-level, the chalk water in the lower part of the Lea Valley could not, as he had contended, be flowing into the Thames or into the sea; but the rest-level of a well was not always the rest-level in the stratum. Witness was certain it was impossible for a well to deplete above the limit of its cone of exhaustion, which limit might extend a little beyond a mile. As wells extended in the Lea Valley for about ten miles, within this ten miles, and a mile on either side, the Companies might be drying Hertfordshire. The Kent Company had only been pumping as a maximum 18,686,384 gallons out of 27½ millions they said they could get; but he was not aware that Kentish streams as a consequence were being dried. He believed that a large further quantity of water could be obtained from East Kent. He based this belief on a statement



in the Balfour report. He was not aware of the results since 1893 of gaugings of springs and observation of 400 wells there.

The CHAIRMAN, addressing Mr. Balfour Browne, said the cross-examination seemed to tend to show that the supplies of water enumerated by Lord Balfour's Commission were not reliable; that the needs of the Companies were more than they had estimated; and that consequently the urgency of going to Wales was demonstrated.

Mr. BALFOUR BROWNE assented.

The CHAIRMAN went on to ask him to remember that the present Commission had nothing at all to do with deciding the question whether the water in the Thames or Lea would be sufficient for the future wants of London or not. If Counsel satisfied the Commission that they must go to Wales, possibly that would be an argument against the Commission's sole subject of inquiry—viz., the financial expediency of purchase—because that might lead to larger expenditure on the part of the purchaser.

Mr. BALFOUR BROWNE thought if he could show what the cost of the Staines scheme would be on completion, it would bear on the question.

The CHAIRMAN: That is quite open to you.

Mr. BALFOUR BROWNE said Mr. Middleton had gone beyond the Balfour Commission report, and said he could go on beyond 1931; whereas he (Counsel) held that they must anticipate this time—that the money at present expended would not meet the wants until 1931, and that anybody in charge of the water supply, whether the County Council or the Companies, or anybody else, would have a large expenditure to meet soon.

The CHAIRMAN remarked that this would not diminish the cost of purchasing the Companies as they stood; it would only add to the future expense.

Mr. BALFOUR BROWNE said then it would come to this: Whether it was not financially expedient to pass these concerns into the hands of the body who could do the work most cheaply.

Cross-examination continued: He did not think the existing or future population of the Thames Valley would have any injurious effect on the river, even though it might number 1,463,000 persons in 1931, and the sewage discharge be 29½ million gallons daily, or 7½ per cent. of the dry weather flow. If 400 million gallons daily were taken from the Thames in a year like 1893, the flow would be reduced to 200 million gallons or less on rather more than 200 days; in a year like 1898, on 137 days, or perhaps a few more. There had been only ten days in any year when the natural flow of the river was below 200 million gallons.

It had been as low as 43 million gallons, and there were no complaints. In 1893, the period of the drought was greater than in 1898; but in the latter year it was more intense. The flow of 200 million gallons over Teddington Weir would have little scouring effect. The existence of the upper part of a tidal river depended on the flood-water, if not on the fresh water flowing down. Without fresh water, there would be no downward action. Filter-beds required cleaning at frequent intervals—how often depended on the state of the river. He believed they were cleaned usually at periods of from 14 to 28 days. On the average, there were two grains per gallon (70,000 parts) of matter suspended in river water. Possibly there might be from 2.1 to 2.6 parts per 100,000 parts in Loch Katrine water; but there was a large amount of peaty matter in this water. At the maximum, the matter would be three or four times as much. Witness had known reservoirs that had been for 19, 18, 12, and 23 years without cleaning. He calculated the net storage to supply 300 million gallons daily at 29,602 million gallons, as compared with Messrs. Hunter and Fraser's figure of 18,000 million gallons; the difference being due to the droughts of 1893 and 1898, of which Messrs. Hunter and Fraser had had no experience. Notwithstanding this enormous difference, his estimate for the total quantity was £8,618,000; while Messrs. Hunter and Fraser's was £9,702,000. A number of cases were then put to witness in which he had estimated the cost per million gallons of water under the Staines scheme at a certain figure, and then for extra quantities under the same scheme calculated the cost at a much lower figure per million gallons. He explained that the difference was due to the fact that the first estimate included works which would benefit subsequent supplies. Asked how it was that Messrs. Hunter and Fraser, for only 18,000 million gallons of storage, with necessary pumping power, allowed £5,391,000, while he, for 29,602 million gallons of storage, allowed £5,778,000, witness said with the original reservoirs as designed by Messrs. Hunter and Fraser it was proposed to excavate to a distance of from 10 to 11 feet, to take so much of the excavated earth as was required to make the banks, and to run the remainder to spoil. With the present reservoirs, the excavation would be limited to that which was required to make the banks, and thus a great deal would be saved. The Staines reservoirs, as being constructed, would supply under the conditions of 1893 a much larger quantity than the limit of 35 million gallons imposed by the Act of 1896.

The Commission adjourned.

The fortieth sitting of the Commission was held yesterday at the Guildhall, Westminster—Lord Llandaff presiding—when Mr. Reginald E. Middleton attended for further cross-examination by Mr. Balfour Browne, on behalf of the London County Council, with regard to his estimates concerning the Staines and Welsh schemes.

#### THE VIEWS OF THE METROPOLITAN VESTRIES AND DISTRICT BOARDS ON THE FUTURE CONTROL OF THE WATER SUPPLY.

In the "JOURNAL" for the 29th ult., we gave the result of an inquiry instituted by the Battersea Vestry with the object of ascertaining the views of the various Vestries and District Boards as to the future control of the London water undertakings. As already mentioned, the preponderating opinion is in favour of a Water Trust or other central authority; and it was ascertained in reply to the following questions: (1) Are you in favour of the water supply being vested in a public authority; (2) if so, in what authority, and how should it be constituted; and (3) are you prepared to assist in the promotion of a Bill in Parliament dealing with the question. Taking the answers of the Vestries in alphabetical order, the Battersea Vestry think the supply should be vested in the London County Council. The Bermondsey Vestry consider

that it should be managed by a Water Trust elected from the City Corporation, the London County Council, the Thames Conservancy, the Vestries and District Boards, and all the governing bodies in Greater London whose districts are supplied by the Water Companies. The Camberwell Vestry think the supply should be under the control of a body representing the ratepayers, and not in the hands of private Companies; such body to be directly elected by the ratepayers. The Clerkenwell Vestry are of opinion that the supply should be placed in the hands of an authority under the Government; while the Fulham Vestry think it should be in the hands of "the central authority," and the Hackney Vestry in the possession of the London County Council. The Hammersmith Vestry consider that a central authority should be created, to be elected from members of the City Corporation, the London County Council, and the Sanitary Authorities of the Metropolis; and the Hampstead Vestry think the water supply should be vested in a public central authority. The Islington Vestry favour the London County Council. The Kensington Vestry think no action should be taken in regard to the question, in view of the proceedings of the Royal Commission. The Vestry have previously dissented from the purchase of the undertakings by the County Council; rather favouring legislation which would secure to the water consumer some more effective control without purchase. The Lambeth Vestry consider the supply should be placed in the hands of a local authority chosen by parochial electors for the whole of the area supplied. The Newington Vestry, like Islington, favour the London County Council as the possessors of the supply. The Plumstead Vestry declined to express any opinion pending the report of the Royal Commission. The Rotherhithe Vestry consider that a Water Trust should be created by the Government, upon which the Metropolitan Sanitary Authorities would be represented. The Vestry of St. George's, Hanover Square, are of opinion that Parliament should empower the London County Council or some central authority to provide water for the people; while the Vestries of St. George's, Southwark, and St. Luke's, Middlesex, consider that the supply should be vested in the London County Council. The St. Martin's-in-the-Fields Vestry think the supply should be in the hands of a public authority; but they regard the matter as not ripe for the consideration of details. The Vestry of St. Marylebone hold the view that there should be a central authority, but that it should not be the London County Council. St. Pancras and Shoreditch, on the other hand, think the Council should own the supply. The Vestry of Stoke Newington are of opinion that the supply should be in the hands of an authority composed of representatives comprised within the area served. The Vestry of St. James's, Westminster, hold the view that the London County Council should be placed in the position of trustees, with obligations to ratepayers and consumers alike.

The questions were put to nine Boards of Works in the Metropolis. The Holborn Board consider that the water supply should be vested in an authority specially constituted for the purpose, such as a Water Board or Trust. The Lee Board think the water undertakings should be managed and controlled in conjunction with the Companies by representatives of the London County Council, the City Corporation, the Councils of all other counties and the Vestries and District Boards within the limits of supply. The Limehouse Board favour the formation of a Water Trust, consisting of members directly elected by the people in the areas affected; whereas the neighbouring Board of Poplar consider the supply should be vested in the County Council. The St. Giles Board are not in favour of the supply being in the hands of a public authority. The St. Olave's Board think an authority, consisting of the London County Council and representatives of local bodies outside the county, should own the water supply; while the St. Saviour's Board are of opinion that the control of the supply should be vested in a corporation composed of representatives elected by the several County Councils. The Strand District Board thought the control should be placed in the hands of a central authority; but the Board are not prepared to express any further opinion pending the report of the Royal Commission. The Whitechapel Board consider that a competitive supply should be provided, or the whole supply taken over by a body directly representative of the ratepayers.

With regard to the question of promoting a Bill to deal with the water question, the majority of the authorities who have replied state that they have no legal power to render any financial assistance in the matter.

**The Stockton and Middlesbrough Water Scheme.**—It is understood that at a private meeting of the General Purposes Committee of the Middlesbrough Corporation last Thursday, it was resolved to recommend the Council to authorize the Stockton and Middlesbrough Water Board to proceed with their Bill in Parliament for additional powers, provided they can get an increased charge for water supplied to the large consumers. From a recent return of the accounts of the Board, it is to be seen that the average price per 1000 gallons realized from the large consumers last year was 3.7066d., and from domestic consumers 8.3112d.; the average being 4.7673d. The cost for working expenses, &c., is 1.0546d. per 1000 gallons; but interest and redemption last year amounted to 4.7641d. per 1000 gallons—practically equal to the average revenue. Thus there is a loss of 1.0514d. per 1000 gallons; and it is to avoid this demand upon the rates of the constituent authorities that the Middlesbrough Council wish the Board to secure an increased income from the large consumers.

**The Wages Question at the Darlington Gas-Works.**—The Sub-Committee appointed at a recent meeting of the Darlington Town Council to investigate the matter of the application of the men at the gas-works for an increase of wages, met a deputation from the latter last Wednesday. The deputation, which consisted of ten or eleven men, was headed by Mr. Lynas, the District Secretary of the Gas Workers' Union, who acted as spokesman. Besides the members of the Sub-Committee, there were present the Town Clerk (Mr. H. G. Stevenson), the Engineer (Mr. T. Smith), and the Manager of the works (Mr. F. P. Tarrat). Mr. Lynas placed the case for the men before the Sub-Committee, quoting the rates of wages paid at Sunderland, Newcastle, and South Shields. The request in effect is for an advance of wages of 2s. per week all round; the men involved being the stokers, the cokemen, the fire cleaners, the coal wheelers, the boilermen, the labourers, &c., numbering over 100. It was intimated to the deputation that the Sub-Committee would look into the application and give an answer in due course. The interview lasted about an hour.



NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Corporation of Glasgow on Thursday adjusted the clauses of their Gas and other Bills for the next session of Parliament. So far, there does not appear to be any opposition to any of the measures. On the Gas Bill, the first 32 clauses were adopted without comment, which says a great deal for the skill of the draftsman in interpreting the wishes of the Corporation. In some smaller corporations, I fancy, the passing of so many clauses without discussion or explanation would have been looked upon as little short of a scandal. In Glasgow, however, the multitude of subjects before any one meeting of the Corporation, precludes the notion of each member speaking his mind upon every question, for the benefit of the ratepayers—or for his own glorification—as seems to be the practice in some municipalities. The clauses following the 32nd deal with electricity; and one or two remarks were made regarding supplies beyond the city boundaries. Bailie W. F. Anderson suggested that there should be a differential rate on outside users of electricity. He thought it strange that the community of Glasgow should take all the risk of such undertakings, and that outsiders should participate in the advantages. Mr. A. Murray asked whether they would be obliged to supply gas or electricity beyond the city boundaries. Replying to these questions, Sir James Marwick, the Town Clerk, said that Parliament had already laid down the principle that if they supplied gas (and electricity would be in the same position), there must be no differential rate. They were not obliged to supply beyond the boundaries of the city.

On Tuesday, the Dundee Town Council adjusted the clauses of their Bill, in which, among other provisions, power is taken to enlarge the gas-works. As drafted, the Bill proposed that the cost of the promotion of it should be borne by the Town Council. The Corporation, however, considered that, as the Gas Commissioners had so large an interest in the Bill, in the way of having the new ground required for extensions legalized, they should bear a reasonable share of the cost. The clause was accordingly altered so as to make the Gas Commissioners bear one-third of the expense of the Bill. This is quite reasonable.

The vacancy in the gas manership of Falkirk was advertised, according to the resolution of the Committee, in the "Scotsman" and "Glasgow Herald" newspapers. Assuredly it was not the prodigality of the Commissioners in the making of their want known to the class whom they wished to reach which led to a large number of replies being received. Questions of personal friendship—perhaps of personal interest—must have led to the circulation, far and wide, of the fact that a manager was wanted for the Falkirk Gas-Works. The time given was short. It was only on Nov. 23 that the Committee instructed the advertisements to be issued; and replies were required to be in by the 2nd inst. This gives nine days, including Sunday—not a very long time in which to send out intimations, and for applicants to get together testimonials and have them printed and forwarded. Expedition in matters of this sort is good for all concerned; but this is, to my mind, going a little too fast, and may lead to the giving of some credence, which would not otherwise

have been the case, to the statement that the man had been already selected. The salary offered is not less than £230, to include everything; the Committee having resolved to discontinue the practice of giving an allowance for house and gas. It is not a princely sum for a rising place like Falkirk; but it has brought forward, according to Bailie Cook Rennie, applications from gentlemen in almost every town in Scotland, and from some places in Ireland. The applications, he said, were so numerous, and the testimonials so voluminous, that the Committee, who had hoped to bring forward a list of candidates whom they considered eligible on Monday last (the 5th inst.), had been unable to do so. They had adopted the method of sending the applications and testimonials round the members of the Committee, so that everyone should be examined carefully, and there should be no respect of persons—every man being judged according to his merits. The only difficulty the Committee had now, Bailie Rennie said, was in fixing, among so many good men, who was the best. This took place at a meeting of the Town Council on Monday. On Thursday, the Committee met and drew up a short list of candidates. Three names were agreed upon; Mr. J. Kincaid, of Peterhead; Mr. J. M'Nair, of Wishaw; and Mr. T. Lighbody, of Renfrew.

The subject of the lighting of Cowdenbeath was before the Police Commission of the burgh on Thursday night. The Committee in charge of the matter reported that they had had three schemes before them, and that they had agreed to ask a Glasgow firm the terms upon which they would be prepared to fit up an electric installation. The firm replied; and the Committee were of opinion that the estimated cost was too great to justify them in recommending such a scheme to the Commissioners. At the request of the Committee, the whole subject was recommitted to them. The Clerk reported that the Gas Company were now supplying oil gas, and were likely to do so for some weeks at least.

At certain times there is an outbreak of abuse of railway companies for not supplying a sufficient number of waggons for the conducting of the coal traffic of the country. Whenever this symptom appears, one may be certain that prices for coal are disposed to rise. It is better that the reason why waggons are sometimes scarce should be known. There may be, and probably there are, more causes than one; but the principal reason is to be found in the practice which exists of large coalowners having waggons of their own. The railway companies rely upon having the service of these waggons; and they do have the use of them in ordinary times. But there come periods when an advance in prices is looked for; and traders' waggons are loaded up and run into sidings, ready to be rushed into the market when the desired price is obtained. The railway companies are then called upon to furnish waggons to take up the running in place of those standing idle; and they are unable to do so. One of these crises is on just now. Doubtless gas managers will be suffering inconvenience in the delivery of coal. It is right, therefore, that they should be able, in the matter of liability for non-delivery, to put the saddle on the right horse. It may also be of service to them to know that, when such outcries arise, coal is about to be dearer.

A report by Professor Frankland, of Birmingham, upon the water supply of Paisley, which had been sought on account of a recent outbreak of typhoid fever, has been submitted to the Local Authority. In a summary

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1347.

| Issue.         | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME.                      | Closing Prices. | Rise or Fall in Wk. | Yield upon Invest. ment. | Issue.           | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME.                            | Closing Prices. | Rise or Fall in Wk. | Yield upon Invest. ment. |
|----------------|--------|-------------------|-------------------------------|----------------------------|-----------------|---------------------|--------------------------|------------------|--------|-------------------|-------------------------------|----------------------------------|-----------------|---------------------|--------------------------|
| £              |        |                   | p. c.                         |                            |                 |                     | £ s. d.                  | £                |        |                   | p. c.                         |                                  |                 |                     | £ s. d.                  |
| GAS COMPANIES. |        |                   |                               |                            |                 |                     |                          |                  |        |                   |                               |                                  |                 |                     |                          |
| 590,000        | 10     | Oct. 13           | 10½                           | Alliance & Dublin 10 p.c.  | 21-22           | +½                  | 4 15 5                   | 75,000           | 5      | Nov. 30           | 6                             | Malta & Medn., Ltd.              | 43-51*          | ..                  | 5 14 3                   |
| 100,000        | 10     | "                 | 7½                            | Do. 7 p.c.                 | 16-17           | ..                  | 4 8 3                    | 541,920          | 20     | Nov. 11           | 5                             | Monte Video, Ltd.                | 18-14           | ..                  | 7 2 10                   |
| 800,000        | 100    | July 1            | 5                             | Australian 5 p.c. Db.      | 105-107         | ..                  | 4 13 6                   | 617,946          | Stk.   | Aug. 31           | 9½                            | Newcastle & Gateshead Con.       | 232-235         | ..                  | 4 2 8                    |
| 200,000        | 5      | Nov. 11           | 6                             | Bombay, Ltd.               | 61-63           | ..                  | 4 2 11                   | 252,355          | Stk.   | Jan. 3            | 3½                            | Do. 3½ p.c. Db. Stk.             | 113-117         | ..                  | 2 19 10                  |
| 40,000         | 5      | "                 | 6                             | Do. New, £4 paid           | 42-43           | ..                  | 5 1 1                    | 150,000          | 5      | Nov. 30           | 8                             | Oriental, Ltd.                   | 7-7½            | ..                  | 5 6 8                    |
| 880,000        | Stk.   | Aug. 12           | 12                            | Brentford Consolidated     | 275-280         | ..                  | 4 5 9                    | 135,000          | 5      | "                 | 8                             | Do. New, £410s. pd.              | 61-63           | ..                  | 5 6 8                    |
| 240,000        | "      | "                 | 9                             | Do. New                    | 210-215         | ..                  | 4 3 9                    | 15,000           | 5      | "                 | 8                             | Do. do. 1879, £1 pd.             | 13-15           | ..                  | 4 11 5                   |
| 50,000         | "      | "                 | 5                             | Do. 5 p.c. Prf.            | 140-145         | ..                  | 3 9 0                    | 60,000           | 5      | Sept. 29          | 7                             | Ottoman, Ltd.                    | 5-5½            | ..                  | 6 6 2                    |
| 159,375        | "      | June 10           | 4                             | Do. 4 p.c. Db. Stk.        | 130-135         | ..                  | 2 19 3                   | 500,000          | 100    | Dec. 1            | 6                             | People's Gas & 2nd M. of Chicago | 102-106         | ..                  | 5 13 2                   |
| 220,000        | Stk.   | Sept. 15          | 11½                           | Brighton & Hove Orig.      | 263-268         | ..                  | 4 5 10                   | 848,070          | 10     | Oct. 13           | 6                             | River Plate Ord.                 | 9-9½            | ..                  | 6 6 4                    |
| 226,320        | "      | "                 | 8½                            | Do. A. Ord. Stk.           | 190-195         | ..                  | 4 7 2                    | 250,000          | Stk.   | June 29           | 4                             | Do. 4 p.c. Db. Stk.              | 99-101          | -½                  | 3 19 3                   |
| 935,500        | Stk.   | Aug. 31           | 5                             | Bristol, 5 p.c. max.       | 125-130         | ..                  | 3 16 11                  | 250,000          | 10     | Sept. 29          | 10                            | San Paulo, Ltd.                  | 15-16           | ..                  | 6 5 0                    |
| 420,000        | 20     | Sept. 29          | 10                            | British                    | 484-494         | -½                  | 4 10 0                   | 135,000          | Stk.   | Sept. 15          | 10                            | Sheffield A.                     | 242-245         | ..                  | 4 1 8                    |
| 50,000         | 10     | Aug. 12           | 11½                           | Bromley, Ord. 10 p.c.      | 25-27           | ..                  | 4 5 2                    | 209,053          | "      | "                 | 10                            | Do. B.                           | 242-245         | ..                  | 4 1 8                    |
| 75,000         | 10     | "                 | 8½                            | Do. 7 p.c.                 | 20-22           | ..                  | 3 17 3                   | 447,427          | "      | "                 | 10                            | Do. C.                           | 242-245         | ..                  | 4 1 8                    |
| 500,000        | 10     | Oct. 13           | 6                             | Buenos Ayres (New) Ltd     | 92-10           | ..                  | 6 0 0                    | 5,600,000        | Stk.   | Aug. 12           | 5½                            | South Metrop., 4 p.c. Ord.       | 137-140         | -1                  | 3 16 1                   |
| 98,122         | Stk.   | June 29           | 4                             | Do. 4 p.c. Db. Stk.        | 98-100          | ..                  | 4 0 0                    | 1,460,000        | Stk.   | July 14           | 3                             | Do. 3 p.c. Db. Stk.              | 102-105         | ..                  | 2 17 2                   |
| 150,000        | 20     | July 14           | 8½                            | Cagliari, Ltd.             | 29-30           | ..                  | 5 10 0                   | 60,000           | Stk.   | Aug. 31           | 12                            | Tottenham and J. A.              | 280-290         | ..                  | 4 2 9                    |
| 100,000        | 10     | Sept. 29          | 7                             | Cape Town & Dis., Ltd.     | 14-15           | ..                  | 4 13 4                   | 60,000           | "      | "                 | 9                             | Edmonton J. B.                   | 200-210         | ..                  | 4 5 9                    |
| 50,000         | 50     | Nov. 2            | 13                            | Do. 6 p.c. 1st Mort.       | 57-59           | ..                  | 5 1 8                    | 182,380          | "      | June 10           | 7                             | Tuscan, Ltd.                     | 10-11           | -½                  | 6 7 3                    |
| 550,000        | Stk.   | Oct. 13           | 13½                           | Commercial Old Stock.      | 310-315         | ..                  | 4 5 9                    | 149,900          | 10     | July 1            | 5                             | Do. 5 p.c. Dbs. Red.             | 160-163         | ..                  | 4 17 1                   |
| 200,750        | "      | "                 | 10½                           | Do. New do.                | 240-245         | ..                  | 4 5 9                    | WATER COMPANIES. |        |                   |                               |                                  |                 |                     |                          |
| 200,750        | Stk.   | June 10           | 10½                           | Do. 4½ p.c. Db. dc.        | 147-152         | ..                  | 2 19 3                   | 746,164          | Stk.   | June 29           | 10½                           | Chelsea, Ord.                    | 313-318         | ..                  | 3 6 0                    |
| 800,000        | Stk.   | June 10           | 10½                           | Continental Union, Ltd.    | 205-210         | ..                  | 4 15 3                   | 150,000          | "      | "                 | 5                             | Do. 5 p.c. Prf.                  | 170-175         | ..                  | 2 17 2                   |
| 200,000        | "      | "                 | 7½                            | Do. 7 p.c. Prf.            | 190-195         | ..                  | 3 11 10                  | 160,000          | "      | "                 | 4½                            | Do. 4½ p.c. Prf. Stk., 1875      | 148-152         | ..                  | 2 19 3                   |
| 51,600         | Stk.   | Aug. 31           | 14                            | Croydon A 10 p.c.          | 305-310         | ..                  | 4 10 4                   | 175,785          | "      | Sept. 29          | 4½                            | Do. 4½ p.c. Db. Stk.             | 157-162         | +2                  | 2 15 7                   |
| 168,400        | "      | "                 | 11                            | Do. B 7 p.c.               | 255-265         | ..                  | 4 3 0                    | 1,720,560        | Stk.   | Oct. 13           | 7                             | East London, Ord.                | 212-217         | ..                  | 3 4 6                    |
| 555,000        | Stk.   | Aug. 12           | 5½                            | Crystal Palace Ord. 5 p.c. | 125-130         | ..                  | 4 0 9                    | 654,740          | "      | June 29           | 4½                            | Do. 4½ p.c. Db. Stk.             | 158-162         | ..                  | 2 15 7                   |
| 60,000         | "      | "                 | 5                             | Do. 5 p.c. Prf.            | 140-145         | ..                  | 3 9 0                    | 390,000          | "      | "                 | 3                             | Do. 3 p.c. Db. Stk.              | 103-105         | ..                  | 2 17 2                   |
| 486,090        | 10     | July 28           | 11                            | European, Ltd.             | 23-24           | ..                  | 4 11 8                   | 700,000          | 50     | June 29           | 7                             | G'd Junction, 10 p.c. max.       | 115-118         | ..                  | 3 3 7                    |
| 354,060        | 10     | "                 | 11                            | Do. £7 10s. paid           | 17-18           | ..                  | 4 11 9                   | 310,000          | Stk.   | Sept. 29          | 14                            | Do. 4 p.c. Db. Stk.              | 138-143         | ..                  | 2 15 11                  |
| 5,922,230      | Stk.   | Aug. 12           | 12½                           | Gaslight & Coke, A. Ord    | 285-290         | +2                  | 4 4 6                    | 708,000          | Stk.   | Aug. 12           | 14                            | Kent                             | 365-370         | ..                  | 3 15 8                   |
| 100,000        | "      | "                 | 4                             | Do. B, 4 p.c. max.         | 120-125         | ..                  | 3 4 0                    | 160,000          | "      | "                 | 7                             | Do. New, 7 p.c. max.             | 212-217         | ..                  | 3 4 6                    |
| 665,000        | "      | "                 | 10                            | Do. C, D, E, 10 p.c. Prf.  | 308-313         | ..                  | 3 3 11                   | 1,043,800        | 100    | June 29           | 10½                           | Lambeth, 10 p.c. max.            | 300-305         | ..                  | 3 8 10                   |
| 30,000         | "      | "                 | 5                             | Do. F, 5 p.c. Prf.         | 152-157         | ..                  | 3 3 8                    | 406,200          | 100    | "                 | 7½                            | Do. 7½ p.c. max.                 | 230-235         | ..                  | 3 9 10                   |
| 60,000         | "      | "                 | 7½                            | Do. G, 7½ p.c. do.         | 233-238         | ..                  | 3 3 0                    | 350,000          | Stk.   | Sept. 29          | 4                             | Do. 4 p.c. Db. Stk.              | 138-143         | ..                  | 2 15 11                  |
| 1,300,000      | "      | "                 | 7                             | Do. H, 7 p.c. max.         | 195-200         | ..                  | 3 10 0                   | 500,000          | 100    | Aug. 12           | 12½                           | New River, New Shares            | 432-437         | ..                  | 3 0 8                    |
| 463,000        | "      | "                 | 10                            | Do. J, 10 p.c. Prf.        | 308-313         | ..                  | 3 3 11                   | 1,000,000        | Stk.   | July 28           | 4                             | Do. 4 p.c. Db. Stk.              | 138-143         | ..                  | 2 15 11                  |
| 476,000        | "      | "                 | 6                             | Do. K, 6 p.c. Prf.         | 165-190         | ..                  | 3 3 2                    | 902,300          | Stk.   | June 29           | 7½                            | Southw'k & V'xhall, Ord.         | 177-183         | +7                  | 4 2 5                    |
| 1,061,150      | "      | June 10           | 4                             | Do. 4 p.c. Db. Stk.        | 131-133         | ..                  | 3 0 2                    | 126,500          | 100    | "                 | 7½                            | Do. do. 7½ p.c. max.             | 167-172         | +5                  | 4 7 3                    |
| 294,750        | "      | "                 | 4½                            | Do. 4½ p.c. do.            | 148-153         | ..                  | 2 18 10                  | 489,200          | Stk.   | "                 | 5                             | Do. do. 5 p.c. Prf.              | 170-173         | ..                  | 2 17 10                  |
| 958,000        | "      | "                 | 6                             | Do. 6 p.c. do.             | 155-200         | ..                  | 3 0 0                    | 1,019,585        | "      | Oct. 13           | 4                             | Do. 4 p.c. A Db. Stk.            | 138-143         | ..                  | 2 15 11                  |
| 70,000         | 10     | Nov. 11           | 8                             | Hongkong & China, Ltd.     | 134-141         | ..                  | 5 10 4                   | 1,155,066        | Stk.   | June 10           | 10                            | West Middlesex                   | 295-300         | ..                  | 3 6 8                    |
| 3,800,000      | Stk.   | "                 | 10                            | Imperial Continental       | 222-226         | ..                  | 4 8 6                    | 200,000          | "      | Sept. 15          | 4½                            | Do. 4½ p.c. Db. Stk.             | 162-165         | ..                  | 2 14 7                   |
| 276,400        | 100    | Aug. 2            | 4                             | Do. 4 p.c. Dbs. Red.       | 98-101          | ..                  | 3 19 3                   | 200,000          | "      | "                 | 3                             | Do. 3 p.c. Db. Stk.              | 102-105         | ..                  | 2 17 2                   |
| 473,600        | Stk.   | Aug. 12           | 3½                            | Do. 3½ p.c. Db. Stk.       | 102-105         | ..                  | 3 6 8                    | * Ex div.        |        |                   |                               |                                  |                 |                     |                          |
| 560,000        | 100    | Oct. 1            | 5                             | Met. of Mel. 5 p.c. Db.    | 110-112         | ..                  | 4 9 3                    |                  |        |                   |                               |                                  |                 |                     |                          |
| 250,000        | 100    | "                 | 4½                            | bourne J 4½ p.c. Db.       | 105-107         | ..                  | 4 4 1                    |                  |        |                   |                               |                                  |                 |                     |                          |

† Next dividend will be at this rate.



of his investigations he states that, "while the results do not actually prove a connection between the water supply and the recent epidemic, they are obviously quite in harmony with the existence of such a connection; that, on general grounds, the water in the dead ends of mains is most calculated to cause mischief, because in the event of any dangerous contamination of a water supply having taken place, the morbid material (typhoid bacilli) will tend not only to accumulate in such areas of sluggish circulation, but they will also remain there for a longer period of time than in any other part of the network of mains. The water consumer in such an area will, therefore, not only be more likely to receive typhoid bacilli, but will receive them in larger numbers and over a longer period of time; and there is thus a greater probability of his infection being secured. These considerations show the high importance of the regular and frequent flushing of all such dead ends being carried out, and the serious danger to the water consumer of any want of attention to this duty." The Professor adds that the system which prevails in Paisley, of making a direct connection between the water-mains and the sewers, is one of the most serious breaches of the laws of hygiene which he has met with in the whole course of his experience, and which it is impossible to condemn in sufficiently strong terms. He has no hesitation in saying that it is the imperative duty of the sanitary authority to see that every single connection of this kind is forthwith abolished. As the result of Professor Frankland's investigation, Dr. Donald, the Medical Officer of Health for the burgh, feeling that his conclusions as to the cause of the epidemic have been established, and taking into account the opposition he received to his proposals for the improvement of the sanitary arrangements in the burgh, has tendered his resignation.

#### CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Dec. 10.

**Sulphate of Ammonia.**—There has been a quiet market all through the week; and prices have been barely maintained—the closing quotations being £9 18s. 9d. to £10 per ton f.o.b. at the ports. Consumers continue to buy in fair quantity for prompt and early delivery; but dealers have for the most part bought sparingly. In the forward position, makers' quotations remain at £10 5s. per ton, ordinary terms, f.o.b. Leith, and at £10, Beckton terms, London. But speculators are quoting abroad at about the equivalent of spot prices for near months; and a moderate amount of business has resulted.

**Nitrate of Soda** is a shade weaker in the forward position; but on spot quotations remain at 7s. 6d. per cwt. for good, up to 7s. 7½d. per cwt. for fine, quality.

LONDON, Dec. 10.

**Tar Products.**—There is no change of any moment in the position of the various articles constituting this market. Benzol continues its dull, uninteresting way. Pitch is moderately steady, although most producers are fully sold, and have no interest in the market operations in this article which dealers now and again import into it. Creosote continues firm;

and the same may be said of heavy tar oils generally. Carbolic acid is in fair request, but shows no inclination to better prices, which it was hoped might come with the autumn of this year. The outlook, however, is undoubtedly healthy, and production is taken up. Anthracene is nominally quoted weaker; but the very best "A" makes are not being offered at anything like the price mentioned below. The naphthas are moving freely without any change in price. Tar is reported weaker; and distillers who have bought at high prices must be having a poor time.

To-day's values are: Tar, 14s. to 19s. 6d. Pitch, east coast, 24s. 6d.; west coast, 22s. Benzols, nominal, 90's and 50's, 8½d. Toluol, 1s. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 2d. Crude, 30 per cent., naphtha, 3½d. Creosote, 3d. Heavy oils, 50s. Carbolic acid, 60's, 1s. 10½d. Creosote salts, 30s. Anthracene, nominal, "A," 3½d.; "B," 2½d.

**Sulphate of Ammonia** is only in indifferent request. Makers, however, are generally firm in their notions of value; and quantities for spot or early forward delivery cannot be obtained under £9 16s. 3d. to £10, according to port and conditions of delivery—in all cases less 3½ per cent. discount.

#### COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—A strong healthy tone is maintained throughout the coal trade of this district, with a brisk inquiry for all descriptions of fuel. Many of the pits are working six days per week; while the general average is ten to eleven days per fortnight. The better qualities of round coal are now moving off freely for house-fire purposes; and, with low stocks at most of the collieries, the advent of a period of exceptionally severe weather would probably raise a difficulty in meeting requirements at not a few of the pits. List prices remain without quotable change, but are exceedingly firm at the maximum rates. Steam and forge coals are also in active demand for both inland requirements and shipment. Merchants and consumers in many cases are just now placing orders to cover themselves for next year, so as to provide against contingencies usually brought about by the holiday stoppages of the pits. Prices are decidedly hardening for good qualities of steam and forge coal, which, for inland sale, are fetching 7s. 9d. to 8s. 3d. per ton at the pit; and for shipment, 9s. and 9s. 6d. up to 10s. in special cases, for delivery at the ports on the Mersey or the Manchester Ship Canal. The advance in engine fuel reported last week has not in any way checked inquiry; and only in very isolated instances have customers raised objection to the higher rates. Supplies of the better descriptions of slack continue short to meet the requirements of merchants and consumers; and orders in excess of what collieries are able to entertain, still come forward at the advanced rates, with the result that here and there the tendency is towards still further hardening, where new business from outside quarters is offered. Ordinary qualities of slack could scarcely be bought under 4s. to 4s. 3d. per ton; good medium sorts, 4s. 6d. to 4s. 9d.; with best qualities quoted from 5s. up to 5s. 6d. for some special sorts.

**Northern Coal Trade.**—There has been since the last report continued

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BIRMINGHAM:

1, OZZELLS STREET.

Telegraphic Address: "GOTHIC."

MANCHESTER:

37, BLACKFRIARS STREET.

Telegraphic Address: "GOTHIC."

## WINTER SEASON 1898-9.

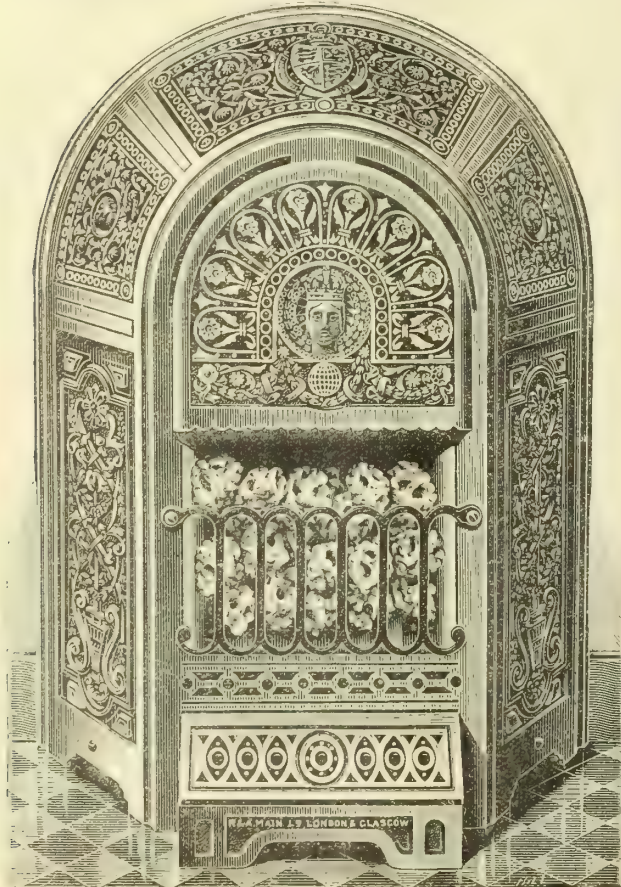
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activity in the coal trade of this district. The quantities sent out have been extremely heavy; so that the stocks of consumers should have increased. There has been a good demand for best Northumbrian steam coals; and the price is now from 9s. 6d. to 9s. 10½d. per ton f.o.b. Second-class steam coals are 9s. per ton; and steam smalls are rather more abundant at 4s. 6d. In the gas coal trade, the deliveries for the last few days have been higher than for a very long period. There has been a large arrival of steamers; and with full work at the pits, as much as 24,000 tons daily have been sent out of one dock on the Tyne alone. For occasional cargoes, the prices quoted have varied from 8s. 9d. to 9s. 3d. per ton f.o.b.; while for contracts for export over next year 8s. is the quotation for good Durham gas coal. Prices of gas coke show little or no change this week.

**Scotch Coal Trade.**—There is continued activity in all branches of the coal trade; and indications seem to point to a further rise in prices. There is a large output of splint, and a good demand for it. Ell and main are also going off well, at slightly better prices. The quotations are: Main, 8s. 3d. to 8s. 6d. per ton f.o.b. Glasgow; ell, 9s. 3d. to 9s. 6d.; and splint, 9s. 9d. to 10s. The shipments for the week amounted to 153,514 tons—a decrease of 17,336 tons upon the preceding week, but an increase of 4664 tons over the corresponding week last year. For the year to date, the total shipments have been 9,206,968 tons—an increase upon the same period of last year of 1,583,615 tons.

**The Proposed Additional Water-Works for Bury.**—At a meeting of owners and ratepayers held at Bury last Friday, a resolution was unanimously passed sanctioning application by the Corporation to Parliament for power to construct a reservoir at Ogden and other additional water-works for the better supply of the borough and other districts within their water area.

**The Proposed Acquisition of the Seaford Water-Works by the Local Authorities.**—A meeting of owners and ratepayers of Seaford was held last Thursday, for the purpose of passing a resolution authorizing the Seaford District Council to join with Newhaven in promoting a Bill to Parliament empowering the Councils to purchase the undertaking of the Newhaven and Seaford Water Company. There were about 200 people present; and the resolution was carried practically unanimously.

**Fatal Acetylene Gas Explosion.**—Mr. Alfred Burlingham, aged 32, son of Mr. D. C. Burlingham, jeweller, of High Street, Lynn, was making some experiments last Friday afternoon in the manufacture of acetylene gas in an outhouse at the rear of his father's premises. The generator was of the usual pattern, but the holder consisted of iron plates made into a box and soldered, having a piece of tubing attached, without an ordinary burner, for testing the light. A lad who was with Mr. Burlingham was instructed to light this tubing, and instantly there was a terrific explosion. The top of the box was blown off, and fragments of the shattered iron struck Mr. Burlingham in the throat, fracturing his jaw. He was also struck on the temple. Death was instantaneous. The lad recovered after being unconscious for a time, and was found to be totally deaf.

**Okehampton Water Supply.**—The Okehampton Town Council have resolved to apply to the Local Government Board for sanction to borrow £1200 for the extension of the town water supply. The plans have been approved, and as soon as the loan has been obtained the work will be proceeded with.

**The Quality of the Chelsea Water Supply.**—A report on the examination of the water supplied by the Chelsea Water Company from November, 1897, to November, 1898, with some observations on the suitability of the Thames as a source of supply for London, has been presented to the Chelsea Vestry by Dr. Louis C. Parkes and Dr. S. Rideal. The conclusions arrived at by these gentlemen are stated as follows: "The results of our examinations appear to us to show that, even in a year exceptionally favourable to the purifying operations undertaken by the Water Companies, the element of danger necessarily attaching to the supply of a water taken from sources inevitably exposed to contamination is not by any means invariably eliminated by the methods of purification at present relied upon. A system of filtration which does not invariably keep out or destroy the common accompaniments of sewage and animal pollutions may, on the occasion of epidemic prevalences in communities on the river banks above the Companies' intakes, also allow the passage of the infective disease organisms in numbers sufficient, as the case may be, to cause epidemics among the water consumers, or mere sporadic outbreaks, or isolated occurrences among the more susceptible of the population. We are therefore of opinion that considerations of public safety require that reliance should not be placed upon sand filtration, as at present conducted as the sole means of defence when the water to be operated upon is derived from a tainted source."

**The Poll on the Gas-Works Purchase Question at Reigate.**—The result of the poll on the question of the purchase of the Reigate and Redhill Gas Companies' works by the Corporation has been announced, as follows: Against, 3542; in favour, 1329—majority against, 2213. About 4300 papers were distributed; and of these some 3600 were collected. A great many of them were, however, not marked; the number not counted amounting to about 700. Commenting on the result of the poll, the "Surrey Mirror" expresses regret at the decision of the ratepayers against the municipalization of the gas-works—a decision which it believes posterity will deplore. One reason assigned for it is that a considerable number of independent private residents were influenced in their voting by a distrust in the ability of the Corporation—who, it appears, are "divided by ward and personal differences"—to manage the gas supply with advantage and success; another, that the purchase of the gas-works would mean the postponement of the introduction of electric lighting. The writer consoles himself with the reflection that what has happened will rather tend to hasten its introduction, and materially improve its prospects of success. But he says the Gas Companies may "rest assured that the new illuminant will not interfere with the prosperity of their undertakings, and that if competition does result in cheaper gas and in a better supply, the increased consumption, which is inevitable, will amply compensate them for any concessions they may, in the future, find themselves compelled to make."

# JOSEPH AIRD

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**The Acetylene Industry in England.**—The balance-sheet of the Midland Acetylene (Parent) Syndicate, Limited, of Cradley Heath, shows a loss for the twenty months' trading ended Oct. 31 of £6418. The Directors state that only within the past few weeks have the Company been in a position to produce carbide of calcium in sufficient quantities to meet expenses, and to justify a hopeful view of the prospects of the concern. The chief cause of this state of affairs is said to have been the delay in the delivery of the new machinery. Now, however, the prospects are stated to be good.

**Barry Water Supply.**—Mr. James Mansergh has reported to the Barry District Council upon the source of their water supply at Biglis. There was a temporary lowering of the rest level by 3 ft. 9 in. from June to October which caused the authorities some little anxiety; but Mr. Mansergh does not regard it as in any way indicating failure of the supply. He considers that the supply has proved reliable up to 500,000 gallons per day as a minimum. The consumption in the district, however, will soon exceed the powers of the well in the summer months. Consequently he thinks it will be prudent to seek to augment the quantity at command by increasing the zone which contributes directly to the present supply, and a well should be sunk near the existing one. The water is shown to be of a high standard of purity. Its obvious defect is its hardness, amounting altogether to 33.8°, of which 22.4° is temporary hardness; and it could be softened with great advantage.

**Proposed Water Supply for Headcorn.**—An application by the Hollingbourne Rural District Council to the Local Government Board for power to borrow £3755 to provide a water supply for Headcorn and the adjoining hamlet of Grafty Green was the subject of an inquiry by Colonel A. G. Durnford on the 2nd inst. Considerable interest was taken in the proceedings; the scheme being opposed by some of the ratepayers, as well as by the South Kent Water Company. The cost of the proposed works was estimated at £3754, made up principally of £1000 for land, £1600 or £1700 for supply-pipes, and £400 for a reservoir. The Medical Officer of Health for the Hollingbourne district gave evidence to the effect that a good water supply was needed; Mr. A. J. Burrows said the work could be carried out for the amount estimated; and Mr. E. K. Burstal described the source of the supply as eminently satisfactory. His estimate for the whole proposal, including the buying of land, amounted to £3941. The repayment of this amount in forty years, including principal and interest, meant £170 5s. per annum. To his mind, the scheme seemed the most economical and best for the provision of a limited supply of water. For the opponents, it was contended that the estimates were misleading; and it was stated that the general feeling of the inhabitants was against the scheme. Mr. F. L. Ball, Secretary to the Mid-Kent Water Company, said a full supply to Grafty Green would cost £35 if furnished by his Company. Mr. E. Easton and Mr. De Rance thought the South Kent Company, who were now obtaining water from the Mid-Kent Company, would themselves shortly be in a position to supply water to the places proposed to be served by the Council. At the close of the inquiry, the Inspector announced that he would view the site of the proposed scheme the next day.

**Reductions in Price.**—The Directors of the Bath Gas Company intend to reduce the price of gas from 2s. 6d. to 2s. 4d. per 1000 cubic feet after the current quarter; and additional discounts of 2½ per cent. and 5 per cent. respectively will be given to consumers of 1 and 3 million cubic feet in any one year. The Hadlow Gas Company will reduce their price from 6s. 8d. to 5s. 10d. per 1000 cubic feet from the 1st of January next. Under the new arrangements with the Corporation of Ramsgate, the price of gas at Minster, which has hitherto been 3s. 9d. per 1000 cubic feet, will be reduced to 3s. 4d.

**New Joint-Stock Companies.**—The Crawley and District Water Company has been incorporated with a capital of £30,000, in £10 shares, for the supply of Crawley and the district with water, under the provisions of an Act obtained last session. The Sea-Water Works Construction Company, Limited, with a capital of £100,000, in £1 shares, has been formed to adopt and carry into effect an agreement made between the London Sea-Water Supply Company of the one part and the Company of the other; to contract for the construction, provision, and maintenance of all plant and machinery necessary for the supply of sea and fresh water to any cities, towns, and villages in the United Kingdom, America, or elsewhere; to build and maintain reservoirs, canals, embankments, water-works, pumping-stations, cisterns, pumps, culverts, filter-beds, &c.; to acquire and turn to account any patents, patent rights, and inventions, &c. A Company has been formed under the title of Simmance and Abady, Limited, with a capital of £10,000, in £1 shares, to "enter into an agreement with J. F. Simmance and J. Abady, and to acquire, own, and work British patents No. 11,202 of 1896 and No. 7243 of 1897 for penny-in-the-slot and penny and shilling (combined) gas-meters.

**Southwark and Vauxhall Water Company.**—The report of the Directors of this Company for the six months ending Sept. 30 states that the number of new domestic supplies brought into charge during the half year was 737, estimated to produce an increased annual rental of £1804; and, in addition, the income derived from meter-rents and other sources shows a most satisfactory increase on the corresponding period of past years. The Directors say it has been a gratifying result that during the recent long season of drought the Company were not only able to afford an abundant supply of water in their own district, but to very materially assist another Company, who had found themselves temporarily unable to give so abundant a supply as usual. The Directors remark on this circumstance: "To place your Company in this position, no less than nine Bills have been promoted in Parliament since 1884, of which six have been successful, one was withdrawn, and two did not receive the approval of Parliament, but the main features of which were introduced in Bills in the following year, and were successfully carried through. While thus congratulating the shareholders, your Directors cannot forget that these necessary powers have only been obtained after the most determined opposition by the London County Council and their predecessors, and, consequently, at heavy expense; but they contrast with great satisfaction the present position of the Company and the supply afforded to their district with what it might have been had this persistent obstruction been permitted to prevail."

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## TO CORRESPONDENTS.

Owing to the Christmas Holidays, the next number of the JOURNAL will be published on SATURDAY, the 24th inst. Correspondents are therefore requested to forward communications so as to reach the office not later than FRIDAY MORNING.

## EDITORIAL NOTES.

## The Employers' Parliamentary Council.

THE first ordinary meeting of the newly formed Employers' Parliamentary Committee, which is a direct outcome of the Employers' Federation, was held at the Westminster Palace Hotel last Friday, under the presidency of the Earl of Wemyss. This movement on the part of the associated employers of the United Kingdom first took form early in November, when a private gathering of representatives of various Employers' Associations was convened at the same place by Lord Wemyss. This preliminary meeting was largely attended, according to an authoritative statement sent to us shortly afterwards; and the company was wholly composed of accredited and representative employers in all the principal industries and trades of the United Kingdom. These occupations made a formidable list, far too long to give here. The holding of the meeting was suggested by Sir Benjamin C. Browne; and other moving spirits were: Mr. W. Shepherd, Chairman of the London Central Association of Master Builders; Mr. G. A. Laws, of the Shipping Federation; Sir William Lewis; Mr. A. Siemens; and Mr. George Livesey. It was agreed that a Parliamentary Committee representing the employers of the United Kingdom is necessary to keep watch over the interests of both employers and employed, which are continually being threatened and interfered with by Parliament at the instigation of those who profess the cause of Labour, and by their pertinacity and clamour often succeed in bending public opinion to their desires. There has hitherto been no organization directed to ensuring that Parliament shall be put in possession, from an authoritative source, of views of labour and trade questions other than those of professional Trade Unionists, which have prevailed so greatly with the Board of Trade.

The new body formed to supply this want made its first public appearance on Friday, and it seems to have launched itself into political life with every prospect of a successful and beneficial career. In order to avoid misconceptions, the name of the organization has been altered from Parliamentary Committee to Parliamentary Council. It is to be hoped the members of the Executive will keep their eye upon their Chairman. It will never do for the Council to become a mere echo of the Liberty and Property Defence League, some of whose parliamentary performances have been more grotesque than impressive. Liberty is a very fine thing; and Property is eminently desirable in this world. The Earl of Wemyss, however, in undertaking the defence of Liberty and Property against parliamentary aggression, has not always adjusted his protests to the necessities of the times, which in many ways require the interest of the individual to yield to that of the community to which he belongs. The Employers' Parliamentary Council will have plenty to do without tilting against windmills. They will not commit the banalities nor descend to the futilities of the Parliamentary Committee of the Trade Union Congress; but although they will not need incessant advertisement to keep up their strength, they will have to guard against the lethargy that is apt to overcome an army which only acts on the defensive. A policeman is naturally a less interesting figure than the picturesque free-lance of Labour, who goes prancing up and down on his ancient socialistic hobby, decked out in the gew-gaws of brand-new Trade Unionism, calling on the possessors of wealth and influence to "stand and deliver." The policeman must be on hand, however, if only to prevent this blatant vagabond from hurting himself against the immutable bulwarks of economic truth, which he is too short-sighted to see.

## The Sulphate of Ammonia Committee.

THE experience gained by this Committee in their first year of active work has enabled them to make and prosecute their plans in good time for the coming agricultural season. That their labours have already borne good fruit, cannot be denied; and what they have done, and are now doing, in the propagation of information for the creation of a greater interest in sulphate of ammonia among the agricultural community will, it is believed, have an even more important effect in the year now very soon to begin. It is rather to be regretted that the "prize essay" in the competition recently closed is not likely to be ready for publication in time to be of service in the early part of the year; but this is not the fault of the Committee. The competitors reached a



number greatly exceeding expectation (altogether above seventy essays were submitted); and consequently the work of adjudication will take some time to perform. The value of the prize at stake, as well as fairness to the competitors, demands that each and all the compositions sent in shall receive careful and critical examination; and the eminence and suitability of the gentlemen who have undertaken the duty ensure that this will be done. It cannot, however, be expected that they can lay aside their ordinary work to attack and get out of hand at once such a ponderous task; so that a little time must necessarily elapse before their award can be known.

In one particular in this organization we should like to see a substantial development. At present the subscribers to the Committee number 138—representing, we believe, about one-half the tonnage of sulphate of ammonia produced in the country. But the number mentioned is only equivalent to one-third of the makers. Of this one-third, we could not name more than a score; and we have not sufficient interest in the matter to inquire who the others are. Therefore we have no knowledge as to who are the non-subscribing two-thirds. But, whoever they may be, we would, with all earnestness, remind them that they are, according to their degree as producers, reaping the benefit, whatever it may be, that has issued from the work of the Committee. Nitrate of soda is backed up by an influential as well as rich Committee; and the greater the number of subscribers to the Sulphate of Ammonia Committee, the stronger will they be, and the more vigorously will they be enabled to carry on their work. A further increase in the price of sulphate of ammonia would be heartily welcomed; but even the maintenance of the present price is surely worth striving for at the modest outlay of 6d. per ton. Let the non-subscribers consider whether it is not so. We understand that arrangements have been made for the merging of the old Association of Sulphate of Ammonia Manufacturers into the new organization; and from the end of the present year the former will cease to exist.

#### The Taxation of Gas in Italy.

THE condition of the kingdom of Italy has for some time past offered a profoundly disquieting study to economists; and the references to this subject in the speech of the Chairman of the Continental Union Gas Company, reported elsewhere, are not of a reassuring character. Apart from this, there was not much of general interest in the topics of Mr. Arthur Lucas's able speech on the report and accounts. The Company light Milan, which is one of the busiest cities of united Italy; and the curses of the concession system have come home to roost in this case. The essence of this system of gas supply is mortgaging the present to the future; and when the day of reckoning comes, the process of readjustment is usually the reverse of pleasant. In the case of Milan, the realization of the hard-and-fast terms of the prolongation of the concession was attended by many unforeseen complications, including an extraordinarily mild winter, rioting, and a period of dear coal. It never rains but it pours. The Company had to give up £29,000 of revenue from gas, and pay the extra cost of all these complications besides. Over and above all, there are the crushing national and municipal taxes. Nobody who has not lived and attempted to do business in Italy can have the faintest idea of what it means to be "taxed up to the eyes." The ruling idea of the Royal and Communal Governments, when they see a bit of business doing, is to tax it. They tax the raw material, they tax the product, they tax the profit supposed to be made out of it by those interested, they tax the money that passes from hand to hand. In the case of gas supply, as at Milan, the Government take a duty of 2 centesimi per cubic metre; and the Municipality do likewise. This tax of 4 centesimi per cubic metre means 11d. per 1000 cubic feet. Now, being at their wits' end for money, the preposterous National Government have hit upon the happy idea of increasing their 2 cents. to 5 cents. per cubic metre—equivalent to a duty of 1s. 1½d. per 1000 cubic feet. Of course, the Gas Companies are politely informed that it will only be for them to collect the extra taxation from the consumers. Seeing how terribly bled the Italian citizen is already, for the support of one of the least efficient of the civilized Governments of Europe, there can be no wonder at the opposition of the Gas Companies to this additional impost. Italy is in a wretched state; and if the Continental Union Gas Company had to depend

entirely upon their business in this country, their prospects would not be bright. They have other large stations, however, which help to redress the balance of their fortunes. The experience of the Company in regard to Italian taxation is enough to reconcile the British gas manufacturer to his old enemy, the hypothetical tenant. The one bright spot in the record of the year's work at Milan is the efficiency and devotion to duty of the Chief Engineer of the station, and other members of the staff, who managed to keep the city from the horror of darkness even with revolution and anarchy raging round the gates of the works.

#### The Latest Words on Acetylene.

THE course of lectures on "Acetylene," by Professor V. B. Lewes, the last of which we give to-day, constitute a masterly presentment of all that is best worth knowing at the present time concerning this most interesting lighting agent. Speaking generally, the ordinary man whose attention has been attracted to acetylene lighting wants reliable information upon three points, and no more. He requires to know how the acetylene can be produced safely and conveniently for his particular purpose; how it can best be burnt; and how it compares for cost with possible substitutes. It is precisely upon these leading points that Professor Lewes is a most candid, explicit, and trustworthy authority. Those inquirers who desire to know more about carbide of calcium and its possibilities will not go to him in vain; but close practical matters are Professor Lewes's special care. This is abundantly shown throughout the course of lectures. But a good illustration of the method is the lecturer's treatment of the question of illuminating power, in the last discourse. It is by no means easy to compare two different kinds of light-sources on the basis of lighting effect; and the history of commercial electric lighting is a long record of the trick of forcing the technical term "candle power" to subserve purposes never intended by the old photometrists who coined it. Professor Lewes might have juggled with acetylene and coal gas in the same way. But instead he took the straightforward way of comparing the actual average lighting value of a flat flame of acetylene burning at the practicable rate of 1 cubic foot per hour, which is 34 candles, with an incandescent coal-gas burner of the same consumption, which is about half this value. This is a perfectly fair comparison. Again, with regard to the cost of acetylene, Professor Lewes declines to value the gas in the holder, made from calcium carbide at current prices, at less than 40s. per 1000 cubic feet. Even so, there is assuredly a market for it in country-house lighting. The trouble of smoking at the burner is not yet cured; nor does it seem likely to be if, as Professor Lewes avers, the cause is divided between the generator and the burner. We must, however, deny ourselves the gratification of following up the salient points of these fascinating lectures one by one. Professor Lewes himself bespeaks attention for the forthcoming report of the Committee on the exhibits at the recent acetylene show at the Imperial Institute. At the same time, we very heartily endorse his summary of this part of the subject, in which he records his conviction that, "as time goes on, the tendency on the part of acetylene consumers will be to use the simplest form of generator available, with a holder proportionate to the needed consumption." Thanks largely to him, intending users of acetylene for lighting can learn all about it without becoming victims of those tricks of trade which have so quickly gathered round the new industry.

#### The Technical Press on London Smoke.

SOME of our technical contemporaries have entered into the discussion of the smoke problem as it affects London; and the difference between their reasoned observations and the ravings of the ordinary newspaper writers ought to awaken the latter to the perception that they do not know quite so much about this subject as they do (say) about the peace policy of the Tzar or the inner workings of the mind of Mr. Chamberlain. There has been a meeting at a gentleman's town house, in Onslow Gardens, to consider the expediency of founding a new Smoke Abatement Society. It is a pity that nobody attended to tell the tale of the old one, which came out like a lion and perished like a lamb. Nothing new has transpired concerning the governing factors of the problem. The "Engineer" discusses the subject in its relation to factory working, and agrees with us that, while the burning of bituminous coal under steam-boilers without production of smoke is possible, it is not an economical nor for many purposes a practicable performance.



Our contemporary proceeds to discuss the old story of avoiding smoky domestic fires by the use of anthracite fuel, and concludes that this will never do. Further, it argues that dwelling-house chimneys do not really emit much smoke, because of the trapping of the soot by the chimneys. It is impossible to accept this argument as a statement of truth, in view of what happens to London on a still, cold morning when everybody is lighting up fires. The only handy cure for the smoky London house chimney is the gas-fire; and the more popular these become, the clearer will be the atmosphere.

#### Sir Archibald Geikie on Science in Education.

ONE of the most remarkable discourses on the subject of "Science in Education" that we ever remember was pronounced at the opening of Mason University College, Birmingham, for the present session, by Sir Archibald Geikie. The text of this inspiring address was given in the local papers, and also in "Nature" for the 1st inst. It well repays the earnest study of both young and old followers of the truth, as it is, in Science. How true it is that the voice of the Prophet is as greatly needed now as it ever was in the slow development of mankind! Professor Geikie speaks like an echo of the voice of the Age itself. He does not tell the student what is wanted to be known, but simply how to set about knowing anything and everything that is to be known of any subject. He warns students of science and technology against neglecting the older learning and "humanities." Devotion to science is good; but it is by no means everything. The most scientific of men may be a hopeless bore, and as hopelessly incapable of conveying to others what he knows himself. Among the mental habits which good education in science helps to foster, Professor Geikie named some that are bound to tell in any career. These are: Accuracy, Thoroughness, Breadth, Reading, and Patience. Equipped with these qualities, a student is certain to go far; and wherever he may go he will carry, and find, treasures new and old. To read Professor Geikie's address is almost enough to persuade one to hie to Birmingham forthwith, for the purpose of becoming a student of Mason University College. In default of this, the next best thing is to take Professor Geikie's wise and eloquent words to heart, registering the silent vow to live up to them as perfectly as may be in one's limited sphere. Such counsel is a complete university curriculum.

#### Trade Union Deputations.

VERY fittingly, the year's record of the Trade Union movement was completed last week by a couple of Ministerial receptions of a select deputation from the Trade Union Congress. The President of the Board of Trade first received the party, which sought to interest him in the grievances of railway servants and certain complaints of travellers by workmen's trains. It is a familiar charge against employers that any workman who makes himself conspicuous in agitating for the removal of an injustice or the obtaining of a benefit becomes a "marked man," to be got rid of on the first plausible pretext. The allegation is a very serious one; and we wish we could believe that it is always groundless. Unhappily, the evil exists in all grades of society, and is responsible for an incalculable amount of suffering. Nobody knows the extent to which the effects of envy, hatred, malice, and downright tyranny are allowed to range, through the reluctance of the victims to complain for fear of being "marked." Railway servants are far from being the only, or the greatest of sufferers from this kind of injury, which is as old as humanity, and as common as human meanness and spite. "Belling the cat" has never been an easy and painless operation, and never will be. Mr. Ritchie rightly promised the deputation that a full investigation should be instituted into all cases of individual persecution brought before him; and this is all that can be done. There are, of course, two sides to every question of the kind that may occur in reference to the disciplinary course of works management. The workman who is by habit and temperament a busybody, although his interference may sometimes have a reasonable cause, is sure to get himself cordially disliked in the end, and will be "shunted" at the first opportunity. Employers do not like "sea lawyers." One such talkative, bumptious individual will be a centre of discontent for a whole factory; and the sooner he is put outside, the better for everybody.

After speaking very frankly and sympathetically on the subjects brought under his notice, Mr. Ritchie turned the

tables upon the deputation and "went for" them, as representative Trade Unionists, in regard to the falling-off of British exports. He declared that a main cause of the comparative decline of the export trade of the country was "the unhappy disputes which had from time to time occurred between capital and labour." He cited the engineers' strike and the South Wales coal war, which had caused immense loss to the trade of the country, and inquired who had gained by them. Not the workmen, and certainly not the employers. It would not have been difficult for the President of the Board of Trade to fix the responsibility for these outbreaks. But, like a prudent statesman, he was content to let history speak for itself; only asking that there may be no repetition of such senseless rebellions. Later in the day, the same deputation saw the Chancellor of the Exchequer, with the object of asking the Treasury to assist in the removal of the obstacle to the unlimited deposition of Trade Union funds in the Post Office Savings Bank. They asked that the Trade Unions should be treated the same as Friendly Societies in this regard. In reply, they were told that Trade Unions are not very "friendly" societies, in any sense of the word. The Chancellor of the Exchequer objected to becoming the custodian of Trade Union war-chests, for various reasons, and reminded the deputation of the fact that their societies do not discriminate between strike and benefit funds. The impeachment was not denied; but Mr. S. Woods remarked that there was a custom, after a strike was over, of repaying the amount borrowed for fighting purposes from the benefit fund. The Chancellor of the Exchequer "was afraid there had been cases where that had not been done." He told the deputation finally that, if they would allocate their society funds to different applications, he would try to meet their wishes in regard to the strictly provident and benefit accumulations. Altogether, these deputations seem to have gone to Ministers for wool, and to have come away pretty closely shorn.

#### WATER AND SANITARY AFFAIRS.

THE Royal Commission on the London Water Supply held yesterday their forty-second meeting for the reception of evidence. The Royal Commission of which Lord Balfour of Burleigh was Chairman sat on forty-five days, during which the reception of oral evidence occupied thirty-two. That Commission obtained some further information by employing Mr. Reginald E. Middleton as an Assistant-Commissioner, to visit certain localities and ascertain the precise facts bearing on the subject of their inquiry. In the present instance, the terms of reference are much more complicated than in the former case, though locally the question seems to rest within narrower limits. Geographically, Viscount Llandaff's Commission does not extend so far as that which related to Lord Balfour's inquiries; and yet the question of a supply from Wales has been taken largely into consideration, and has formed a substantial part of the evidence lately accepted. The Commission seek to ascertain the quantity, quality, and cost of a supply from Wales, as compared with similar items in the case of one from the watersheds of the Thames and the Lea, especially in relation to the scheme of the Staines reservoirs. The question of quantity was well put by Mr. Walter Hunter in his evidence last Tuesday, when he remarked that, having a river at our feet with an average daily flow of about 1300 million gallons, it was suggested that we should go to Wales and rely on a watershed yielding, at the utmost, 415 million gallons per day. Supposing the Thames to be discarded, as the County Council seemed at one time to intend, within a certain period the Welsh supply would fail; and the County Council would then have to come back to the Thames to get the additional water which would be wanted. If the Thames water was good, and the supply from that source was the least expensive, Mr. Hunter submitted that it was absurd to go to a distant watershed until compelled to do so. In reply to this argument, Major-Gen. Scott remarked that the future of the Thames supply was "admittedly uncertain." We are surprised to hear this, except on the philosophical basis that nothing is sure in this world. General Scott's idea seemed to be that, with an increasing population, the quality of the Thames supply might seriously deteriorate. This would depend on what was allowed to go into the river. The population above



the present intakes on the Thames has largely increased during the last half century; but is there any evidence that the supply taken through these intakes has undergone deterioration? Sir E. Frankland gives data for the last 30 years, which, so far from showing progressive deterioration in the supply, demonstrate marked improvement.

No doubt the quality of the supply as it reaches the consumer depends in a great measure on the efficiency of the filtration effected by the Companies. But filtration will be required for the Welsh water; and Mr. Hunter has remarked that if the Londoners had the brown water of Wales and Thirlmere supplied to them, "there would be an outcry." Mr. Middleton gave similar evidence; and the October report of Sir William Crookes and Professor Dewar—very incorrectly quoted by the Daily Press, or else incorrectly cited by Mr. Balfour Browne—states that, in their experience, extending over a period of fifteen years, they have seldom, if ever, known the colour of the London Water Supply, in its most peaty condition, to equal the average colour of Loch Katrine, Thirlmere, or the Welsh Lakes. The "pure nectar" referred to by Lord Llandaff thus resolves itself into something like brown sherry. As to the matter of cost, even Sir Benjamin Baker and Mr. Deacon admit it must necessarily be more expensive to bring water from Wales than from Staines. If so, why should London incur the larger cost? Close at hand, London has an ample and a good supply; and whatever may happen a hundred years hence, there is no reason why the present generation should seek any other. With their present powers, and with their existing works, the Companies have a surplus of 24 million gallons a day; and the scheme of intercommunication will provide for turning this in any direction where it may be wanted. On the financial aspects of the question, Sir Frederick Bramwell has given some decided evidence, as well as on the engineering points. Supposing the Water Companies to be bought up, and the supply confided to a municipal authority, the example of other cities shows the likelihood that a rate-in-aid would be resorted to. In such a case, as Sir Frederick pointed out, industrial concerns in the Metropolis supplied with water from their own wells, would be subject to "a new tax." This would be paying for water supplied to somebody else. Sundry extravagant notions, hostile to the Water Companies, have been mooted of late before the Commission; and also, we may say, by some of the Commissioners themselves. It is surely no contention on the part of the Companies that, if there are frosts or droughts, they need not supply any water at all, and may "still go on." The remark emanated from Lord Llandaff, and was followed up by Mr. Balfour Browne, who averred that if the drought were to last a whole year the Companies would not be bound to supply a single drop of water. It was suggested that this consideration would influence the arbitrator in the event of purchase. We venture to say that an arbitrator would have too much good sense to regard it.

Two of the London Water Companies have held half-yearly meetings during the past week; and were it not for the hostile attitude of the County Council, the Metropolitan Water Supply would rest on a satisfactory basis for the whole of the Companies and for the consumers. There is nothing whatever in the position of the Companies inimical to the interests of the public; whereas the aggressive tactics of the County Council, could they be successful, would add to the local burdens of the Metropolis without any corresponding advantage. At the meeting of the Southwark and Vauxhall Company, presided over by Alderman Sir H. E. Knight, the magnitude of this particular undertaking was shown by some striking figures in the speech from the chair; and certainly it could not be said that the Directors, as supported by the shareholders, had stinted their outlay in seeking to maintain a full and satisfactory supply. The capital account now stands at about £3,000,000, and in a few years more will be increased to £4,000,000. One-sixth of the water supply of London is furnished by the Company; and the daily supply per head is several gallons above the average, though the Grand Junction is higher, and to some extent the Chelsea. That the Company are spending money wisely as well as freely, is shown by an increase of £11,000 in their water-rents in one year. Some of the expenditure is indeed of a forced and undesirable character, due to the action of the County Council. No blame attaches to the Government for instituting the present Royal Commission; yet the inquiry has

been simply brought about by the agitation set on foot by the Progressives, and the Water Companies are put to a heavy expense in order to appear before the Commission with a due representation of their case. There is a further expenditure to come during the ensuing session in fighting the Water Bills of the County Council. But what the Chairman designated as the "innate prosperity" of the Southwark and Vauxhall Company enabled the Directors to pay a dividend for the half year at the rate of  $7\frac{1}{2}$  per cent. in place of 6 per cent. per annum; and Sir Henry was confident this rate of dividend would be maintained in the next half year. Beyond that he would not prophesy until he met the shareholders again. In the discussion which followed the Chairman's speech, an act as just as it was generous was performed, by the unanimous adoption of a resolution moved by Dr. Chesshire, that the remuneration of the Directors should be increased by £1000 per annum. Compared with the other London Companies, the Southwark and Vauxhall Company have hitherto given their Directors a singularly scanty remuneration.

At the meeting of the Grand Junction Company, the Chairman, Mr. F. Tendron, was able to make a statement very similar to that put forth by Sir H. E. Knight. The Company's water-rental showed an increase of £6000, compared with the corresponding half of 1897; and an addition of very nearly  $1\frac{1}{2}$  per cent. might be made to the dividend, did they not prefer to sacrifice, as it were, this portion of the present income in order to make payments on account of work that would be beneficial to the Company in the future. The Staines project, when once in operation, would benefit them for nearly forty years to come; but the Chairman contended it was most unjust that they should at the present time have to meet charges out of revenue when the expenditure would only be of advantage to them after the Staines works came into operation. Criticizing the policy of the County Council in pushing forward their Welsh project, Mr. Tendron expressed his belief that, if the Council could get hold of the existing works, they would not be ashamed to throw the Welsh scheme over altogether, and adopt the storage plan in the Thames Valley. The County Council might well do this, and the public be the better for it. Mr. Tendron stated that the Grand Junction Company would be able to provide for the increased population in their district by their share of the Staines reservoirs right up to 1937. The more the case is gone into, the more evident does it become that the Welsh scheme is unnecessary, even if perfect in itself, which it is not; whereas the Companies offer all that is required, or that will be wanted for long years to come, and at a price many millions less than that appertaining to the scheme of the County Council. Lord Onslow repeats his warning concerning the "rate-in-aid," and shows how it may even become something more than 5d. in the pound. Attention was called in "The Times" of yesterday, in a letter from the Special Correspondent of that journal, and another from "Thames," to the little professional and scientific value attaching to the report on the Welsh project which the County Council have obtained from Sir B. Baker and Mr. Deacon. We commented on this singular characteristic at the time the report first appeared.

#### Reduction in Price by the South Metropolitan Gas Company.

—The Directors of the South Metropolitan Gas Company have decided to reduce the price of gas 1d. per 1000 cubic feet (bringing it down to 2s. 2d.) as from Christmas, and to increase the quantity of gas sold by slot meters from 27 to 29 cubic feet for 1d. as soon as the 80,000 meters of this kind now in use in the Company's district can be altered. When the previous change in price was made, no concession could be allowed to the prepayment consumers owing to the large amount of work entailed for so small a reduction; but this is now more than made up—the additional quantity of gas to be given being equal to  $2\frac{1}{2}$ d. per 1000 cubic feet.

**The "Robert Hunter Fund."**—There is only one contribution to the fund to acknowledge this week—viz., £1 from Messrs. J. E. Williams and Co., of Manchester—making, with the amount already acknowledged, £267. As the "JOURNAL" fund is to be closed by the end of the year, will intending subscribers who have not so far sent in their contributions kindly do so before the 31st inst.? An opportunity has not yet presented itself of determining, after consultation with Mrs. Hunter, the exact disposition of the fund; but due intimation will be made in the "JOURNAL" early next year as to what has been done with the amount placed at her disposal by those whose names have been given in our pages during recent weeks.



## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1432.)

THE Stock Exchange had a good time last week. Not that business was superabundant—in fact, it was rather the other way—but there was a cheerfulness all along that made things buoyant. The influence was most apparent where there was most activity; and as the American market had the bulk of the business, so it had the largest advance. Most other departments shared the improvement in various degrees; and the slightly lower price of Consols is quite accountable for in the Money Market. The settlement was not a heavy one; and it presented no difficulties. It produced a smart demand for money; and a still stronger demand may be expected next week, after which the probabilities are in favour of easier conditions. Business in Gas was very quiet. Not much stock was on offer, except that of undertakings affected by special circumstances. Apart from these, the general tendency was steady. In Gaslights, the "A" opened unchanged, and was only lightly touched throughout the week at about middle prices; and it closed at the same. A fair amount was marked in the secured issues; the debenture stocks commanding higher figures. South Metropolitan was still inclined to droop; and, a parcel being "specially" done on Friday at 136, the quotation fell a point. Nothing at all passed in Commercials. In the Suburban and Provincial group, a transaction in the seldom seen Bromley put the price up; but British had a material decline. This, however, is no more than is warranted by the reduced rate of dividend; and at present figures the shares stand at a  $\frac{1}{4}$  per cent. price for money, which is the fair average for high-class issues. Business was slack among the Continental undertakings; but they stood well. Imperial pushed up a point; and Union was calm and steady under the difficulties it has had to encounter—an agreeable tone being set by the proceedings at the recent general meeting. None of the rest made any move calling for special remark. Transactions in Water were of the usual quiet description. The general tendency was steady; but movements were a little chequered. Chelsea and Southwark advanced in view of higher dividends. But New River relapsed; and East London debenture fell back more in line with figures realized by the recent issue.

The daily operations were: Business was moderate enough on Monday. Most of it was in Gaslights; and the 4 per cent. debenture rose 1, and ditto 6 per cent. 2. New River Water fell 2. Transactions in Gas on Tuesday were extremely light. Bromley old gained 1. In Water, Chelsea advanced 1; but East London 3 per cent. debenture receded 1. Wednesday was just as quiet. British began falling with a drop of  $\frac{1}{2}$ . On Thursday, there was a slight revival of business. Imperial rose 1; but British fell 2. Activity was not maintained on Friday. Everything was quiet and unchanged. Saturday was as quiet as usual. South Metropolitan fell 1; and British,  $\frac{1}{2}$ .

### ELECTRIC LIGHTING MEMORANDA.

The Electric Lighting of the City of London—Are the Contracts Null and Void?—Repair, not Reprisal—The Prudent Course.

THE question of admitting competitive electricity supplies into the City of London has naturally been forced into greater prominence than ever by recent legal proceedings. The subject came before the meeting of the Corporation last Thursday, when a petition was received from the Charing Cross and Strand Electricity Supply Corporation, stating that the applicants are prepared to supply electrical energy to the whole City, and asking the assent of the Corporation to their undertaking such supply in competition with the City of London Company. The application raises some interesting points of law and practice. First of all, there is the question of systems, upon which the "Engineer" only the other day was so dogmatic. Our esteemed contemporary assured the world at large that "low-tension continuous current distribution has had its best day;" yet here we have the example of one of the most successful electricity supply companies in London basing a vast scheme of extension upon the superior cheapness, steadiness, efficiency, and safety of their low-tension distributing service. All the theorizing in the world will not answer such a case as this. If the high-tension alternating system, as worked by the City of London Company, were all that some electrical engineering fancy paints it, there should be no room for the Charing Cross Company in the same streets. As a matter of fact, the memorial of the would-be competitors was very numerous and influentially signed by genuine City firms, including some 29 bankers, 81 insurance companies, and 82 newspaper proprietors. The presenter of the petition moved that it should be referred to the Streets Committee for consideration and report, which was agreed to.

The initial objection to the reception of the petition was that the Corporation were bound by their contracts with the City of London Company not to depart from the existing arrangement, by which the Company have the monopoly of electric street lighting in the City for a term of 14 years longer. Since the

memorial was drawn up, however, certain unexpected things have happened. It was admitted in evidence in the hearing of the libel action discussed in this column last week, that the official Chairman of the City Commissioners of Sewers at the time was pecuniarily interested in the contracts. By the Act which regulates the proceedings of this authority, it is provided that no person being a Commissioner or a member of the Courts of Alderman or Common Council shall be directly or indirectly interested or concerned in any contract for the execution of any works, on pain of forfeiting £100 and the invalidation of the contract. It is not for us, of course, to say whether this very proper and usual enactment actually invalidates the contracts of the City of London Company with the Corporation. Some members of the Court of Common Council think that it does, in which case the legal obstacle to the proposal of the Charing Cross Company disappears. It does not follow, however, that the deliverance of the Corporation from their special engagements with the City of London Company means their assent to the competition of the Charing Cross Company. It may induce the Corporation to undertake the supply themselves. And if certain members have their way, this is how the situation will work out. Not being asked for our advice, we are free to offer the opinion that the Corporation should think several times before undertaking competitive electric lighting, as favoured by Mr. Brooke-Hitching and Mr. W. H. Pannell at the last meeting.

There is a very natural desire on the part of those members of the Corporation who resent the ancient scandal raked up afresh in the Law Courts, to do something to illustrate in the plainest fashion the deliverance of the Corporation from the consequences of Mansion House "indiscretion." Also, the modern tendency in favour of the direct supply of electricity by Local Authorities is sure to sway the Common Council. The argument against falling into the arms of a new Company on the morrow of emancipation from the toils of an old one is certain to tell heavily against the Charing Cross petition. All the same, the wise course is that recommended by Mr. A. C. Morton, who "hoped the Streets Committee would take proper legal and scientific advice, and do their best to protect the interests of the citizens." The real question is not of reprisals, but of repairing a mistake. After all is said concerning Mansion House "indiscretions," the fact remains that the Corporation acted as was thought for the best at the period. So far as the direct interest of the ratepayers of the City is involved, no harm whatever has been done. It should not be overlooked that the terms for public lighting, which is done for 2½d. per unit, are exceptionally good for the City. The new-comers will not promise to do it for less. It may be assumed that neither the Corporation themselves, nor anybody else, could serve the public lamps at such a rate and pay their way, without the help of sufficient private lighting at a more profitable price. The private lighting is the *crux* of the whole affair. The enemies of the City of London Company allege that their private lighting rates are high; but this is a question of degree and comparison.

The much-abused City of London Company would point to the losing business of public lighting as one reason for their high private charge, if high it is. They have to supply the public lighting of the City, actual and prospective, at 2½d. per unit. Their would-be competitors have not at present any public lighting at all. When they enter the City, they will have to perform a proportionate amount of this service; and much good may it do them! Then as to private lighting, the City of London Company's rates are 7d. per unit for the first 6 units consumed in each and every quarter per 8-candle power lamp fixed; for the next 4 units, 6d. per unit; for the next 2 units, 5d. per unit; and 4d. per unit beyond. The Charing Cross Company say they hope to do the work in the City for a maximum charge of from 4d. to 5d. per unit for private lighting, and from 2d. to 3d. for motive power. We should say to the Corporation, Let them do it! There will be precious little profit for anybody in the business, at these prices. Certainly, it will not be worth while for the Corporation to attempt it, and incur all the risk and odium of competing by the aid of public money with private enterprise, for so small and problematical an advantage as any brand-new municipal scheme could show. If the matter is thus regarded from the single point of view of the interest of the citizens, as ratepayers and users of artificial light, there cannot be two opinions as to what had better be done. With the Corporation to see fair, and keep the rival Companies up to the mark in those respects in which the commercial incentive does not operate, the City will do far better than with the Corporation itself going into the business at cut rates.

### THE ELECTION OF THE FIRST WORKMEN DIRECTORS OF THE SOUTH METROPOLITAN GAS COMPANY.

WE desire, before the year closes, to place on record a fuller account than has yet appeared of the coming into operation of the measure of constructive statesmanship originated by Mr. George Livesey and embodied in the South Metropolitan Company's Acts of 1896 and 1897. This is what is known to students of industrial politics and gas administration as the "Workman Director" scheme. It is unnecessary to go into the beginnings of this movement, which, with all the development and criticisms,



will be found duly chronicled in the volumes of the "JOURNAL" for the past nine years. Suffice it to state that legislative sanction for the addition of Workmen Directors to the South Metropolitan Board was granted in the Act of 1896, but under conditions which made the concession of principle inoperative. The property qualification of an employee Director was fixed at £250 nominal value of the Company's ordinary consolidated 4 per cent. stock, which he was to have held for twelve months and to continue to hold. Next year an amending Act was passed reducing the qualifying holding to £100 nominal stock. Thereupon proceedings with a view to the realization of the scheme were set on foot.

After a good deal of quiet, informal preparation, carried on both among the old Directors and among the executive and working staff, the Chairman (Mr. George Livesey) circulated under date of Oct. 6 a carefully reasoned appeal to the workmen shareholders to consider the position and responsibilities of the directorate of the Company. He reminded them in this address that the administration of such an undertaking have to deal justly and considerately with all persons doing business with, or having an interest in, the Company. These individuals he classified alphabetically into (1) The gas consumers; (2) the employees of all ranks; (3) the shareholders who provide the capital for carrying on the business; and (4) the tradesmen who supply materials to or purchase products from the Company. If a Director were to take a class view of his duties and responsibilities, so as to favour one interest always, and ignore the others, he would be worse than useless. It might be observed that by the ordinary constitution of joint-stock companies, only one class of interest—that of the shareholders—is directly represented on the board of management. This is quite true; and Mr. Livesey also admits it to be true that Directors are sometimes prone to give too much consideration to the interests of the shareholders, and too little to the other interested parties. "There is a tendency in all men to look first to their own class; but men of the right sort will make the doing of justice all round superior to any personal or class interest, and thus in the long run do the greatest amount of good both for themselves and others."

Let us pause here for the purpose of interposing an observation suggested by these remarks. What is the justification for the democratization of governing bodies, but this principle of uniting all worthy classes of the community in the active work of administration? It is not, in England at any rate, the failure in action of the older forms by which Authority operated, that led to the widening of the national deliberative and executive organizations. The old governing bodies drawn from a single class of the population, whereof the last remaining representatives were the Grand Juries of counties, were as a rule devoted to duty, regardless of the public interest, and frugal in expenditure—in brief, they were good boards of directors, representing as they did those who were esteemed as having a "stake in the country." The necessity of bringing the people into the work of government, however, has been held to over-rule all considerations of the efficiency of any "governing class;" and so the popular element has been entrusted with power, in full hope and confidence that it will educate itself as kings and landlords have had to do in the discharge of public duty. The only secret and guarantee of success in this regard lies in the assurance that the sense of public duty and of what is due from man to man is not confined to one class of Englishmen. Englishmen have always had a genius for self-government such as men of no other race have exhibited; and their instincts are in sympathy with government, provided that it is just and ordered in a way they can understand.

This being once granted, there was ample justification for Mr. Livesey's trust in the good sense, in the selection of the first Workmen Directors of the South Metropolitan Company, of the constituency called to exercise their franchise. He promised, on behalf of the old Board, that the new members would be welcomed "with the full desire and purpose to work on the most friendly terms with them." The staff employees of the Company had decided not to take any part in this first election; thus leaving the field quite clear for the wage-earning majority. It appeared that forty-eight of the workmen possessed the necessary qualifications of holding the required amount of stock and having been not less than seven years in the Company's service. This is in itself a remarkable testimony to the efficacy in promoting thrift of the profit-sharing scheme.

These eligible individuals were unequally distributed over the Company's stations. At Bankside, there was none; at Rotherhithe there were two, of whom only one was willing to stand as a candidate; at East Greenwich, there were six, of whom one stood; at Greenwich, of seven qualified, there was no candidate; at Vauxhall, out of fourteen qualified, one stood; and at the head-quarter station of Old Kent Road, out of nineteen qualified, there were nine candidates. In this case, a preliminary vote was necessary to determine the selection of the one representative candidate for the station. This sifting process was not necessary in the case of the other stations. The effect of the preliminary voting would be to reduce the final list of candidates to four names, one each for East Greenwich, Old Kent Road, Rotherhithe, and Vauxhall. Lastly, on Oct. 28, every voter at all the six stations was invited to vote for two out of the four candidates; and the two who received the highest number of votes were to be entitled to take their seats at the Board on Wednesday, Nov. 2.

The number of votes of every shareholder, and the method of voting, were set out on the voting papers, which were sent by post to the voters about a week before the date of the election. The voting power was one vote for every £10 of stock up to £100; after that, one vote for every £25 of stock up to £300; after that, one vote for every £50 of stock up to £1000; and no more. Consequently, the voting could not be by ballot, but was conducted exactly as in the case of ordinary shareholders' voting. Having explained all this, Mr. Livesey was careful to add that it was not for him or any man to suggest which of the four candidates should be selected. He laid the greatest stress upon the fact that this responsibility rested wholly and solely upon the workmen shareholders themselves, and was non-transferable. The circular concluded thus: "Every voter is perfectly free to vote as he pleases. All that I ask is that he will give his votes to the candidates that he honestly believes will work best for all the interests bound up with the Company. In this, the last step of the top stone of our profit-sharing system, I confidently expect the most suitable men will be elected; and, when it is proved to the world that this confidence has not been misplaced, the workmen shareholders of this Company will have the satisfaction that they have worthily and honourably done their part in an earnest effort to improve the relations of employers and employed in the great British Nation."

From one of the voting papers for the Old Kent Road workmen that lies before us, we learn that of the nine candidates from this station the period of shortest service was eleven years, and of the longest twenty-six years. The occupations of the candidates were as follows: Automatic collector; storekeeper's office; foreman, retort-house; automatic collector; chief foreman, retort-house; fitter; horsekeeper; foreman, retort-house; and service layer. In the first voting, the bulk of the suffrages went to John Alfred Butcher, of the storekeepers' office, and to Henry Fox, chief foreman, retort-house. Ninety-five voters did not vote. As neither of the leading candidates obtained an absolute majority of the votes polled, there was another contest, which resulted in the selection of Mr. Butcher. At the final voting, Mr. Butcher and Mr. Austin, of East Greenwich, became the first Workmen Directors of the Company. Writing at the time, Mr. Livesey expressed the opinion that "unquestionably the best and most suitable men had been selected." It is fair to say, however, that there was little to choose between the last four men left in the running.

Thus was answered one of the cheap and ready-made objections urged against the Workman Director scheme—that the voters would bestow their favours upon unsuitable men. It was shown, moreover, that the workmen shareholders took a most active and intelligent interest in the voting, quite five-sixths of all the voters going to the poll. It is not to be wondered at, therefore, that Mr. Livesey, in communicating the result of the election to the "JOURNAL," remarked: "So far, all I can say is that I am greatly pleased." And well he might be. How the Workmen Directors will be found to answer—not as regards their own persons, for it would be impertinent to question their character or ability—but as part and parcel of a system, is to be shown only by time, which tries all things. What is at least certain is that the South Metropolitan workmen shareholders have justified themselves by their conduct of the election. We have never been able to understand why the workmen of a gas company, who in their capacity of householders are regarded as competent to participate in the government of the British Empire, should be esteemed incapable of picking out from among themselves one or two men to whom they would be willing to entrust the care of their savings, and a voice in the administration of the Company's business.

The two new Workmen Directors of the South Metropolitan Company entered on their office at a most favourable juncture, just after the old Board had conferred a great boon upon the mechanics and yard hands by extending the breakfast interval from the half hour to three-quarters of an hour, and had raised the stokers' wages. Neither of these ameliorations of the gas workers' lot is ascribable to the reformed Board; but they must smooth the way for the new Directors by relieving them of any immediate solicitude for the interest of the class to which they do not cease to belong. These Directors would have been placed in a painful dilemma if the first thing to face them on the agenda had been the question of increasing wages or of shortening the hours of labour. If these ameliorations had followed, instead of preceded their elevation, though they might not have claimed any credit for them, it would have been difficult to disabuse the workmen's minds of the idea that the new Directors were to be thanked for the improvement. This would have constituted a claim upon them which would have hampered their future action.

As it is, fortunately, the reformed Board has started with a free hand, under the happiest auspices. It would be almost an insult to Messrs. Butcher and Austin to look for any noticeable effect of their accession to the Board, in the shape of an alteration of the Company's policy or the conduct of their business. Nobody cares, in the ordinary way, who succeeds to the directorship of a gas company, so long as all the requirements are satisfied. The real success of the South Metropolitan Workmen Directors will be of another kind. It will consist in the demonstration of the great truth that Capital and Labour can join hands, not only in carrying on, but also in conducting a vast business. Labour will see in this a very clear object-lesson on



the folly and error of the teaching that Capital must always be preying upon it, keeping it in subjection, and opposing all its aspirations for more ease and still greater profit. The existence of the Workman Director is a proof that there is no plot of Capital against Labour. The experience of these Directors will also avail to demolish the pernicious doctrine that labour, sheer handiwork, is the source of all profits in business. They will learn, if they did not know before, that it is the mind and resources of the Master that make the work of the Man profitable; the lack of these that renders his labour vain. Lastly, the experiment will go to show that there is no need for the creation of a new Socialist universe on the ruins of the old, to make an opening for the workman to dignify his class, without forsaking his calling. In this age, with the joint-stock system ever more and more shutting out the individual employer, the last consideration is of the first importance. By-and-by, the master of a business which is truly and wholly his own—such as the frugal workman of old might hope to secure by no great effort—will have become extinct. The shareholder will be the only employer; and the workman who is a proprietor and also a director will be the sole representative of the industrious apprentice, who used to marry his master's daughter and live happy ever after.

### THE DISCOVERER OF COAL GAS.

A Dutch Claimant to the Title.

A REPORT to the effect that coal gas was discovered and applied to certain uses in 1784 by a Professor Minckelers, has already been noticed in the "JOURNAL" (*ante*, p. 423); but evidence in substantiation of the statement recently collected by Heer P. Bolsius for our Dutch contemporary "Het Gas," deserves more prominent notice. We therefore propose to relate the more important incidents in the life of a worthy pioneer in scientific research, in support of whose claim to be the discoverer of coal gas there appears to be substantial documentary evidence.

Jan Pieter Minckelers, according to the records of Maastricht, was baptized at a church in that town on Dec. 2, 1748. His father was an apothecary, and he obtained for the boy education at the hands of the Jesuits, with the intention of preparing him for clerical duties. The youthful Minckelers, however, showed a preference for the study of natural science, which he pursued at Louvaine (Löwen) so successfully that, in his 24th year, he was appointed Professor of Philosophy at the University in that town. The professorship of chemistry was at that time held by Heer van Bouchante. After the invention of the air balloon in 1782 by the brothers Montgolfier, who used warm air as the filling medium, Charles inflated a balloon with hydrogen. The use of this gas at once suggested a search for other light gases, which would replace it for the purpose, and could be prepared more easily. Both Minckelers and von Bouchante endeavoured to discover a suitable gas for the filling of balloons; but Minckelers was first able to announce that he had been successful in his quest. He states in a note on "Inflammable Air obtained from Various Materials," that, on Oct. 1, 1784, he put some powdered coal into a gun-barrel, and obtained by distillation a large yield of inflammable air, which was four times lighter than atmospheric air. A balloon of not quite a cubic foot capacity was filled with this gas, and set free near Louvaine. It descended 25 kilometres from the spot. A larger balloon was afterwards filled with coal gas, and set free near the same place; and on Feb. 23, 1785, a well-authenticated ascent of a coal-gas balloon took place near Antwerp.

In 1785, moreover, Minckelers lighted his lecture-room by means of the inflammable air obtained from coal. Van Hulthem, a pupil of Minckelers, communicated this fact to Professor Morren; and Heer van Even, the Louvaine librarian, has found a record of it in the town archives. This use of coal gas by Minckelers anticipates the reported discoveries of it by Lebon in France, and by Murdoch in England. Philippe Lebon was born in 1767, and is reported to have prepared illuminating gas by the dry distillation of wood in 1791. William Murdoch is regarded in this country as the discoverer of coal gas; and 1792 is the year in which he is supposed to have done so. A comparison of these dates leads Heer Bolsius to the conclusion that coal gas was discovered by Professor Minckelers, and was also first applied to illuminating purposes by him.

Minckelers afterwards went to Brussels, but returned to Louvaine in 1790 to pursue the calling of an apothecary. He subsequently took charge of a natural science laboratory at Maastricht. He died in that town on July 4, 1824. The details of his life given in the above account have been taken from Heer Bolsius's narrative, which has been reprinted from "Het Gas" and published as a monograph,\* along with a well-executed facsimile of a portrait of the reputed discoverer of coal gas which exists in the archives of Maastricht.

**Society of Engineers.**—At the annual meeting of this Society on Monday last week, Mr. John Corry Fell was elected President; the Vice-Presidents being Messrs. H. O'Connor, C. Mason, and Percy Griffith. The Secretary (Mr. G. A. Pryce Cuxson) has resigned; and Mr. Perry F. Nurse succeeds him.

\* "Korte Levensschets van Jan Pieter Minckelers, Uitvinder van het ichtgas," door P. Bolsius.

### OBITUARY.

The death is announced of Mr. J. H. FELLOWS, J.P., of Yarmouth, in his 71st year. Deceased was Chairman of the Gorleston and Southtown Gas Company—a position he had held for six years—and a Director of the Yarmouth Gas Company.

Mr. JOHN HALL, J.P., head of the firm of Messrs. John Hall and Sons, of Lincoln, died suddenly on the 9th inst., at the advanced age of 82. He was a Director of the Lincoln Gas and Water Companies before the undertakings were acquired by the Corporation.

### NOTES.

#### Tints of Iron Oxide Paints.

According to the "Ironmonger," a question has arisen with respect to the reliability of the different tints of iron oxide paints, which are now sold of a variety of shades ranging from dark brown to red or purple. The difference of colour is attended by a difference of price, though the chemical composition of the various pigments of the class is roughly the same. The comparative dearthness of the darker tints of oxide paint is due to the fact of the coloration being produced by heating some material, such as ochre, in a muffle furnace; the depth of purple shade produced being due to the period and strength of the heating. Experiments have been carried out in Germany to ascertain whether there is any practical advantage as regards power to resist corrosion in the more expensive grades of this paint. The results of the investigation may be briefly summed up as follows: A purple oxide does resist the attack of acid vapours in the atmosphere better than a brown one; but, bearing in mind the great difference in price, a red oxide is the most suitable for general adoption. The specific gravity of the pigment rises during the furnacing; and, assuming that the colours are fairly pure, it forms a trustworthy indication of their industrial value. The heavier the oxide, the better it is; and, allowing for cost, a specific gravity of 4.2 is the most desirable. Always supposing that the substance is fine enough to grind well into oil, the degree of fineness does not affect the anti-corrosive power of the paint. It may be remarked that acid-resisting capacity is of special importance in the case of oxide paints, because these are most generally employed to protect iron in gas-works, and on railway roofs and bridges, where the metal is exposed to the most active corrosive influences.

#### Main Laying Under Water.

Another example of main laying under water is reported, in the case of the water supply of the new United States immigrant station on Ellis Island, in New York harbour. The supply is purchased from the Jersey City Water-Works at the price of \$100 per million gallons, and is delivered through a 6-inch pipe 5400 feet long, of which 5100 feet is submerged from 10 to 17 feet at high tide. The pipe is in 12 ft. 5 in. lengths, making 12 feet net, weighing 800 lbs. apiece. The metal is  $\frac{3}{4}$  inch thick, and Ward flexible joints are used throughout. Most of the bottom was muddy; and in this a trench 10 feet wide and 5 feet deep was dug for the pipe, by a bucket dredger which deposited the spoil under water alongside, to be used for back-filling. For laying the pipe, two large barges were braced together, side by side, about 6 feet apart; and in the space between an inclined plane of wood was made reaching from the deck level to the bottom of the trench. This plane was hinged at the top, and was 55 feet long, so that as the tide rose the slope merely became steeper. The operation of jointing and lowering the main was continued from one shore end; the other end always resting on the slope, and fresh lengths being added as the barges were warped ahead. When the weather became rough and the barges rocked so much as to strain the joints, the barges were hauled ahead altogether and the pipe allowed to rest in the trench, from which it was afterwards recovered. Progress was made at the rate of 43 joints per day. The main was filled with water to sink it; and after the job was completed, this water was driven out by compressed air, which also showed the leaks. These were attended to by a diver. The work is regarded as a success; the total measured leakage in 15 hours being only  $3\frac{1}{2}$  cubic feet at a pressure of 45 lbs. The specification was for a maximum leakage of 1 cubic foot per minute.

#### Gas for Electric Lighting Installations.

A noteworthy example of the adaptation of gas power to an isolated electric lighting installation is that of the new Palace Theatre at Plymouth. There are some 1200 incandescent, and six Jandus arc lamps in this installation; the generating plant having to be concentrated on a site 30 feet long by 14 feet wide. Upon the ground floor there are four Campbell gas-engines, of 25 to 30 brake horse power; and the dynamos are on the first floor immediately overhead. The different parts of the plant are of various makes; the general design being by Messrs. Veale and Co. In actual working, the following results appear: The usual electricians' grievance about "the peak of the load" is exhibited in an aggravated form, since the lights are only required for about four hours a day, so that the load-line is all "peak." The gas is ready when required, however, and the consumption averages 7000 cubic feet per night, which generates 220 units of electricity. The Plymouth Gas Company's charge



for gas is 1s. 9d. per 1000 cubic feet, which works out to 12s. 3d. per night, or £3 13s. 6d. per week of six days. The cost of the electricity per week is, therefore, as follows: Gas, 42,000 cubic feet, £3 13s. 6d.; wages of two attendants, £2 8s.; oil, waste, and engine sundries, 12s. 6d.—total, £6 14s. for 1320 units, or 122d. per unit. It is pretty safe to say that few electric lighting installations in the country work at a cheaper rate. In making up the total cost, other charges have, of course, to be taken into consideration. There is a battery for the day lighting, which cost £300, and may be renewable in five years; and this adds 0.39d. to the cost of the unit. Still, the whole works cost does not amount to 1½d. per unit, which is an extremely good showing for the combination. It would probably have been more economical still to do the whole lighting by means of incandescent gas-burners, and thus get rid of the complication attending the conversion. But this is perhaps to come.

#### The Nature and Origin of the Light of Fireflies.

At a time when chemical science is prone to plume itself upon its power to disclose the secret composition of the smallest particles of matter, and physical science professes to be able to explain the phenomena of light upon mechanical principles, it is a little disconcerting to find that the mystery of the cheapest and oldest terrestrial light in the world—the self-luminosity of fireflies—remains impenetrable. Whatever may prove to be the nature and method of production of the “light of the future,” which is so often talked about, there are great mysteries still as regards this most ancient of light sources. Many observers have studied the light of fireflies of different species, and of glowworms; and all they have learnt about its production is that it can be extinguished by carbonic acid, and intensified by oxygen. Hence it has been deduced that the light is a combustion effect. As regards the nature of the fuel, and how it burns, recent research has ascertained that the photogenic apparatus is composed of cells of some fatty kind of substance, among which air-passages and nerve fibres are distributed. The active agent—it would be unscientific to call it “principle”—is presumed to be “some form of free phosphorus.” This is as pure a guess as might have been framed from the first production of phosphorus itself. The probability of the slow combustion theory of the cause of the luminosity is rudely shaken, however, by spectroscopic examination of the light itself, which goes to show that the light is very rich in ultra-violet rays. If it is due to combustion, therefore, this combustion must be of a nature very different from that which is ordinarily called by the same name. Instead of slow burning producing the same sort of light, it would need the fiercest kind of ordinary combustion to yield anything resembling it. Yet the light of insects is cold. From all this, it would appear a natural inference that science had better begin here at the beginning of terrestrial lighting, before presuming to formulate suggestions about the “light of the future.”

#### A “New Process” of Combustion.

A fine example of the operation known as creating a scientific mountain out of a molehill of practical performance, is afforded in the notices that have lately “gone the round of the Press” respecting a so-styled “new process of combustion” brought before the Franklin Institute by Mr. Paul J. Schlicht. The title is portentous; and Mr. Schlicht has produced a ponderous paper in support of it. Underneath the heap of verbiage, there is an idea capable of being expressed in a sentence. Mr. Schlicht's invention consists in surrounding the flue-pipe of a heating stove for a short distance with a jacket-pipe, through which the air supply for the furnace is drawn. He claims to have “discovered” the fact that “if a current of air is properly introduced into a chimney or flue through which hot products of combustion are escaping, the air-current will flow in a direction contrary thereto, and, becoming heated in its contact therewith, will reach the sphere of combustion in a condition highly favourable to the union of its oxygen with all the combustible elements of the fuel.” The suggestion is a curious one. It really means feeding a closed furnace with air by means of its own smoke-flue, which Mr. Schlicht claims to do by a simple expedient. He shows a typical example of a common domestic heating stove, with its flue-pipe projecting through the wall, and then carried vertically upwards in the usual way. The top piece of the flue is a slightly smaller pipe, which is fixed concentrically with the other, so as to leave an annular opening between the two. The lower pipe forms a short sleeve for the upper, open at the top to the atmosphere. This is the source of the air supply, which enters the annular opening and travels down the smoke-flue to the fire; while the smoke is at the same time travelling in the opposite direction, in contact with it. In the case of a horizontal flue, the air can be admitted by an elbow-pipe projecting through the lower side of the flue, and pointing inside for a short length in the direction of the fire—of course, close to the bottom of the flue-pipe. Mr. Schlicht claims manifold and great advantages from his system. The phenomenon of fresh air and the products of combustion travelling in contrary directions in mutual contact, without mingling, was exhibited years ago by one of Mr. Frederick Siemens's recuperative gas-lamps.

The Harrogate Town Council (being now the owners of the water-works) have raised the salary of Mr. W. E. Dixon, their Water Engineer, from £300 to £400 per annum.

## TECHNICAL RECORD.

### ACETYLENE.

By VIVIAN B. LEWES, F.I.C., F.C.S.,

Chief Superintending Gas Examiner to the Corporation of London,  
Professor of Chemistry at the Royal Naval College, Greenwich.

[The Last of a Course of Cantor Lectures at the Society of Arts, delivered Dec. 12, 1898.]

As I have before stated, it was in the autumn of 1894 that I first received a supply of American carbide; and in reporting on this material on Nov. 26 of that year, I wrote: “This gas, when mixed with an equal quantity of air, can be burnt at a No. 4 Bray burner; and the illuminating power of the mixture would be equal to 65.7 candles per 5 cubic feet of gas consumed, which would give the acetylene an illuminating value of 131.4 candles per 5 cubic feet. The presence of an inert gas, such as the nitrogen, in the air is well known to exercise such a cooling power on the flame as to seriously reduce its illuminating value; and I find that if the acetylene be burnt by itself at a suitable burner, it develops no less than 230-candle power per 5 cubic feet of gas consumed.” Further experiments made during December, 1894, with carefully purified gas yielded a slightly higher result; and in the paper read before the Society in January, 1895, I gave the illuminating power of the gas, when burnt under the best conditions, as being 240 candles.

A considerable amount of vagueness exists as to what is meant by the illuminating value of a gas; and the only assumption which can be arrived at is that it is the highest illuminating effect which can be produced from the gas without the aid of regeneration or artificial air supply other than that created by the flame itself.

The proper combustion of any hydrocarbon gas, however rich, can be effected by supplying the flame with exactly the amount of air necessary to prevent smoking; and it is under these conditions that the highest illuminating effect possible with the particular burner is obtained.

With flat flames, the ratio between the air supplied and the gas consumed is governed by two factors: (a) The thickness of the flame; and (b) the pressure under which the gas issues from the burner. When a gas issues from a burner under pressure, the uprush of the escaping gas mechanically draws in air, so that when consuming a poor coal gas in a flat flame the pressure has to be kept down, or too much air would be dragged in, which would consume the hydrocarbons too rapidly and so seriously affect the amount of light emitted; while as the gas increases in illuminating value, more and more air is required for proper combustion, and this can be obtained by increasing the pressure at the burner.

Experience has shown that with ordinary sized flat-flame burners, 7-10ths of an inch pressure gives practically the best results with coal gas of the quality supplied in London; and up to a certain limit, the same flat-flame burner can be used for richer gases by increasing the pressure. When this limit is reached, a thinner sheet of flame has to be employed—i.e., a smaller burner used—low initial pressure resorted to, and then by increasing pressure this can be made to consume gases of increasing value, until the pressure reaches a point at which the flame becomes distorted, when a still smaller burner has to be taken. By such means as these, even acetylene with its enormously high illuminating value can be satisfactorily consumed; while by thickening the flame and reducing the pressure to the point at which the uprush almost ceases to cause a mingling of air with the flame, and leaves the supplying of the oxygen to diffusion, even a poor gas can be made to develop its illuminating power.

On consuming acetylene from a No. 000 union jet burner at all ordinary pressures, a smoky flame is obtained; but on increasing the pressure to 4 inches a magnificent flame results, free from smoke, and developing an illuminating value of 240 candles per 5 cubic feet of gas consumed. Slightly higher values have been obtained; but 240 candles may be taken as the average value under these conditions. This figure is the one quoted by most manufacturers of acetylene apparatus, who argue from it that acetylene is fifteen times as valuable in illuminating power, volume for volume, as London coal gas.

Such a comparison is, however, absolutely misleading, as, in contrasting the value of acetylene with coal gas, one must always bear in mind that the illuminating power of London gas is determined by consuming it at the rate of 5 cubic feet per hour in the London argand; while in practice any power from 8 to 90 candles can be obtained from this volume, according to the form of burner in which it is consumed. Although small flat-flame burners only emit from 1 to 2 candles per cubic foot of gas consumed, good incandescent mantles will yield about 18 candles per cubic foot, and certainly 17 on the average. As incandescent gas lighting is rapidly displacing other methods of burning gas, and as this tendency will be enormously increased when the lapsing of the Welsbach monopoly reduces the price of the mantles to the figure now charged in Germany, it is evident that no calculation is fair that does not include this as a factor.

Moreover, a very short experience soon shows that burners consuming 1 cubic foot of acetylene per hour are the largest that



can be practically used for domestic purposes; and that, taking such burners all round, 32 candles per cubic foot is a fair average of the light developed by them—although out of a big batch of burners one occasionally finds a few which will go as high as 36 or even 40 candles per cubic foot. The influence which the size of the burner and the rate of consumption has upon the illuminating power of coal gas is well known, and is shown in the following table:—

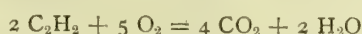
| Flat Flame Burner. | Candles per Cubic Foot. | Flat Flame Burner. | Candles per Cubic Foot. |
|--------------------|-------------------------|--------------------|-------------------------|
| No. 7              | 2'44                    | No. 3              | 1'63                    |
| 6                  | 2'15                    | 2                  | 1'22                    |
| 5                  | 1'87                    | 1                  | 0'85                    |
| 4                  | 1'74                    | 0                  | 0'59                    |

As the consumption of acetylene is regulated by exactly the same factors as act in the case of coal gas, it is evident that the smaller the burner and consumption the lower will be the candle power per foot of the acetylene; and in practice with a  $\frac{1}{2}$  cubic foot burner 24 candles per cubic foot is a good result. Taking a series of burners of the Naphey type, obtained from Falk, Stadelmann, and Co., the following results were obtained:—

| Burner, No. | Pressure, Inches. | Gas Consumed, Cubic Feet. | Light, Candles. | Candles per Foot. |
|-------------|-------------------|---------------------------|-----------------|-------------------|
| 0           | 2'0               | 0'15                      | 0'7938          | 5'3               |
| 8           | "                 | 0'275                     | 3'2             | 11'6              |
| 15          | "                 | 0'40                      | 8'0             | 20'0              |
| 25          | "                 | 0'65                      | 17'0            | 26'6              |
| 30          | "                 | 0'70                      | 23'0            | 32'85             |
| 40          | "                 | 1'00                      | 34'0            | 34'0              |

From these considerations, it is evident that the only fair way to contrast the light obtainable from coal gas and from acetylene is to take the incandescent burner on the one hand, and the 1 cubic foot flat-flame burner on the other, when it is seen that, instead of being fifteen times the value of the coal gas as an illuminant, it is only about twice its power. The acetylene burner, however, has an advantage over the mantle—one can more or less regulate the light to the amount required.

When acetylene is burnt in air under such conditions as to complete its combustion, it is converted into carbon dioxide and water vapour—the same compounds as are produced by all combustible hydrocarbons—



and 1 cubic foot of acetylene requires  $2\frac{1}{2}$  cubic feet of oxygen.

The researches of Dr. Gréhan have shown us that, when burning with a smokeless flame, no carbon monoxide can be detected in the products emitted by its combustion; and its sanitary position will, therefore, be defined by the amount of oxygen abstracted from the air and carbon dioxide produced, as compared with other illuminants.

Taking the average sized room which would be well lighted by an illumination equal to 64 standard candles, we find that this amount of light from various illuminants would yield the following results:—

| Illuminant.   | Oxygen Removed from the Air, Cubic Feet. |    | Products of Combustion, Water Vapour, Carbon Dioxide, Cubic Feet. |         |
|---------------|------------------------------------------|----|-------------------------------------------------------------------|---------|
|               |                                          |    |                                                                   |         |
| Sperm candles | 38'5                                     | .. | 26'2                                                              | .. 43'6 |
| Paraffin oil  | 24'9                                     | .. | 14'0                                                              | .. 39'8 |
| London gas—   |                                          |    |                                                                   |         |
| Batswing      | 26'1                                     | .. | 29'4                                                              | .. 19'2 |
| Argand        | 23'0                                     | .. | 25'6                                                              | .. 17'0 |
| Regenerative  | 10'6                                     | .. | 8'3                                                               | .. 5'2  |
| Incandescent  | 3'1                                      | .. | 4'6                                                               | .. 1'8  |
| Acetylene     | 5'0                                      | .. | 2'0                                                               | .. 4'0  |

So that, light for light, acetylene fouls the air less than any of our ordinary illuminants, with the exception of the incandescent gas-burner.

In comparing the heating effect of various illuminants on the air of a room, it is necessary to determine the calorific value of the combustion of a cubic foot of the illuminating gas employed; and it is manifest, from theoretical considerations, that a highly endothermic compound like acetylene must have a far higher heating power than ordinary coal gas. The mean of a number of experiments made in Junkers' calorimeter gave as the thermal value of the ordinary London gas supply 158 calories; while under the same conditions acetylene yielded 320.

The theoretical amount of heat emitted by the combustion of a cubic foot of acetylene is 349'08 calories. But this would only be given by the absolutely pure and dried gas; and the experimental number determined in the calorimeter represents more truly the heating power of the moist gas under ordinary existing conditions.

Taking, now, the case in which a room is lit up with a power equal to 64 candles, we find that if we call the heating effect produced by an incandescent mantle giving this amount of illumination 100, then—

#### Ratio of Heat Emitted to Yield a Light of 64 Candles.

|                     |     |
|---------------------|-----|
| Incandescent mantle | 100 |
| Acetylene           | 115 |
| "London" argands    | 571 |
| Flat-flame burners  | 914 |

So that, for all practical purposes, the heating effect on the air by acetylene is the same as with incandescent mantles.

When we come to compare the cost of acetylene and coal gas, one is again struck with admiration at the statements made by the advocates of the former as a rival to the well-established coal gas industry. At the present time the wholesale price of

carbide is £20 a ton; but I believe that to fill large cash orders it can be obtained at £16 a ton at Foyers, which would mean at least £20 a ton at the works where it is to be decomposed and the gas distributed. The decomposition of carbide is not a costly operation; but at least 10 per cent. would have to be added to the price of the carbide for handling, water, repairs, interest on plant, purification, &c., and this would bring the price of the acetylene to £2 per 1000 cubic feet in the holder. Coal gas in the holder, when made on the scale common in our big cities, costs, however, about rs. 2d. per 1000 cubic feet; and about 100 per cent. has to be added to this to cover charges for distribution and profit. The power of doing this is dependent on the amount of gas sold; and while the South Metropolitan Company can make a fair profit on gas at 2s. 3d. per 1000 cubic feet, there are many small country works that cannot pay a dividend with gas at three times that price. With acetylene, the smallness of the output would necessitate a heavy charge over cost price; and I should be surprised to find an installation of acetylene, even in a fair sized town, paying its way with a less charge than £3 per 1000 cubic feet.

Looked at from this point of view, it is at once manifest how absurd it is to talk of acetylene as a possible rival of coal gas; and the sooner this is realized, the better will it be for the future of this brilliant illuminant.

Abroad, where coal gas is dear, it is possible, by taking the price of acetylene in the holder and comparing it with distributed coal gas, to make acetylene out to be, light for light, as cheap as the latter when consumed in a flat-flame burner; but even this method of calculation breaks down before the high light emissivity of the incandescent mantle. It is in districts where no coal gas exists that the true field for acetylene is to be found; and here its ease of generation, and the beauty of its light, makes it a pleasant companion after the greasy dimness of the candle, or the smell of the oil-lamp.

When I first attempted to burn acetylene, I used the Bray nipples which could be had on the market, and found that I obtained very high illuminating effects, and could, for a time, continue the combustion in a satisfactory way by using 3 or 4 inches pressure at the burner. This high pressure was, however, undesirable; and I then devised a cubic foot burner in which, by drilling the union jet holes of very small size and at a more obtuse angle, I was able to burn the gas at 1 inch pressure. About this period, also, Bray made some specially small tips for use with acetylene. Both these nipples answered extremely well for a time, and developed from 30 to 36 candles per cubic foot of gas. But they both had the same weakness, and after a few hundred hours began to smoke. As a smoking acetylene flame covers everything in a room with a thick deposit of soot in a very short space of time, such burners were manifestly not fitted for the work they had to perform.

The trouble generally commenced with a filiform growth of carbon appearing at the nipple, which quickly distorted the flame and caused a cloud of soot flakes to descend. If the burner was cleaned and relighted, the trouble began again in an hour or two; and the only thing to be done was to replace the nipple by a new one. If the nipple had been burning some time, and was then removed and broken, it was found to be carbonized for some depth into the material; showing that a liquid hydrocarbon had soaked into the substance, and had been split up there by the heat, with deposition of carbon. The generally accepted idea was that the heat of the nipple polymerized some acetylene to benzene, and that this forming a drop did the mischief; and efforts to keep the burner cool were looked upon as a likely direction in which to search for success.

While these troubles were going on in England, attempts had been made in America to use acetylene diluted with a certain proportion of air, which permitted it to be burnt in ordinary flat-flame nipples; but the danger of such admixture being recognized, nipples of the same class as those used in England were employed, and the same troubles ensued.

In France, single jets made of glass were first employed; and then Risener and Luchaire, Ragot, and others, made burners in which two jets of acetylene coming from two tubes spaced some little distance apart should impinge and splay each other out into a butterfly flame. Soon after Bullier introduced the idea of sucking air into the flame at, or just below, the burner-tip; and at this juncture the Naphey or Dolan burner was introduced in America—the principle employed being to use two small and widely separated jets instead of the two openings of the union-jet burner, and to make each jet a minute bunsen in which every jet of acetylene dragged in from the base of the nipple enough air to surround and protect it, while burning, from contact with the steatite.

These burners were hailed with delight, and their success led to their being pirated right and left. But although they mark a very great improvement, and will burn for several hundred hours without smoking (unless in a fit of false economy the user insists on turning them down and leaving them for an hour or so as two small separate flames, in which case they generally start smoking on being turned on again), the trouble is by no means got over; and a Naphey burner will often be found smoking as heartily as one of its more humble brethren. The fact is that the cause of smoking is to be found quite as much in the generator as in the nipple; and over-heating during generation is undoubtedly a prime factor in this worrying phenomenon.

If smoke or tar vapour be examined under a high microscopic



power, it is seen that it consists of minute vesicles or bubbles in a marvellously active condition of movement, and fulfilling, in a most perfect manner, the conception one forms of molecular motion. Ever bombarding each other, but never colliding, these small vesicles, filled with gaseous matter, continue their career until some mechanical action bursts them, and deposits the minute trace of liquid which formed the skin of the microscopic balloon.

It is for this reason that the most successful forms of washer for extracting tar during the manufacture of gas consist of fine jets or orifices through which the gas passes at considerable velocity and comes in contact with a baffle which breaks up the vesicles; and anyone with experience in carburetted water-gas making knows the trouble that arises from filiform growths of carbon when, owing to an insufficient temperature in the cracking and superheating chambers, the carburetted gas contains vapours instead of permanent gaseous products.

When acetylene has been made in a generator at an undue temperature, it carries with it benzene vapour, which, as it commences to condense, assumes this vesicular form; and on coming to the extremely minute holes which form the apertures of the burner, the mechanical scrubbing which it encounters causes the breaking up of the vesicles and the deposition of the benzene, and other hydrocarbons held in suspension by benzene, which soak into the steatite and carbonize. The presence of finely divided carbon has a great effect in determining the decomposition of the acetylene itself, so that a rapid growth of carbon takes place at the burner. Then no ordinary clearing of the deposited carbon from the exterior will ever make the nipple fit for constant use again, as the catalytic action of the carbon deposited in the pores of the steatite, and which cannot be got rid of, causes the deposition of a fresh supply of carbon. Whilst, when the benzene vapour gets past the nipple and burns, as it requires three times as much air as acetylene, it often starts the flame smoking from this cause.

The impurities, however, in acetylene, other than vapours, also play a certain part in the choking of the burner, as if there be much phosphuretted hydrogen in the gas, a small quantity of phosphoric acid is apt to be deposited in the burner-nipple and helps to distort the aperture, while silica from siliciuretted hydrogen has the same effect.

It will be found with experience that the prevention of smoking in a burner will be overcome quite as much by attention to the temperature in the generator as to the burner itself; and where a generator which gives over-heating is in use, a well-arranged scrubbing apparatus that would get rid of the benzene from the gas would be found a distinct advantage in stopping burner troubles, while, when proper purification is introduced, the difficulty will be found to have been practically solved.

At the Acetylene Exhibition held in Berlin early this year, all the newest forms of burner were shown; and the best burners of each class were tested at the Imperial Physical Institute both for consumption and light-giving power. It was found, after 18 hours burning, that several had to be eliminated on account of their then commencing to smoke; 30 hours proved fatal to another batch; while a few only continued giving satisfactory results after that period. This shows that the same troubles which have been rife in England have been equally marked on the Continent.

The results also obtained as to the candle power of these burners fully bear out the figures which I have obtained. It may be of interest at this point to record the candle power of some of the many burners which I have personally tested.

| Date.    | Name of Burner.                | Pressure, Inches. | Gas Consumed, Cub. Ft. | Light, Total. | Produced in Candles, Per Foot. | Per 5 Ft. |
|----------|--------------------------------|-------------------|------------------------|---------------|--------------------------------|-----------|
| 1894. .. | Lewes . . . . .                | 1.75 ..           | 1.02 ..                | 32.82         | 32.17                          | 160.8     |
| " ..     | Bray No. 000. . . .            | 2.00 ..           | 1.85 ..                | 64.00         | 34.59                          | 172.9     |
| 1895. .. | Bray No. 4 (acetylene) 1.50 .. | 0.50 ..           | 12.00                  | 24.00         | 120.0                          |           |
| 1896. .. | Naphey or Dolan . . .          | 2.00 ..           | 0.60 ..                | 16.00         | 26.60                          | 133.0     |
| 1897. .. | Falk-Naphey . . . .            | 2.50 ..           | 0.50 ..                | 11.00         | 22.00                          | 110.0     |
| " ..     | " .. . . .                     | 2.50 ..           | 0.75 ..                | 20.00         | 26.00                          | 130.0     |
| 1898. .. | " .. . . .                     | 2.50 ..           | 1.00 ..                | 34.00         | 34.00                          | 170.0     |
| " ..     | Nurnberg . . . . .             | 2.50 ..           | 1.00 ..                | 36.00         | 36.00                          | 180.0     |
| " ..     | Hera . . . . .                 | 2.50 ..           | 0.80 ..                | 26.00         | 32.50                          | 162.5     |
| " ..     | Ideal . . . . .                | 2.50 ..           | 0.75 ..                | 20.00         | 26.50                          | 132.5     |
| " ..     | Billwiller . . . . .           | 3.00 ..           | 1.00 ..                | 40.00         | 40.00                          | 200.0     |

These really represent the best results obtainable by the combustion of acetylene under domestic conditions.

The Dolan or Naphey tip was a great advance at the time when it was introduced; but the arms which carried the tips were made of metal, and these were perpetuated in the first batch of piracies made. The effect of heat after a time is to slightly distort these arms, thus throwing the two jets of gas out of line. This trouble has now been remedied by making the arms of the burner entirely in steatite, which, though adding to the cost, is a distinct advantage.

The incandescent mantle has made such a revolution in coal-gas lighting that it is not surprising that attempts should have been made to adapt acetylene for the purpose; and the first thing which had to be done when taking steps in this direction was to construct an atmospheric burner which would satisfactorily consume the gas.

One would expect that acetylene, when consumed in an atmospheric burner, would give an excessively hot flame, not only on account of its composition, but also because of its endothermic character. Le Chatelier calculates that the temperature of a non-luminous acetylene flame will range from 2100 to 2420° C.;

the temperature, of course, varying with the ratio of acetylene to air, as shown in the following calculations:—

| Percentage of Acetylene. | Percentage of Air. | Temperature, Deg. C. |
|--------------------------|--------------------|----------------------|
| 7.40                     | 92.60              | 2420                 |
| 12.90                    | 87.10              | 2260                 |
| 17.37                    | 82.63              | 2100                 |

In order to make a bunsen burner for acetylene, the tube has to be extremely narrow, and it is even then found to be very liable to flash-back; while it needs a high pressure in order to bring about satisfactory combustion of the gas with an absolutely non-luminous flame. One of the chief difficulties which has to be overcome is due to the range over which mixtures of air and acetylene are explosive, and which we have seen lies between the limits of 3 per cent. and 82 per cent. of acetylene; and it must also be remembered that the velocity of the explosion of acetylene, when mixed with air, is greater than with a mixture of air and coal gas. The propagation of the explosive wave down the burner tube cannot be satisfactorily stopped by the ordinary device of using wire gauze, on account of the low igniting point of acetylene and air mixtures; while if high pressures are used, so that the rate of flow shall be greater than the velocity of propagation downwards, more air is sucked in by the uprush of the gas, and the velocity of the explosion is again increased.

The best results have been obtained by taking a bunsen burner in which a constriction in the air-tube creates a high velocity at that point which, on the principle of the Smithell's flame separator, prevents the propagation downwards just at that point.

Le Chatelier has shown that the rate of propagation of an explosive mixture of air and acetylene depends upon the diameter of the tube through which the wave is being propagated; and he has worked out the limits between which the explosive wave would pass through tubes of certain diameters—

| Diameter of Tube, Inches. | Explosion, Lower Limit, Per Ct. Acetylene. | Explosion, Upper Limit, Per Ct. Acetylene. |
|---------------------------|--------------------------------------------|--------------------------------------------|
| 1.57                      | 2.9                                        | 64                                         |
| 1.18                      | 3.1                                        | 62                                         |
| 0.79                      | 3.5                                        | 55                                         |
| 0.24                      | 4.0                                        | 40                                         |
| 0.16                      | 4.5                                        | 25                                         |
| 0.08                      | 5.0                                        | 15                                         |
| 0.03                      | 7.7                                        | 10                                         |
| 0.02                      | 0.0                                        | 0                                          |

It will be seen that in a tube 0.02 inch, or 5 mm. in diameter, the propagation of the explosive wave ceases.

These investigations have been used as a basis upon which to construct acetylene burners for heating purposes; and burners have been made by the Allgemeine Carbid and Acetylen-gas Company, of Berlin, in which, by means of constricted tubes, satisfactory consumption is ensured; and it is found that the diameter of the tube at the constriction must be in a definite proportion to the particular mixture of air and acetylene consumed, as the more air employed the greater must be the constriction in the strangled portion of the tube. Such burners have a flame which is very valuable for heating purposes, and give a very intense temperature.

The same Company have also used these burners with incandescent mantles of somewhat different shape and composition to those ordinarily employed, and state that the photometric result is 30 to 40 per cent. higher than that obtained by the combustion of pure acetylene alone. I have quite lately been experimenting with an acetylene bunsen, and get much higher results than these, as, with a Welsbach No. 2 mantle, I have obtained as much as 90 candles per cubic foot of acetylene consumed; and as far as I have gone, the mantle appears to be hardened and strengthened by the intense heat to which it is subjected. But it yet remains to be seen how the life of the mantle is affected by the intense temperature of the flame.

Acetylene atmospheric burners are now also employed for heating, cooking, and metallurgical operations on a small scale; and with a reduction in the price of the gas, these uses for it will undoubtedly open up a wide field.

The value of acetylene in photographic work is now universally recognized; and Mr. W. H. Walmsey has arrived at its relative value, as compared with the ordinary sources of light, by determining the time needed to fully expose carefully prepared plates, with the following results:—

|                                         | Seconds. |
|-----------------------------------------|----------|
| Direct sunlight                         | 1        |
| Acetylene, 1 cubic foot burner          | 3        |
| Diffused daylight reflected from mirror | 12       |
| Incandescent mantle                     | 24       |
| Coal gas                                | 240      |
| Oil gas                                 |          |
| Oil lamp                                |          |

It is also, to a certain extent, being used for projection work; but it is not so well suited for this, as, in common with multiple wick oil-lamps and incandescent mantles, the flame offers too large a surface of illumination.

M. Molteni has attempted to determine the projection value of various illuminants by a photometric process in the following way: The measurements were made with an ordinary lantern, the stage of which carried an opaque card in which was cut an aperture 0.7 centimetre square; and the distance of the lantern from the screen was such that each side of the square on the screen measured 1 metre. The screen was replaced by a disc of paper; the opposite side being illuminated by a standard lamp







which to a certain extent envelops the hydrocarbon; and instead of its undergoing complete decomposition, it is broken down to methane and hydrogen and mingles with the water gas, while any residual carbon is left behind in the fuel. It is quite possible by such means to make a diluting gas containing—

|                             |    |
|-----------------------------|----|
| Hydrogen                    | 45 |
| Carbon monoxide             | 15 |
| Methane                     | 30 |
| Unsaturated hydrocarbons    | 5  |
| Carbon dioxide and nitrogen | 5  |

100

This gas costs from 8d. to 10d. per 1000 cubic feet, and has an initial illuminating value of about 10 to 12 candles. On mixing with it 5 per cent. of acetylene, a gas having an illuminating value of 18 to 20 candles is obtained, which, being a mixture of perfect gases, gives no trouble as regards layering, and which, having the same specific gravity and illuminating value as coal gas, can be distributed and burnt in precisely the same way.

It is also found that mixtures of this gas with 50 per cent. of acetylene are not detonated when compressed for railway carriage lighting by any temperature which it would be possible to attain in the cylinder; and it seems that this method of utilizing acetylene is pre-eminently the one which promises for it the largest and most remunerative future.

In concluding this course of lectures, I am impressed by the feeling that the limited time at my disposal has prevented me doing full justice to my subject. I should have far preferred a course of forty rather than four lectures in order to deal with the many important points and side-issues which, of necessity, have been omitted. I leave my subject with the sincere hope that, as time wears on, those points which appear to us now to be difficulties will be made abundantly clear; and that in the future cheapened carbide will enable this beautiful hydrocarbon to take its proper place in the foremost ranks of our illuminants.

#### SOCIETY OF CHEMICAL INDUSTRY.

A Meeting of the London Section of the Society was held on the 5th inst., at Burlington House, under the presidency of Mr. Boverton Redwood. After the reading and discussion of a communication by Colonel W. J. Engledue on "Ozone and its Commercial Applications," Mr. Arthur Marshall read two short papers, one of which, on "An Improved Apparatus for the Estimation of Carbonic Acid in Minerals, &c.," was of interest to gas engineers who use lime as a purifying material.

The improved apparatus was a modification of the well-known Scheibler's calcimeter, which is unreliable for any but a very limited class of work. Mr. Marshall uses an evolution flask or bottle of very small dimensions, and in it treats a weighed amount of the material under examination with concentrated hydrochloric acid. He thus avoids the necessity of adding to the volume of carbonic acid collected a certain volume to compensate for the absorption of that gas by dilute hydrochloric acid. This correction for absorption is one of the most objectionable features of Scheibler's apparatus; but, on the other hand, the tension of the vapour of concentrated hydrochloric acid cannot be altogether ignored. In place of receiving the evolved carbonic acid in a rubber bladder, the expansion of which forces the confined air by which it is surrounded to depress a column of water in a measuring tube to an extent corresponding to the volume of carbonic acid evolved, Mr. Marshall collects the carbonic acid over petroleum, in which he believes it is absorbed to an inappreciable degree. He had not, however, learnt what actually was the coefficient of absorption of the gas in the petroleum he employed. He immersed the evolution flask in a vessel of cold water, in order to prevent the heat of the reaction causing expansion of the volume of the gas; but he did not surround the measuring tube with a water-jacket. An attachment to the glass tube which leads from the evolution flask to the measuring tube, renders unnecessary the reading of a thermometer and barometer for the correction of the volume of the gas, in the same manner as Mr. Vernon Harcourt's aerothermometer and Professor Lunge's gasvolumeter are used in other branches of analysis. This attachment seems to be the most valuable improvement on Scheibler's apparatus introduced by Mr. Marshall. The improved instrument may prove useful to gas engineers who wish to ascertain the approximate amount of calcium carbonate in the lime they employ.

A note by Mr. I. Redwood on an action of acetylene on platinum was, for lack of time, taken as read. The author appears to have observed the destructive effect of the intensely hot acetylene flame on platinum utensils. This action renders acetylene almost useless as a gas supply for bunsen burners in a number of laboratory operations in which platinum crucibles are used.

**Mr. Walter Hunter on the London Water Supply.**—At one of the meetings of the Society of Arts after Christmas, Mr. Walter Hunter, the Engineering Director of the Grand Junction Water Company, and Joint Engineer with Mr. Reginald E. Middleton to the Staines Reservoirs Committee, will read a paper on "London Water Supply."

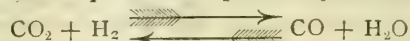
#### THE THEORY OF THE WATER-GAS PROCESS.

The following is an abstract-translation of a contribution by Dr. H. Luggin, of Karlsruhe, on the above subject to a recent number of the "Journal für Gasbeleuchtung."

The gas which is produced by the action of steam on incandescent carbon can vary very greatly in composition. In order to secure a high yield of the combustible gases, carbonic oxide and hydrogen, it is necessary in the first place that the steam should have ample opportunity for action on the carbon. Even when this condition is fulfilled, a good result will not be achieved unless the temperature of the carbon is kept sufficiently high. Practical men will be interested to learn that the first principles of theoretical chemistry afford a basis for the establishment of quantitative relations between the temperature of the generator and the composition of the gas produced in it.

Certain theoretical considerations recently set forth by Hoitsema, which are of value for the purpose of the present paper, will be first of all detailed; then certain experimental facts collected by Hoitsema in support of his theory will be recorded; and finally his theory will be applied to the present case. We shall thus be in a position to apprehend why the two evils—viz., imperfect decomposition of the steam in the generator, and a large proportion of carbonic acid in the water gas made—invariably are unavoidable consequences of too low a temperature in the generator.

The theory of Hoitsema deals with the reaction between carbonic acid and hydrogen whereby carbonic oxide and steam are formed; and the converse reaction between carbonic oxide and steam, by which carbonic acid and hydrogen are produced. Both reactions take place at a high temperature; and Horstmann has conjectured an equilibrium expressed by the balance:



In a mixture of the four gases—carbonic acid, hydrogen, carbonic oxide, and steam—in a state of incandescence, both reactions must always take place simultaneously. Every moment a certain number of molecules of carbonic acid and hydrogen are converted in the manner indicated by the arrow  $\rightarrow$ ; while simultaneously a certain number of molecules of carbonic acid and hydrogen are formed according to the change indicated by the arrow  $\leftarrow$ . A stable state or equilibrium will result when simultaneously the same number of molecules are converted both ways; and the composition of the mixture remains unaffected by the conversion. Hoitsema's investigation elucidates this equilibrium; and shows how it is dependent on temperature. The water-gas process consists merely in the phenomena which occur between incandescent carbon and steam, and the products which result from the interaction of these two bodies—viz., carbonic acid, hydrogen, carbonic oxide, and steam. These four gaseous products, however, are in the state of equilibrium referred to above when they leave the generator; and hence Hoitsema's theory possesses importance for the water-gas process. The first question is how to ascertain the quantitative relations which must obtain when equilibrium is found in the gaseous mixture at a given temperature.

Let us, in the first place, suppose that the gas contains a gramme-molecule of hydrogen per litre, or that the concentration of the hydrogen ( $\text{C.H}_2$ ) is unity. At the same time there may be  $m$  gramme-molecules of carbonic acid contained in a litre of the gas, or the concentration of the carbonic acid ( $\text{C.CO}_2$ ), will be equal to  $m$ . The frequency with which the molecules of carbonic acid react on the molecules of hydrogen will clearly be proportional to their number, and, therefore, proportional to  $\text{C.CO}_2$ . If, now, we suppose that the concentration of the hydrogen in the gas is changed so that  $\text{C.H}_2 = n$ , while  $\text{C.CO}_2$  remains unchanged at  $m$ , then the reaction between the molecules of hydrogen and the molecules of carbonic acid will clearly be  $n$  times as frequent as before. Consequently, the amount  $m$  of gramme-molecules of carbonic oxide and water which are formed by the reaction in unit time will be found to be proportional to the product  $\text{C.CO}_2 \times \text{C.H}_2$ , or—

$$m = \text{C.CO}_2 \times \text{C.H}_2 \times k_1$$

where  $k_1$  is a number which expresses the velocity of reaction for carbonic acid and hydrogen. But if equilibrium is maintained in the mixture, then at the same time as these  $m$  molecules of carbonic oxide and water are formed, there must conversely be formed  $m$  molecules of carbonic acid and hydrogen. The latter molecules are formed by the converse reaction between the molecules of water and carbonic oxide in the mixture, thus:

$$m = \text{C.CO} \times \text{C.H}_2\text{O} \times k_2$$

where  $k_2$  represents the velocity of the reaction between carbonic oxide and water, and  $\text{C.CO}$  and  $\text{C.H}_2\text{O}$  the concentrations of the carbonic oxide and water vapour respectively in the mixture. These expressions may now be put in an equation:

$$\text{C.CO}_2 \times \text{C.H}_2 \times k_1 = \text{C.CO} \times \text{C.H}_2\text{O} \times k_2$$

or—

$$\frac{\text{C.CO} \times \text{C.H}_2\text{O}}{\text{C.CO}_2 \times \text{C.H}_2} = \frac{k_1}{k_2} = K (1)$$

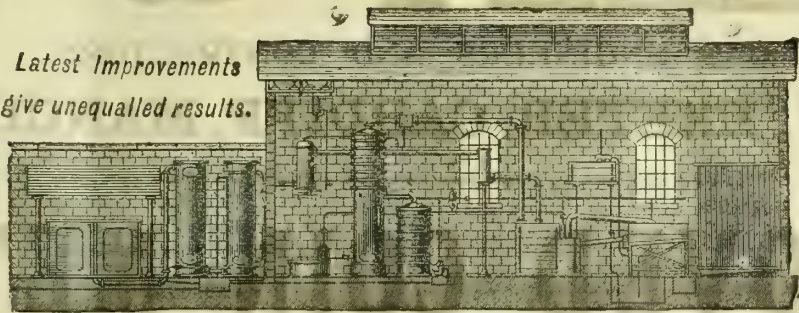
This relation may be expressed in words thus: The product of the concentrations of the carbonic oxide and of the water vapour, divided by the product of the concentrations of the carbonic



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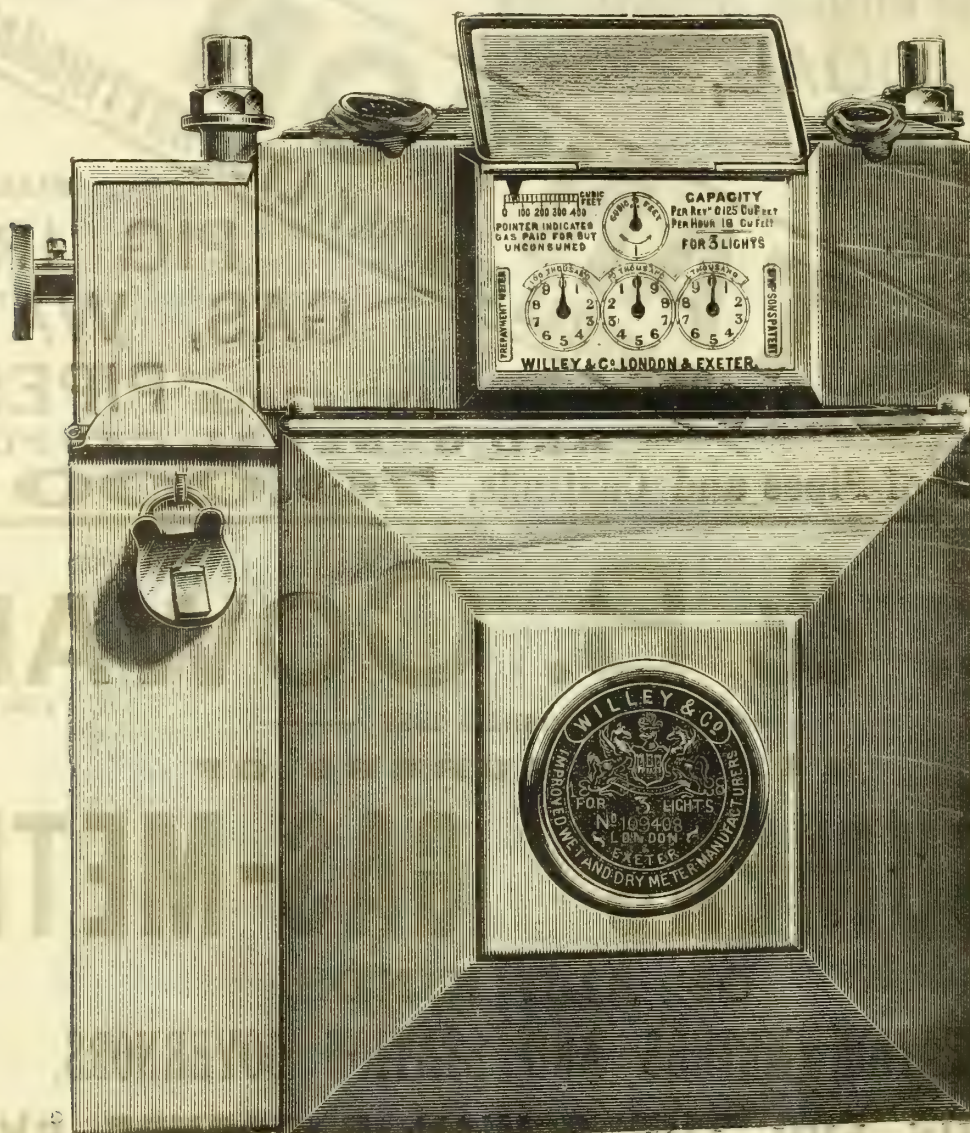
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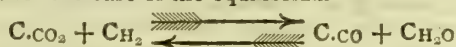
acid and of the hydrogen, is equal to a certain value  $K$ , which value is the equilibrium-constant of the gaseous mixture.

Knowledge of the equilibrium-constant affords much valuable light on the composition of the gaseous mixture. For example, if the product of the concentrations of the carbonic acid and of the hydrogen ( $C.CO_2 \times C.H_2$ ) in a mixture is known, then the above relation gives also the value of the product of the concentrations of the carbonic oxide and of the water vapour ( $C.CO \times C.H_2O$ ); and thus it may be seen that the concentration of the water vapour present in the mixture must be so much the less the more carbonic oxide there is present. We may in anticipation draw a conclusion with reference to the water-gas process—viz.: At temperatures between  $1000^\circ$  and  $1100^\circ$  C. ( $1832^\circ$  and  $2012^\circ$  Fahr.), the equilibrium-constant  $K$  has an average value 1.8; and at the same time the concentrations of hydrogen and carbonic oxide are of the same order of magnitude, or, roughly,  $C.CO = C.H_2$ . Equation (1) then takes the form—

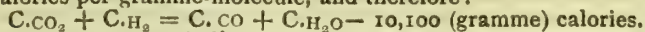
$$1.8 = \frac{C.H_2O}{C.CO_2}$$

which signifies that the concentration of the undecomposed water-vapour is about double as great as that of the carbonic acid in the generator gas.

Before giving numerical evidence of the existence of an equilibrium in the heated gaseous mixture of carbonic acid, carbonic oxide, water vapour, and hydrogen, the influence which temperature exerts on the equilibrium-constant  $K$ , and therefore on the composition of the gaseous mixture must be discussed. Those chemical processes which are attended by an absorption of heat are associated with a rising temperature; while, conversely, reactions in which heat is liberated for the most part occur at low temperatures. Phenomena of dissociation are, however, commonly observed at high temperatures, for those bodies which are formed at low temperatures with liberation of heat are decomposed with absorption of heat at sufficiently high temperatures. This law is thermo-dynamically well established; and it is valid for the case of the equilibrium



The reaction indicated by the upper arrow is associated with a considerable absorption of heat. For a temperature of  $15^\circ$  C. ( $59^\circ$  Fahr.), Berthelot found an absorption of 10,100 (gramme) calories per gramme-molecule, and therefore:



As the reaction indicated by the upper arrow is associated with absorption of heat, it will proceed the more briskly the higher the temperature is; while the converse reaction, which is attended by liberation of heat, will then take place to a diminishing extent. The product of the concentrations of the carbonic oxide and of the water vapour ( $C.CO \times C.H_2O$ ) will thus continually attain higher values as the concentration of these two bodies increases; while, on the other hand, the product of the concentrations of the carbonic acid and of the hydrogen ( $C.CO_2 \times C.H_2$ ) diminishes as the temperature rises. Therefore the constant of the reaction

$$K = \frac{C.CO \times C.H_2O}{C.CO_2 \times C.H_2}$$

will increase as the temperature rises. It follows that the value of  $K$  will finally reach infinity, or that ( $C.CO_2 \times C.H_2$ ) will, at the highest temperature, become zero, even though it cannot be demonstrated that the absorption of heat becomes continually more trifling as the temperature  $t$  increases, until it finally approaches *nil*, and that the reaction at yet higher temperatures would be attended by liberation of heat. These variations in the heat  $q$  of the reaction by which carbonic oxide and water are formed from carbonic acid and hydrogen, find expression in the following formula:

$$q = 10111 - 0.72 t. - 0.00101 t^2$$

[The peculiar variations in the heat of the reaction which are observed as the temperature rises, are due to the want of uniformity in the specific heats of the several constituents. The mean specific heats of hydrogen and of carbonic oxide, according to Mallard and Le Chatelier, are given by the expression  $4.76 + 0.00122 t$ ; while the similar values for carbonic acid and water vapour are respectively  $6.50 + 0.00387 t$  and  $5.78 + 0.00286 t$ . Therefore, heating one molecule of carbonic acid and one molecule of hydrogen from zero to  $t$  will require  $0.72 t + 0.00101 t^2$  calories more than will the heating of one molecule of carbonic oxide and one molecule of water through the same range of temperature. At zero, the formation of one molecule of carbonic oxide and one molecule of water from one molecule of carbonic acid and one molecule of hydrogen requires 10,111 calories. Let us conceive the conversion to proceed thus: The carbonic acid and hydrogen are first heated from  $0^\circ$  to  $t^\circ$ ; they are then converted to carbonic oxide and water vapour; and these two gases are then cooled to  $0^\circ$ . The heating of the mixture of carbonic acid and hydrogen requires about  $0.72 t + 0.00101 t^2$  calories more than the cooling of the carbonic oxide and water affords; and therefore the heat absorbed by the chemical change when the gases are heated to  $t^\circ$ , will be less by  $0.72 t + 0.00101 t^2$  than the similar absorption of heat at  $0^\circ$ .]

When the temperature  $t$  is equal to  $2825^\circ$  C. ( $5117^\circ$  Fahr.),  $q$  becomes = 0. At higher temperatures  $q$  has a negative value,

which implies that the reaction is then attended by liberation of heat. Exactly in correspondence with the changes in the heat of the reaction, the number of molecules of hydrogen and carbonic acid which are converted into water and carbonic oxide continues to increase with rise of temperature so long as  $t$  is less than  $2825^\circ$  C., for heat is absorbed in the process of conversion. But, on the other hand, when  $t$  is above  $2825^\circ$  C., the formation of molecules of hydrogen and carbonic acid from molecules of water and carbonic oxide increases as the temperature rises; and this change is then attended by an absorption of heat. The facts may in other words be expressed thus: The equilibrium-constant  $K$  increases with temperatures rising from  $0^\circ$  to  $2825^\circ$  C.; but above the latter temperature, it begins to decrease again.

These theoretical conclusions are supported in the first place by the results of Horstmann's researches on the detonation of mixtures of hydrogen and carbonic oxide with oxygen. The aim of his researches was to ascertain how an insufficiency of oxygen is distributed between the hydrogen and carbonic oxide on explosion. A mixture of this kind, after the explosion, consists of hydrogen, carbonic oxide, carbonic acid, and water in proportions which correspond with the highest temperature attained by the explosion. Cooling takes place so rapidly after the explosion that the state of equilibrium then reached does not appear to be appreciably affected. The heat of the reaction by the explosion is, however, known; and the specific heat of the gaseous mixture can be computed from the specific heats of its several components. From these data the highest temperature attained can be found, as it is equal to

$$\frac{\text{the heat of the reaction}}{\text{the specific heat.}}$$

Analysis of the gaseous mixture which remains after the explosion gives the concentrations of each of the four components; and hence the constant of the reaction  $K$ , corresponding to the temperature in question, may be found from the equation—

$$K = \frac{C.CO \times C.H_2O}{C.CO_2 \times C.H_2}$$

The various series of researches distinctly corroborate the theoretical conclusion that the equilibrium-constant increases up to a certain temperature, and then again decreases. For example, the following results are given by Hoitsema:

|                   |    |   |      |    |      |    |      |    |      |    |      |    |      |
|-------------------|----|---|------|----|------|----|------|----|------|----|------|----|------|
| $K$               | .. | = | 4.96 | .. | 6.01 | .. | 6.49 | .. | 6.27 | .. | 5.78 | .. | 5.00 |
| Temp. $^\circ$ C. |    |   | 2174 | .. | 2454 | .. | 2762 | .. | 2598 | .. | 3057 | .. | 3473 |

The average of the whole series of experiments shows the maximum value of  $K$  to be 6.25; and this corresponds with the temperature  $2670^\circ$  C. The temperature already found, by calculation, for the maximum value of  $K$  was  $2825^\circ$  C.

Hoitsema also substantiates his theory by reference to the researches of Messrs. Macnabe and Ristori,\* who investigated the composition of the gases formed when various solid explosives were fired. These gases contained carbonic acid, carbonic oxide, hydrogen, and water vapour in admixture with nitrogen and a little methane. The concentrations of the first four constituents afford a means of calculating the constant of the reaction. The determination of the temperatures for each case is, however, not very reliable, because the gases are under high pressures and cool quite slowly. The highest temperature attained falls within the same range as in Horstmann's researches—the value of the equilibrium-constant ( $K$ ) fluctuates about 4.2; and indicates the influence of temperature on the equilibrium.

Hoitsema concludes that the results of the researches made on explosives present a study of the equilibrium of the reaction between  $3500^\circ$  and  $1750^\circ$ ; and that the latter temperature approaches those which can be maintained constant for a long time, and at which the equilibrium of the reaction is made to take quite another course. Dr. Bunte drew the author's attention to researches made at Karlsruhe by Herr Harries, of which the results were published in 1894†. In these researches, steam was passed through a heated porcelain tube in which were pieces of charcoal. The amount of steam introduced, the composition of the gas which issued from the tube, and the temperature of the tube, were ascertained. The significance of these researches lay in the demonstration they afforded of the enormous influence which the temperature of the generator exerts on the composition of the gas produced. Tolerably complete decomposition of the steam first occurs at temperatures above  $900^\circ$  C. The appended table presents the results of the observations in a form which facilitates the direct calculation of the equilibrium-constant. The gaseous mixture consists of the four substances with which the equilibrium studied by Hoitsema is concerned. The concentrations of the carbonic oxide,  $C.CO$ , water,  $C.H_2O$ , carbonic acid,  $C.CO_2$ , and hydrogen,  $C.H_2$ , are proportional to the volumes given in the table; and it is therefore easy to calculate the equilibrium-constant  $K$  according to equation (1), and this constant calculated thus is given in the eighth column. It refers to temperatures ranging from  $670^\circ$  C. to  $1130^\circ$  C. The rate of flow of the gas was much greater at the high than at the low temperatures. It will be useful to observe whether the values of  $K$ , based on these researches, are in harmony with the maximum value of the equilibrium-constant of 6.25 found by Hoitsema for

\* Proceedings of the Royal Society, 1894, 56, p. 8.

† "JOURNAL," Vol. LXIII., p. 484.



a temperature of 2825° C.; and whether they correspond with the temperatures at which the formation of water gas occurs.

| Temperature. |      | Volumes per Cent. of the Products. |                   |       |                   |          | Rate of Flow per Hour of the Gas Formed. | Value of K Deduced from the Results of the Observations. | Value of K Computed from Theoretical Considerations. |
|--------------|------|------------------------------------|-------------------|-------|-------------------|----------|------------------------------------------|----------------------------------------------------------|------------------------------------------------------|
| °C.          | °F.  | H.                                 | CO <sub>2</sub> . | CO.   | H <sub>2</sub> O. | Cub. Ft. |                                          |                                                          |                                                      |
| 674          | 1245 | 8.41                               | 3.84              | 0.63  | 87.12             | 1.91     | 1.70                                     | 0.49                                                     |                                                      |
| 753          | 1396 | 22.28                              | 9.23              | 2.67  | 65.82             | 3.81     | 0.85                                     | 0.70                                                     |                                                      |
| 838          | 1540 | 28.68                              | 11.29             | 6.04  | 51.09             | 7.76     | 1.01                                     | 0.93                                                     |                                                      |
| 838          | 1540 | 32.77                              | 12.11             | 7.96  | 47.15             | 6.95     | 0.94                                     | 0.98                                                     |                                                      |
| 861          | 1582 | 36.48                              | 13.33             | 11.01 | 39.18             | 11.23    | 0.89                                     | 1.07                                                     |                                                      |
| 954          | 1749 | 44.43                              | 5.66              | 32.70 | 17.21             | 13.35    | 2.25                                     | 1.41                                                     |                                                      |
| 1010         | 1850 | 47.30                              | 1.45              | 48.20 | 3.02              | 13.03    | 2.12                                     | 1.65                                                     |                                                      |
| 1060         | 1940 | 48.84                              | 1.25              | 46.31 | 3.68              | 20.77    | 2.78                                     | 1.88                                                     |                                                      |
| 1125         | 2057 | 50.73                              | 0.60              | 48.34 | 0.303             | 23.05    | 0.48                                     | 2.11                                                     |                                                      |

A formula established by van t'Hoff affords the means of calculating the changes in the equilibrium-constant K, which accompany changes in the temperature of the reacting mixture. This formula is:

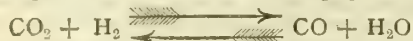
$$d \log(K) = \frac{q}{2T^2} \times dT$$

in which T signifies the absolute temperature of the reacting mixture, and q the heat absorbed in the reaction. In the case in question, integration of the differential equation gives the formula—

$$\log(K) = -\frac{5116}{T} - 0.1947 \log T - 0.000505 T + \text{a Constant}$$

The constant, on the assumption that the maximum value of K is 6.25 for 2825°, is -3.895. The results of the calculations by this formula are given in the ninth column of the table. Except at 674° C., at which temperature the action is very sluggish, it will be seen that the agreement between the experimental and theoretical values of K is fairly good, and is better the more favourable the conditions are for the observation. The discrepancies are about equally distributed either way.

It may be observed that only an apparent equilibrium subsists between the gaseous components of the mixture and the incandescent carbon. The ratio of the carbonic oxide to the carbonic acid changes, for instance, in a very extraordinary manner, and to a much greater extent than even the unusually high heat of vaporization of carbon would lead one to expect. More precise knowledge concerning this apparent equilibrium should be secured by further researches. An accurate solution of any one of these apparent equilibria would be sufficient for calculating the composition of the generator gas for all temperatures of the generator. It would only then be necessary to bear in mind the connection which has been established once for all by the equilibrium discussed in this paper—viz.:



#### BRITISH ASSOCIATION OF WATER-WORKS ENGINEERS.

We to-day conclude our report of the proceedings at the meeting of the above Association on the 10th inst. by giving the principal parts of the paper read by Mr. H. BERTRAM NICHOLS, Assoc.M.Inst.C.E., and of the discussion thereon. The subject of the paper was—

##### WATER SUPPLY FROM THE LOWER GREENSAND AT LEIGHTON BUZZARD.

The lower greensand is an important siliceous formation immediately underlying the gault, composed of soft yellowish sands with ferruginous seams, and it invariably contains a large proportion of solid impurity in solution, nearly all of a saline nature, which, although imparting some hardness, is not injurious to health. Both the upper and lower greensands are of porous and oxidizing strata, which rapidly destroy or remove the organic matter contained in the water percolating through them, and leaving mere traces behind. The proportion of organic elements in these waters is therefore almost invariably very small. Among their constituents they contain protoxide of iron, which probably exercises a reducing effect upon the nitrates and nitrites present in the water; thus removing their oxygen, and transferring a portion of their nitrogen into ammonia, while the remaining nitrogen escapes as gas. Even the sulphates present in the water are in some cases attacked, and sulphuretted hydrogen generated. The evidence of previous animal contamination is thus diminished or even obliterated altogether, while the water acquires a considerable proportion of ammonia.

The waters from the lower greensand are frequently slightly turbid owing to the friable character of the water-bearing stratum. They are palatable, and generally of a moderate degree of hardness. Occasionally they have a slight odour and flavour of sulphuretted hydrogen when first of all raised to the surface. These, however, soon disappear when the water is exposed to the atmosphere.

In connection with the water supply to the town of Leighton

Buzzard, a well and boring has been sunk into the lower greensand. The well is 8 feet internal diameter, lined with cast-iron cylinders in segments carried down to a depth of 48 feet; and below this the well has been deepened a further 16 feet with 7 feet diameter cylinders. Beneath the well the bore pipes are carried down to a total depth of 200 feet from the surface; the tubes varying from 10 to 8 inches in diameter. A great deal of difficulty was met with during the construction of the works in consequence of the sand blowing below the depth of 48 feet from the surface. Down to this depth stiff gault clay was met with; but below this level sand, some of a very loose nature, with bands of varying thickness of grey sandstone, congealed stone, pebbles and sand, and some very hard stone. Owing to the difficulties experienced, the well sinking and boring operations from beginning to finish took about 2½ years to complete—many stoppages having occurred, and difficulties of an unforeseen nature having arisen.

The water above the depth of 175 feet from the surface is entirely shut out from the well, as upon analysis by Professor Attfield in November, 1892, although he reported the water as being most remarkably pure, and among the slightly hard or comparatively soft class of well waters, he mentioned its slight but temporary fault of containing, when first pumped, a little iron in solution. So it was decided to go to a lower depth, in the hope of finding the iron eliminated from the water. At the depth of 200 feet, the water was again tested by Professor Attfield, who reported, in July, 1893, that the water was of good quality for all drinking purposes. "The sample," he said, "contains a red ferruginous sediment. There was no trace of iron in solution. Poured off from the sediment—which is what everybody would do before drinking the water, and which is what I did before analyzing—the water is, as I have said, of good quality for all drinking purposes. I assume, however, that this ferruginous sediment was originally in solution; exposure to the air and the shaking in transit causing its deposition. If that be so, consideration must be given to the question of due exposure in reservoir or otherwise, and arrangements for the periodical removal of sediment if the water is to be used for supplying a town. Such depositing iron ensures purity in the drawn-off water." Upon this report, the author suggested that an aerating spiral trough should be fixed above the surface of the water in the circular tank in the tower, having level overflows each side the channel across the centre of the tank, in order to ensure spray action; and this was incorporated in the scheme of water supply.

In consequence of the severe frost in the winter of 1894, the then Local Board decided to protect the outside of the tank with felt, on account of its extent of surface and exposed situation. But the result of this protection, which necessitated boarding over the top of the tank, was that the spiral trough arrangement did not answer so well as was previously anticipated under the former conditions.

After the works were completed at the end of 1896, and the water had been regularly supplied to the consumers for some time, sentimental objections arose with respect to the colour of the water, so Professor Attfield was again resorted to in October, 1897, when he reported in a similar manner as before on the sample submitted to him. He said: "It contains a perfectly harmless trace of iron, which soon settles. While settling, the water is unsightly; on the other hand, the iron affords a guarantee against organic impurity. I should prize such water as a town supply; but more especially if the iron could be deposited by exposure in reservoirs or otherwise before delivery to consumers."

##### Analytical Data.

One gallon contains the following number of grains and decimal parts of a grain of the respective substances:—

|                                                               |        |
|---------------------------------------------------------------|--------|
| Total suspended solid matter, dried at 250° Fahr.             | Traces |
| Total dissolved solid matter,                                 | 20.5   |
| Ammoniacal matter, yielding 10 per cent. of nitrogen          | 0.09   |
| (equal to ammonia per million, 0.150.)                        |        |
| Albuminoid organic matter, yielding 10 per cent. of nitrogen  | 0.04   |
| (equal to ammonia per million, 0.070.)                        |        |
| Nitrites                                                      | None.  |
| Nitrates, containing 17 per cent. of nitrogen                 | 0.22   |
| (equal to grains of nitrogen per gallon, 0.04.)               |        |
| Chlorides, containing 60 per cent. of chlorine                | 1.9    |
| (equal to grains of chlorine per gallon, 1.15.)               |        |
| Hardness, chalk-grains or degrees: Removed by ebullition, 11; |        |
| unaffected by ebullition, 3—total                             | 14.0   |
| Lead or copper                                                | None.  |
| Physical examination, a faint brownish tinge (iron).          |        |
| Oxygen absorbed in three hours (by iron)                      | 0.16   |

The discoloration of the water remaining a source of trouble to the District Council, they consulted Mr. Holme, the Manager of the water-works at Hornsea, near Hull, at which place the water was stated to be of a similar nature, and had been satisfactorily treated at his hands. He reported that the water when pumped from the well was clear and bright; but when delivered from the rising-main emitted a sulphurous smell, and that this arose from the gas dissolving the oxide in the water, which, when exposed to the air, deposited in the pipes and domestic utensils. He recommended a method of precipitation by breaking the water up and exposing it to the atmosphere; passing it next through filters of coarse gravel and sand, which should retain the oxide; and then storing it in a reservoir sufficient to hold about a day's supply.

From the report of a deputation which visited Hornsea accom-



panied by Mr. T. Hughes, the Water Manager, they found there was a great difference between the water at Hornsea and that at Leighton. At Hornsea the water practically remained clear the whole time; and there seemed to be no difference in the colour of it after exposure. At the same time, there was a deposit of iron after standing only a short time; and this deposit was easily retained by the filters. It was considered, however, better to allow the Leighton water to stand in settling-tanks and deposit before passing through the filters, as the Hornsea process would not take out the iron by working continuously. The deputation recommended that the Council provide an aerator, settling-tanks of sufficient capacity to allow ample time for depositing, afterwards passing the water through a sand filter into a reservoir to give a sufficient body of water for the pumps to draw on.

Mr. Hughes's opinion on the subject is that exposing the water to the atmosphere does not remove the iron, but that it is necessary that it should be exposed before it can be removed. When the water is pumped up from the well, it is perfectly clear before its exposure to the atmosphere. But after being exposed, it becomes very much discoloured; and this gives cause for numerous complaints. Mr. Hughes has fixed up an apparatus at the tower for the purpose of ascertaining whether aeration and filtration would remove the iron; and the experiment has proved successful. But in consequence of his leaving the town to take up a more lucrative appointment, the experiments have been suspended. The water was first passed through an aerator, which consisted of a pipe carried up a height of about 25 feet, and on this pipe were fixed three perforated discs, placed one above the other and about 18 inches apart. The water falling through these discs in the shape of rain allowed the air to be thoroughly mixed with the water, which was afterwards conveyed into a tank through a trough, which again acted as an aerator. In this tank the water became much discoloured, owing to oxidation taking place as a result of the aeration. After this treatment, the water was passed through a gravel and sand filter, when it became perfectly clear and bright, and did not show the least sign of discoloration after being exposed to the air for fourteen days. Mr. Hughes, from continued observation, considers it necessary that the water should remain some time in the settling-tank, otherwise it would oxidize in the filter, with the result that the iron would be found near the invert of the filter, necessitating great expense in cleaning out. It would be better if it were allowed to stand 24 hours after aeration. The iron would be found at the top of the filter, and could readily be removed; and the water would then be free from impurities.

The Council are about to adopt a scheme on the above method to remove the discoloration of the water; and this will probably form one of the first measures to be taken in hand by their new Manager. The water from the well is raised into the wrought-iron tank, 30 feet in diameter and 19 ft. 3 in. in depth, carried on the walls at a height of 62 feet above the ground-level. The tank is divided into two parts for a depth of 5 feet from the bottom of the tank. This division was made in order to allow the whole of one side of the tank to be cleaned out, while there would remain on the other side of the division a sufficient supply of water for the ordinary purposes of the town. The capacity of the tank is 80,350 gallons; the depth of water with this quantity being 18 ft. 3 in. The arrangement of the engines and pumps is in duplicate. Two Crossley 9-horse power nominal gas-engines work the two sets of three-throw pumps; and on the same floor are two other gas-engines, with air-compressors for working the ejectors in connection with the town's sewerage scheme.

In connection with the discoloration of the water, the "Fischer" system of water filtration is being considered by the Council; and Mr. Hughes has submitted proposals by which he estimates the required desiccation of the iron from the water could be arrived at by an expenditure of about £800. For the water supply of small towns situated on the lower greensand, and where they are dependent upon a supply from this stratum, it becomes a serious matter to abstract the iron from the water, necessitating, as it appears to do, additional machinery and pumping the water to an elevated tank after it has been raised from the well or borehole into the settling-tanks or other apparatus requisite for its treatment. Where the water passes over or through the chalk or other calcareous stratum, the hardness is sometimes excessive, as at the Barton boring, near Cambridge, where the total hardness reached 44.3°. Generally speaking, however, the waters from the lower greensand are good and wholesome for drinking and cooking purposes; but in many instances they are too hard for washing.

#### Discussion.

Mr. W. G. PEIRCE (Richmond) inquired the cost of the well and boring, and also whether the work was done by contract or administration. He noticed that the pumping was done by gas-engines; and he would like to know the cost per 1000 gallons of water raised, and the quantity obtained from the well per day.

Mr. W. COLEMAN FINCH (Chatham), having mentioned that he expected soon to be engaged on a boring 600 feet deep, asked to what height the water rose in the borehole described in the paper, the delivery in gallons per hour, the diameter of the perforated tube, and whether in the author's opinion it would not be possible for water engineers to do their own boring, provided they had men used to such work. He thought he should carry out the boring he had mentioned himself. There was an enormous

profit on well boring—in fact, he had good reason for believing that 75 per cent. of the price paid was profit. He did not see why, with care, they should not be able to do such work themselves. Tools could be bought or hired at a reasonable rate.

Mr. F. J. BANCROFT (Hull) inquired whether tests of the yield were made when the well was sunk and then subsequently, to ascertain whether the yield had been maintained. As they all knew, in working in the lower greensand a difficulty was often found to result through the sand running in, and thus partially choking the tubes. The water at Leighton Buzzard appeared to him to be one that could be treated both chemically and mechanically; and the trouble which they had had to deal with seemed to have arisen through the work not having been tackled in the first place on a scientific basis. The sample that was sent to the analyst was, in his opinion, improperly taken. It was allowed to be aerated; and the iron had deposited in the sample when delivered to the analyst. The sample ought to have been taken under water, so as to have been kept free from the oxidizing effect of the atmosphere. In his opinion, a water of this description wanted to be dealt with in two ways: First, it should be aerated—exposed to the atmosphere—which would cause the iron to deposit; and then it should be mechanically separated from the water. He noticed that the tank was boarded over the top; so that the arrangement described for aerating the water was rendered useless. Aeration was provided first; then means were taken to prevent it. Consequently aeration did not take place in the tank, but in the consumers' cisterns and domestic vessels. He was present at the opening of the new water-works at Hornsea a short time since. There the water first passed through an aerator, then over three circulating tumbling discs, was then filtered, and stored in the reservoir. Sand filters were used; but previously cloth ones were employed. He could not agree that at Hornsea, the water remained practically clear the whole time. That seemed contradictory to what they would expect. If the oxide of iron was deposited, the water could not possibly remain clear the whole time. It was considered advisable to allow the Leighton Buzzard water to stand in settling-tanks. He presumed this was after aeration; but it seemed to him there would be little use in allowing the water to be exposed in such a manner with only the surface in contact with the atmosphere. The proper way was to expose an enormous amount by spraying. He should also like to know the value of the wrought-iron tank to which the water was raised from the well. If he understood correctly, this was previous to the aeration and settlement. It seemed to him that the raising of the water to this tank was useless; and the money spent on it had better have been devoted to additional aerating power. The water after analysis should show exactly the treatment it required; and it only wanted to be treated in this way to ensure success.

Mr. W. W. GRAY (Cambridge), referring to the statement in the paper that the water from the Barton boring, near Cambridge, reached a total hardness of 44.3°, suggested that there must be some mistake. From his experience of borings in the neighbourhood of Cambridge, he could assert that the hardness of the water from the lower greensand did not exceed 4° or 4½°. The 44° absolutely varied from all analyses he had had made. He had a boring in the greensand at a depth of 202 feet; and the hardness of the water was 4½°. They had had no difficulty whatever with oxide of iron. The only difficulty they expected was in the mixing of the lower greensand and chalk waters; but fortunately there had not been any trouble in that respect.

Mr. E. J. SILCOCK (Leeds), having pointed out the omission of information as to cost, population, quantity of water obtained, &c., agreed with a previous speaker that where engineers could give the work their personal attention, or had competent assistants who could give constant attention to it, a boring should be carried out by administration. He had had some little experience of boring both by administration and contract; and the prices asked for boring were, as a rule, very excessive. In doing the work by administration, he advised that the plant should be purchased, as the cost of hiring it was as bad as paying for the work being done outright. The tools were not expensive; and after the work was finished, they could be sold. It did not always follow that water from the lower greensand contained iron. He had himself put down a borehole into the lower greensand; and the water had not the slightest trace of iron in it. He noticed that Mr. Nichols had air-compressors on the premises for working the ejectors in connection with the town's sewerage scheme; and he thought it would be a cheap and easy matter to arrange to apply this air for aerating the water. He also requested information as to how the bore-tubes were put down, and what precautions were taken to exclude the sand.

Mr. T. W. A. HAYWARD (Sudbury), alluding to the use of gas-engines for pumping, said it would be interesting to know the price of the gas, as it varied considerably in different towns. In one town he had been in only 2s. 3d. per 1000 cubic feet was charged; while now he had to pay 4s. 5d. So that while gas-engines might pay in one place they would not in another. Reference had been made to the profits of contractors for borings. They were not always large. He knew of an instance in which a contract was let for boring a well 50 feet, commencing 150 feet from the surface; and the contractor only asked 12s. 6d. per foot. After the men got down about 20 feet, one of the tools broke. Then they had to wait two or three days before they could get the necessary appliances from London to get the tool up. When the machinery was started, it also broke down—



in fact, accident after accident happened, until four men were four weeks before they could make a fresh beginning. Supposing each man was only paid £1 a week, it would be seen that this one accident cost £16; whereas the value of the whole job (which took about ten weeks) was only £31 5s.

Mr. W. WHITAKER (Croydon) pointed out that in papers of this description—of a more or less local character—there was the danger, into which authors fell quite naturally, of only thinking of the district of which they were writing, and not of others. They made statements that were perfectly true with regard to one district; but they forgot to qualify them with respect to others. He referred particularly to the first few sentences in the paper. He could not quite understand why the analysis of Professor Attfield should have led to the abandoning of the water in the upper part of the sand. The reason given was because of the iron it contained. But there was iron in the water taken lower down; and he could not see that there would be any more difficulty in dealing with the iron in the water from the upper than from the lower part. Constantly the opinion was expressed that people had only to sink into the lower greensand to get all they wanted. Papers of this kind showed that there were difficulties in these sand supplies. They were not so very easy to get; and the water was not much better than other waters. It was certainly no better than limestone waters. Then there was the question of fine sand running over into the borehole; and, of course, if they attempted to pump from a borehole in the sand, they would certainly have the borehole stopped at some time or other. Coming to Professor Attfield's analysis, he said it had the usual fault—there was not enough of it. They were told the total of the suspended and dissolved solid matter; but they were not told what that solid matter was. They were only informed that it was not lead or copper, and that they knew before. He should like to know the percentage of iron in the water. He thought the Hornsea water was a chalk one, and did not come from the lower greensand. If this was so, there would, of course, be a considerable difference. The author also stated that where the water passed over or through the chalk, the hardness was sometimes excessive. He (Mr. Whitaker) did not know whether that alluded to some underground infiltration of chalk water into the lower greensand, or whether it merely referred to chalk water. As regarded the hardness of this particular water, he did not quite understand it. They were told that 11° of hardness were removed by ebullition—that was to say, the hardness of the limestone water, which was comparatively not hard. It was not the hardness they would expect from the lower greensand water. He suggested that Barton near Cambridge should read Barton in Bedfordshire. The 44° of hardness in that case was enormous; and there must be some special reason for it. If it was the place he was thinking of, the springs were from the base of the chalk, or very near it—either at the top or lower down in the chalk marls. However, it was very interesting to get hardness of that sort recorded. The question was coming to the front as to whether the charges for boring were not very high; and in some cases they certainly were. In America where the cost of labour was heavy, they could do boring cheaper than in this country. There must be some reason for this. The case mentioned by Mr. Hayward was rather unfair. They ought to take the average cost of several works, and not one where a series of accidents happened.

Mr. C. SAINTY (Eton) remarked that the author stated that the water above the depth of 175 feet from the surface was entirely shut out from the well; and yet it appeared that he had a length of perforated tubes to within a short distance (about 34 feet) from the bottom. He should like to know how the water was kept out of those perforations. It was rather strange to have a perforated pipe with blowing greensand, as it seemed to him that sand must get into the perforations.

Mr. C. E. JONES (Leyton) said, in his estimation, the value of the paper would have been increased if the analysis of the water had been complete. It would have been more scientific, and certainly more satisfactory, if the water as brought from the greensand had been analyzed, and had it been followed in its various stages—showing the reactions that took place in the water from time to time, and the means adopted to bring about the reactions. The iron, he took it, could be precipitated by aeration. Pure oxygen would be better; but that would be expensive, and so they had to use atmospheric oxygen. If he had had to do this work, he should certainly have aerated the water by compressed air as it was being pumped into the cistern. Atmospheric aeration was slow, and time and space were required to carry it out; whereas if the water was charged with air under pressure, the same result could be obtained in less time, and more satisfactorily. He should like the author to tell them where the sulphuretted hydrogen came from. This was a poisonous gas, and had a most abominable smell. He did not see any mention of pyrites or sulphur which might account for the formation of the sulphuretted hydrogen. He mentioned other points on which information should be given. He also had an idea (which might be right or wrong) that, if the hardness of the water were materially reduced, there would be less trouble in dealing with the iron chemically. It would also be interesting to know whether milk of lime had been tried in treating the water for its inherent complaints. A little iron was not always objectionable. People now liked white water; and iron in the state of protoxide of iron discoloured it. In some parts of the country, brown waters, such as came from the peat, were habitually

used; and people got to like them in preference to white waters. The colour was not always a criterion of its quality.

Mr. J. S. PICKERING (Nuneaton), who had to deal with a somewhat similar water in North-East Warwickshire, said that, in seeking for a larger supply, it had been necessary to sink deeper; and they had come across water impregnated with iron. They had found it some 20 miles along the same strata. He believed the method adopted at Leighton Buzzard for removing the iron was the proper one, although it was exceedingly expensive for a small town; but he did not see any other way out of the difficulty. They could not supply the water without removing the iron. The sentimental objection was a serious one. In his opinion, the course to adopt was first to aerate the water, allow it to settle in a sedimentation tank, pass it on to sand filters, and then discharge it into the service reservoir. He had adopted the floating arm arrangement, so that the water could be decanted from the surface instead of from the bottom, because any iron that did not deposit in the filters would have an opportunity of doing so in the reservoirs. In his case, the water on being pumped was clear in appearance; but after 24 hours or so it became turbid, and after 48 hours the deposit of iron took place.

Mr. S. E. NORMAN (Burgess Hill) described his method of treating lower greensand water. They pumped it up, and allowed it to fall over a serrated trumpet mouth on to a bed of gas coke. The serrations were so arranged that the water spun in ringlets, and took in air. The gas coke was rough, and so scrubbed the water. It was then run into a channel round the sides and end of a large filter-bed; and in that channel were placed lumps of coke, so as to imitate a stream running in the natural way over boulders. Then the water passed over an apron of coke on to the filter-beds. He found this system most successful, and had not had the slightest complaint since they adopted it. They treated from 8000 to 10,000 gallons per hour over 2000 square feet of filter-bed.

Mr. J. SHAW (Boston) believed that every water required special treatment. There were scarcely two waters alike; and there were very few waters from the lower greensand that were exactly similar. The analysis struck him as being peculiar. The hardness of the water was very high; from 4° to 9° being the average hardness for lower greensand water. Where the hardness rose above that, there were suspicions of surface pollution. He believed that occasionally where these borings passed through chalk, the water was not from the lower greensand at all—the water ran from the chalk into the lower greensand. One thing that struck him as curious was the amount of albuminoid organic matter, 0.04. At Boston, about two months since, in water that had been in store some time, the albuminoid matter was 0.2; and the analyst said it was unfit for consumption. Mr. Silcock had suggested the forcing of air into the rising-main. With some waters it would answer; but in one case in which he recommended it, the water contained a large quantity of iron in solution, and a great deal of rust was deposited in the main. In seven or eight months' time, there was considerable back pressure on the pump; and another pipe had to be laid, as the other was practically choked up.

Mr. W. WATTS (Sheffield) said the idea had struck him that, in clarifying this water, it would be a good thing to have a greater bulk of it, in order to give it a much longer exposure to atmospheric agencies. It was a fact that exposure did not deteriorate water; it made it better—bleached it in fact. From his experience, corporations could carry out borings much cheaper than contractors. With reference to water being raised to a height, and dropped down again, it seemed to him that a good deal of it in windy weather would be lost in spray.

Mr. H. ASHTON HILL (South Staffordshire Water Company) thought that water engineers should well consider the question before they themselves embarked on well sinking and boring operations. There might be circumstances where engineers were favourably situated, with time on their hands, and could go into this department; but even then he should hesitate. Speaking from his own knowledge of two or three boring companies, he said they considered themselves well off if they obtained a dividend of 10 per cent.; and he did not think they should be begrudged this return, on account of the risky character of the work. A contractor might get a good job, and make a little money out of it, which would perhaps pay for losses on the next. For such work as this, he advocated the employment of the highest class of contractor. He had lately had to revise his views on the matter. He had only just completed one boring, and was engaged on another. He was also getting out designs for two large ones—33 inches diameter for 300 feet, and below that a further 300 feet of 18 inches diameter.

Mr. J. JOHNSTONE (Brighton) asked whether the author tried the yield of this borehole in 1896 and again this year; and, if so, what was the difference. Probably he would not find a difference yet from the lower greensand, although at Leighton Buzzard it was not very deep from the surface. In his (the speaker's) own case, there had been an enormous falling off in the underground water, due undoubtedly to the want of rain last autumn and winter. His own feeling was that it would not affect the lower greensand yet, even if it did at all. He had had some difficulty with oxide of iron in connection with two water supplies with which he was connected; and they got over the difficulty quite easily by aerating the water directly from the pumps, pumping over a trumpet mouth, letting the water fall into a



reservoir and settle there, from thence flowing on to the filters, and then pumping into the district. In one case the filter was on the top of the reservoir itself. The water supply simply filtered through the sand, down a small channel, and into the reservoir below.

Mr. W. G. PEIRCE (Richmond) remarked that, for the benefit of the engineer in charge, it was preferable that work should be placed in the hands of a contractor; but there came a time when it was utterly impossible to let the work having regard to price. He was engaged in driving adits, 6 ft. 4 in. in height and 4 ft. 6 in. in width, 300 feet below the surface of the ground. The contractor's price was £3 per foot for the first 50 feet, and £4 beyond. This was such an excessive charge that the Corporation had purchased the plant for £1200, and had now nearly completed 2 miles of adits at a cost of 30s. per foot.

Mr. C. H. PRIESTLEY (Cardiff) said Mr. Hill had remarked that in one place a boring contractor might make a lot of money, and in another might lose on the work. Where he made a great profit, he did so at the expense of the town; and the town lost money which would have been saved if the work had been done by administration. In the other case, it was obvious the town would not be paying an adequate amount for the work done. It was hardly fair to make one town pay for another.

The PRESIDENT spoke of the enormous time taken to sink the well. Taking 300 working days in a year, he found that no less than three days were occupied per foot. He entirely failed to understand the analysis, coming from such an analyst as Professor Attfield. It was stated that there were merely "traces" of total suspended solid matter. This appeared to answer the question as to whether sand was brought up in the borehole. In this sample, it was not; but, on the other hand, the sample might have been taken from an overflowing boretube. The next point was the ammonia 0.09, and the albuminoid 0.04. Many medical officers of health would pull long faces if they had to deal with results like that. He (the President) felt convinced the amount was too high; and that there must be some reason for it. The whole thing was perplexing, because when they came to the hardness, they found the total was 14°, which did not point in any degree to a regular recognized lower greensand water pure and simple. He thought there must be an intercommunication between the chalk and the greensand series. With regard to dealing with this water, it appeared to him to be a simple case; for here occurred in the natural condition of the water that which, in the Anderson process of purifying water, was brought about by artificial means. In that process iron was used for the purpose of getting rid of the organic matter, and then the water was left charged with iron, which was easily dealt with by filtration. He could not understand why in these days the tank was constructed of wrought iron, instead of steel. He also protested against the use of the word "nominal" in connection with the power of engines, and begged members in future to give the brake horse power.

Mr. NICHOLS, in reply, said he had not brought with him many details, as he did not expect such a discussion; but he would answer the questions so far as his memory would permit. The population of Leighton Buzzard at the present time was about 7000. It was not anticipated that it would increase very rapidly; and provision was made, in the first instance, for about 9000 people. It was a combined scheme of water-works and sewerage; and the total cost of it was £22,500. The cost of the water supply distinct from the sewerage scheme was about £9000; and that of the well and boring, about £1350. As to the perforated tubes and the shutting off of the water to a depth of 170 feet, he explained that, when they reached that depth, they tested the water, and found a larger quantity than was at present raised—he believed about 15,000 gallons an hour—but, there being iron in it, they wished to obliterate it. The perforated tubes were not removed; but a lining was put down in between, which shut off the water from the perforations. Then they went down to a depth of 200 feet; and the quantity of water now raised was 12,000 gallons per hour. Since the works were completed, the water had risen in the well 4 or 5 feet; and he did not think it had ever gone lower than it originally stood. The height at which the water stood from the surface was practically 47 ft. 6 in.; and for the purposes of pumping, a depth of 17 ft. 6 in. stood in the well, so that they did not pump from the borehole. The real point in the paper was the removal of the iron in the water. Treating it with coke filters and so on seemed very reasonable where the water could be raised to a high ground, and then passed through a trough into a filter; but unfortunately there was no hilly site within a reasonable distance of Leighton Buzzard. There had been three different analyses by Professor Attfield; and he had chosen the most recent. The analyses slightly varied; and he was sorry he had not included full details of them. The sediment in the water was about 2 grains per gallon. The well and boring were carried out by Messrs. Isler and Co.; and the length of time taken to complete the work was owing to its stoppage by the old Local Board—on one occasion for six or seven months. When they first began to pump, they did find a great deal of sand in the water; but at a lower depth, there was not so much. At the present time, very little sand was coming out of the borehole; it was the red ferruginous deposit that was the trouble. The information as to the Barton well was taken from the sixth report of the Rivers Pollution Commissioners. Milk of lime had not been tried in connection with the Leighton Buzzard water.

## REGISTER OF PATENTS.

**Mantles for Lighting by Incandescence.**—Plaissetty, A. M., of Paris. No. 26,381; Nov. 12, 1897.

This invention has for its object "to produce mantles possessing a degree of tenacity, flexibility, and durability both of structure and of illuminating capacity unattainable by the method of impregnation." It consists essentially in the preparation of a collodion formed by the solution of trinitro-cellulose in glacial acetic acid, and capable of holding in solution or emulsion any incandescent salts or compounds, the production therefrom of filaments by extrusion through capillary dies, the doubling together of such filaments to form loosely twisted threads, and the denitrification of the filaments or threads.

The method of operation is as follows: Nitro-cellulose is dissolved in glacial acetic acid, in proportions which depend on the degree of viscosity required, which may vary according as the collodion when formed into filaments by extrusion is to be passed through a coagulating bath, or as the pressure available is sufficient to thus "spin" a collodion which is so viscous that coagulation will be produced by the mere passage through the air, without the use of any bath. The patentee takes (say) 1200 grammes of glacial acetic acid, 100 grammes of gun-cotton, and from 30 to 50 grammes of incandescent salts, according to their quality and illuminating power. He first makes a sirupy or concentrated solution of the incandescent salts in the form of nitrates, in a small quantity of glacial acetic acid. He then dissolves 35 grammes of the gun-cotton in 500 grammes of the glacial acetic acid, and adds slowly the sirupy solution of the salts thereto—stirring meanwhile, so as to produce a homogeneous mixture. He then dissolves the balance of the gun-cotton in the remainder of the glacial acetic acid; and these two solutions are mixed by adding small quantities of the former to the mass of the latter.

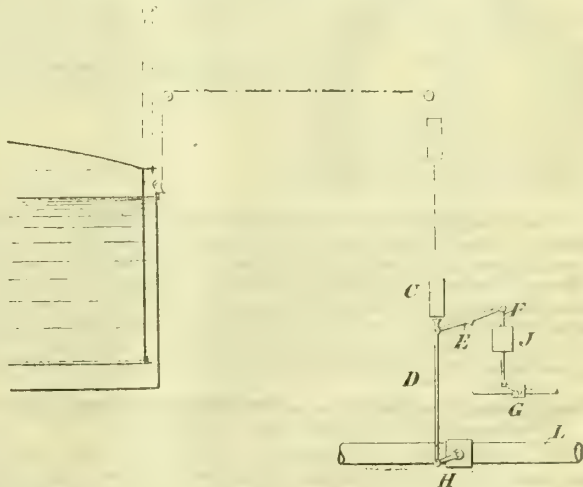
The salts preferred are the nitrates of thorium and cerium in the proportions of: Thorium, 99.25 per cent.; cerium, 0.75 per cent. But mixtures may be used of zirconium and lanthanum, in the proportion of about 60 per cent. of zirconium and 40 per cent. of lanthanum, with  $\frac{1}{2}$  per cent. of cerium; and similarly for other salts obtained from the treatment of monazite sands.

Having obtained an intimately mixed and viscous mass, it is subjected to two consecutive filtrations—first through a coarsely-meshed, and afterwards through a finely-meshed fabric. The viscous or semi-fluid product thus obtained is then "squirted" or "spun" into the form of fine filaments by extrusion, under a pressure of 70 to 150 lbs. per square inch, through dies formed of glass tubes of capillary bore; the hair-like filaments so formed being received in a bath of ammoniacal alum to remove the excess of acetic acid. The filaments are then wound spirally on a revolving drum mounted on a sliding carriage receiving traversing motion by worm gear, and may at once be denitrified (as hereafter described), or may first be dried and wound on to bobbins which are then placed in a doubling machine to form a thread, the degree of torsion being varied according to the purpose for which the mantle is to be used. Thus four or more filaments form a thread to be used for mantles to be employed with the ordinary bunsen burner, and eight or more in the case of high-pressure lamps. A great surface of contact with the flame, and consequently a great light-emitting surface, is thus obtained; and "as the filaments, though lightly twisted together, are still separate and distinct, their aggregate incandescence is greater than would be that of a single filament of the same size as the combined filamentary thread."

The denitrification is effected by immersion in a bath of 20 to 25 per cent. of sulphhydrate of calcium (calcium hydrosulphide), heated to a temperature of 40° C.; the use of calcium hydrosulphide for this purpose forming the subject of another patent, No. 3770 of 1898. In an hour or two, the thread is completely denitrified, and the salts are precipitated in the filaments in the form of oxides. The thread is then air-dried, and the mantle is formed by knitting in the ordinary way, after which it is subjected to the action of a blow-pipe flame, as usual.

**Gas-Exhauster Regulator.**—Cutler, S., of Millwall, E. No. 26,791; Nov. 16, 1897.

The object of this invention is to automatically regulate gas-exhausters by causing the holder which they are exhausting, when it has reached any predetermined minimum height, to reduce the speed of the exhausters and operate a bye-pass valve to return gas from the outlet to the inlet of the exhausters, so as to permit them to run at a reduced speed without decreasing the arranged minimum height of the holder.



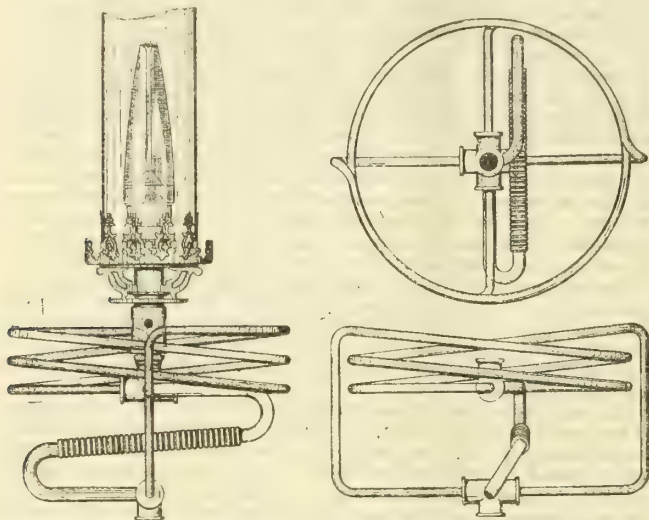
One method of carrying out the invention is to connect the holder by wires, chains, or equivalent parts to a weight C guided to rise and fall vertically, and placed adjacent to the exhausters. This weight, when it reaches any predetermined position, operates a series of links or other



mechanical parts D E F, which in turn actuate the throttle-valve G, placed in the steam-supply pipe of the engine, and a throttle-valve H placed in a pipe connecting the inlet and outlet of the exhauster. In this way, instead of further exhausting the holder, the gas simply passes through the exhauster and back from the outlet to the inlet through the bye-pass pipe L; the speed of the exhauster engine being reduced at the same time by throttling the steam supply. When the volume of gas within the holder again increases, the weight C is raised, and the counterpoise weight J reverses the lever and throttle-valves to their previous positions.

**Anti-Vibratory Supports for Incandescent Burners.**—Eldridge, J., of Oxford. No. 30,560; Dec. 28, 1897.

In order to afford a steady support for incandescent gas-burners, the patentee proposes to employ two tees or other suitable fittings, one of which is adapted to be connected to the gas-supply pipe or other convenient part, while the other supports the burner. The two fittings are



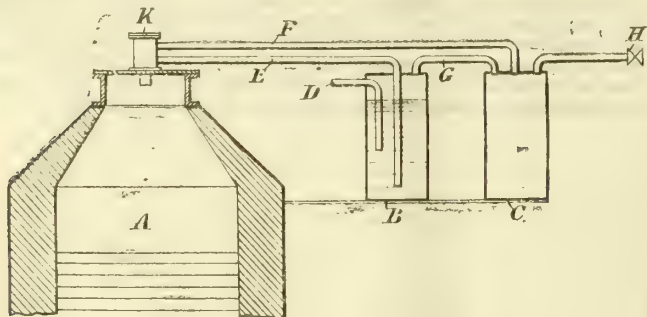
connected by two springs coiled together, as shown in the engraving, so that the burner-fitting is supported by them on two opposite sides. The burner-fitting is connected to the other fitting or to the gas-supply pipe by a flexible tube.

**Burners for Acetylene or Rich Oil Gas.**—McConchy, J., of Glasgow. No. 28; Jan. 7, 1898.

In order to obviate the carbonization of the heat-resisting material of which the top of burners used for acetylene and other rich gases must be composed, the patentee proposes to take off their sharp corners or edges, and so impart to the top of the burner a flat, even surface, or a surface approaching to convexity. In this way, he removes the area of combustion of the flame to a slightly higher altitude. The arc of the flame, and the arc or flat surface of the burner, unite at a central point of their apexes, in order to preserve the burners and enhance their duration.

**Oil-Injector for Water-Gas Carburetters.**—Botley, C. F., of Hastings, and Cutler, jun., S., of Millwall, E. No. 692; Jan. 10, 1898.

This invention relates to the combination of an atomizer for oil—preferably of the kind described in patent No. 9316 of 1896—communicating with the carburetter, an oil-reservoir in communication with the atomizer, and into which the oil is conveyed and subjected to pressure, and a pressure chamber in communication with the oil-reservoir and also with the atomizer.



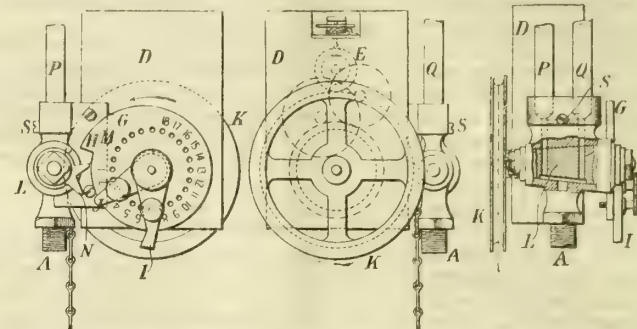
In the arrangement shown, the oil, preferably preheated, is conducted through a pipe D into a reservoir B, wherein it is subjected to a considerable pressure of steam, air, or other gas supplied from the chamber C through the pipe G. The pressure in the chamber C is regulated by a controlling valve H in the supply-pipe. The oil under pressure in B is forced through E to the atomizer K, and encountering there a jet of steam, air, or other gas coming from the chamber C through F, is broken up, and enters the carburetter A in the form of a finely-divided spray.

**Extinguishing Gas-Lamps at a Predetermined Time.**—Gunning, J., of Bournemouth. No. 1539; Jan. 19, 1898.

This is a modification of patent No. 7011 of 1897; and, in his present specification, by way of example, the patentee supposes that there are a number of gas-lights, one or more of which have to be extinguished or lowered some time before the others. To effect this, he provides a stopcock which governs two passages from the service-pipe—the one passage being so arranged as to be closed or partly closed when the plug of the stopcock is in one position (the other passage being then open or partly

closed), and both passages being closed when the plug is turned to another position.

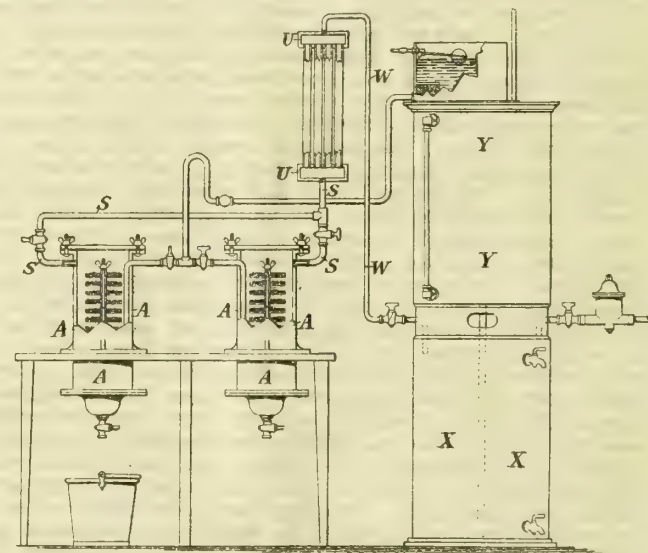
The illustration shows front and back views, and a section through the stopcock. As in the former patent, K is a chain-wheel fixed on the axis of the clockwork spring, which is wound up by pulling the chain; and G is the disc also fixed on the axis of the spring. A is the gas-supply pipe, in which is fitted a two-way cock L, on the plug of which is fixed a lever having two arms M and N; and free to turn on the axis of the disc G, are two arms I and J, of which I is the longer. These arms can be set on the disc G in positions corresponding to any of the hours marked thereon, and held by setting screws. In the plug of the cock L, there is a longitudinal passage communicating with two transverse passages corresponding to ports leading to two gas-pipes P and Q, each supplying a burner or set of burners.



The apparatus operates as follows: The arms I and J being fixed in the desired position on the disc G (say, I at 7 and J at 3), when it is desired to light the gas, the chain is used to turn the disc G in the direction of the arrow, so that its shoulder H, acting on the arm M, turns the plug of the cock so as to put both pipes P and Q in communication with the service-pipe A—both sets of burners being thus supplied. The spring having been wound by the pull of the chain, the clockwork goes on moving the disc G back until the shorter arm J, meeting the arm M after three hours, turns the cock partly round, closing the passage to P, and so extinguishing the one set of lights, but still leaving the passage to Q, for the other set of lights, sufficiently open to keep them full on, or, if desired, less open so as to lower them, according as the passage is made more or less wide. As the clock continues to go, the arm I, after seven hours, acts on the arm N, and turns the plug so far as to extinguish the set of lights supplied by Q. When it is desired to lower at the earlier hour and extinguish at the later hour either one light or a single set of lights, a plug is inserted at Q, so that when the arm J shuts off the supply to P a supply passes to P through the other passage, which can be regulated by the screw S; then at the later hour the arm I extinguishes this by closing the supply.

**Generating and Storing Acetylene.**—Stott, J., of Oldham. No. 8439; April 9, 1898.

In this apparatus, the calcium carbide holders consist of cylinders A; coupled up by water-supply pipes, each having a tap so that either can be shut off at will. The pipes lead downward to near the bottom of the cylinders respectively, so that the water has a rising flow therein to saturate the carbide gradually and proportionate to the supply. Each



cylinder has a rod fitted with a series of superposed trays kept apart by short lengths of tubing, and the whole rigidly fixed by a top nut, so that they can be removed, and separately charged with carbide. The gas gradually generated by contact of the water with the carbide passes by the pipes S to a condenser, consisting of top and bottom boxes U, connected by pipes. The condenser is exposed to the atmosphere, and so tends to cool the gas and deprive it of any moisture it may carry up before it enters the pipe W, which leads the gas into the upper part of the holder X. As the pressure and volume of gas increases, the water from the holder is driven back, and rises in the tank Y; and so one equilibrates the other proportionately to the consumption.

**Prepayment Apparatus for Meters.**—Mayer, C. P., of New Haven, Conn., U.S.A. No. 12,588; June 4, 1898.

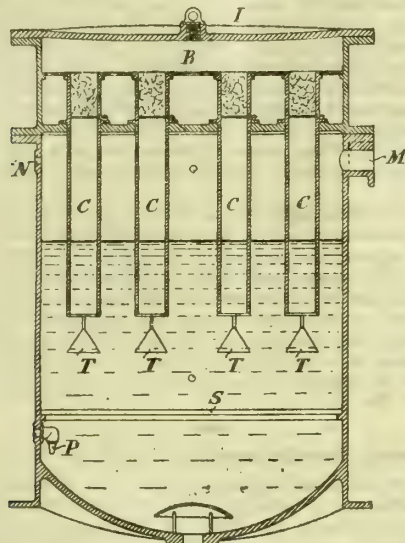
The patentee proposes the combination with a controlling shaft carrying a notched disc and an operating shaft carrying a coin-receiver, of a



single connecting lever carried by the coin-receiver, and adapted to be tilted by the insertion of a coin—one end of the lever being formed to directly engage the notched disc thereby connecting the shafts. The controlling shaft (carrying a notched disc, an operating shaft, and a fixed barrel in which the inner ends of the shafts are journaled, and which is provided with a vertical slot) is combined with: (1) A coin-receiver carried by the operating shaft, and oscillating upon the barrel; (2) a connecting lever carried by the coin-receiver, which is tilted by the insertion of a coin, and caused to engage the notched disc; and (3) a spring acting on the connecting lever to normally retain the lever out of engagement with the notched disc, and after a coin has been inserted to expel the coin through the slot in the barrel, when the coin-receiver registers with the slot. The details of the invention are not intelligible apart from the four sheets of drawings accompanying a lengthy specification—9 pages of print and 42 distinct claims.

**Acetylene Generator.**—Rosenthal, K. E., of Berlin. No. 14,049; June 24, 1898.

This invention relates to an acetylene gas-generator composed of a number of carbide receptacles put into action in the usual manner by the sinking of a gasholder; and it has for its object "to provide improved means for controlling the supply of carbide to the water receptacle, and thus the generation of the gas."

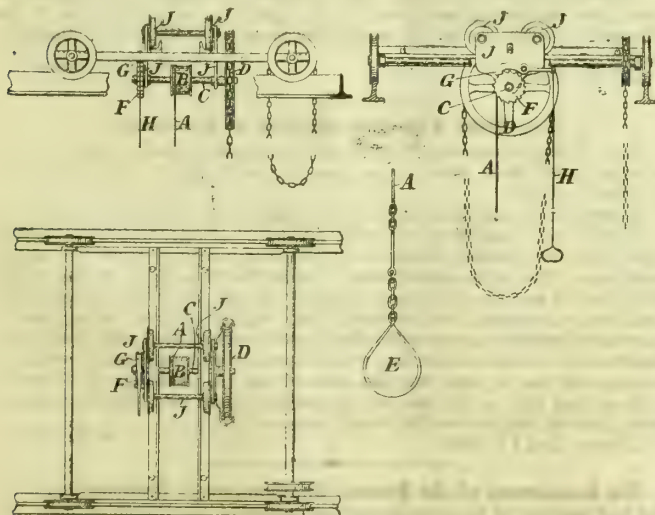


The generator consists of a chamber, above which is an impermeably closed carbide receptacle B. C are pipes partially immersed in water (but separated from the water chamber by means of slides); the upper portions of the pipes serving as receptacles for the carbide. Below the pipes are distributing cones T for the carbide, which falls on to the bars S. At the side is a water-supply pipe with an injection nozzle P. N serves for the screwing on of a manometer and a safety-valve; while M is the pipe leading to the gas conduit. At the bottom is a sieve with an aperture for carrying off the water and the sediment.

The action of the generator is as follows: The cover I is opened, and the carbide poured into the pipes E, the lower parts of which are shut off by the slides already referred to. Thereupon water is admitted at P. Then, by turning a spindle at the side of the generator, the slide is shifted; and the carbide, in consequence of the gradual movement of the female screw on the spindle, falls by degrees (not suddenly) over the distributing cone T into the water and on to the bars S. The pressure of the generated gas at once raises the gasholder bell. If the pressure of gas be relaxed, then, upon the sinking of the bell, the stops strike against the levers, one after the other, according to the extent to which it is desired that gas should be generated.

**Charging Gas-Retorts.**—Ingram, S. J., of Truro. No. 14,438; June 30, 1898.

This is a combination of chain-wheel, drum, and ratchet and pawl, with a carrier and scoop, for the purpose of charging gas-retorts.



A is a wire rope, to the free end of which is attached the carrier E; the other end being fixed to the drum B keyed to the spindle or axle C,

which also carries the chain-wheel D and the ratchet F, in which engages the pawl G, to sustain or release the load at will by the aid of the rod or chain H. The apparatus is mounted on a carriage J travelling on rails. The scoop is loaded with coal and balanced in the carrier E. The rope A is then wound on the drum B by the action of the chain-wheel D, until the scoop is raised on a level with the mouth of the retort, in which position it is retained by the pawl G engaging the ratchet F. The scoop, after being driven home in the retort, is inverted and withdrawn, replaced in the carrier E, and lowered for refilling by releasing the pawl from the ratchet by means of the chain H.

**Incandescent Gas Lighting.**—Boult, A. J.; a communication from E. Salzenberg, of Grefeld, Germany. No. 15,818; July 19, 1898.

This invention (the specification of which is not illustrated) is intended to provide a ball-shaped light "emitting its rays radially in all directions in a uniform manner." This is attained by using gas under pressure—preferably at least 1 atmosphere or more in excess of ordinary atmospheric pressure—in combination with an incandescent body having a somewhat spherical shape, or which, owing to its construction, is caused by the high-pressure gas to assume a shape enabling the light to have a more or less "ball" shape.

The use of high-pressure gas has been already suggested by others, says the patentee, but the pressure has always been very small—only a fraction of an atmosphere—as the generally used incandescent bodies could not withstand a higher pressure. As, however, the shape of the incandescent body was not changed, only "the horizontal radiations peculiar to incandescent gas-light were attained." A suggestion has also been made to secure the incandescent body to a platinum wire netting surrounding it, for the purpose of increasing its strength; but this was merely to protect the incandescent body against breakage from shocks and vibration.

To carry the present invention into effect, burners of the well-known construction are used; but the incandescent bodies are made with as small a mesh as possible, or two ordinary incandescents may be superposed one over the other, so that the meshes of one are partly covered by the threads of the other, and in this way narrower meshes are produced. The bodies are secured to the burner by threads of asbestos or wire, so that the high-pressure gas cannot blow them off the burner. The means of securing them must, however, admit of the shape of the incandescent body being altered to a more or less spherical or spheroidal shape when it becomes inflated by, or subjected to, the pressure of the gas. The force of expansion of the escaping gas after leaving the burner acts from a point at some distance above the top of the burner, and imparts to the mantle a more or less spherical shape; and the whole surface of the incandescent body is rendered uniformly incandescent. At the same time its illuminating power is said to be considerably increased, "being about twenty times as strong as that given by the ordinary mantles, with the ordinary gas pressure. An incandescent gas light which, with the normal gas pressure, is of about 50 to 60 candle power, gives, with the process according to this invention, an illuminating effect equal to about 1000 to 1200 candles."

#### APPLICATIONS FOR LETTERS PATENT.

- 25,584.—DOSSETTER, W. J., "Acetylene gas-generators." Dec. 5.
- 25,588.—TILLOTSON, G., "Automatic gas-regulator and anti-fluctuator." Dec. 5.
- 25,600.—YEADON, A. E. N. & S. N., "Coal-washer." Dec. 5.
- 25,653.—VOELKER, W. L., "Incandescence mantles." Dec. 5.
- 25,654.—GRIFFIN, A. B., "Incandescent gas-burners." Dec. 5.
- 25,664.—YATES, H. J., "Gas-taps." Dec. 6.
- 25,681.—IRWIN, W., and LEATHER, J. P., "Extracting naphthalene from coal gas." Dec. 6.
- 25,721.—HOLMES, W., and STEVENS, C. R., "Heating and cooking apparatus for coal, gas, or other fuel." Dec. 6.
- 25,730.—BARNIEL, P., "Time apparatus for extinguishing gas." Dec. 6.
- 25,771.—ELWORTHY, H. S., and LANE, H., "Producing lighting, heating, and power gas." Dec. 6.
- 25,782.—STRUTT, J. W., "A rotary explosive motor or multicycle gas-engine." Dec. 7.
- 25,800.—BEECHY, C. G., "Gas or oil engines." Dec. 7.
- 25,821.—BICKERTON, H. N., and BRADLEY, H. W., "Gas-engines." Dec. 7.
- 25,853.—THOMPSON, W. P., "Generating, purifying, and storing acetylene gas." A communication from G. Thuillier and A. Aubry. Dec. 7.
- 25,866.—DOWSON, J. E., "Gas-washer." Dec. 7.
- 25,885.—HALLOWS, S., and TUCKER, A., "Acetylene gas-lamps." Dec. 7.
- 25,909.—ARMOUR, L. H., "Prepayment meters." Dec. 8.
- 25,913.—AKERMAN, W. F., and NORMANTON, A., "Apparatus for the lighting up of streets and other places." Dec. 8.
- 25,916.—FYFFE, T. L., "Gas-stoves." Dec. 8.
- 25,917.—BEGGS, D. C., and FIELDING, W., "Manufacture of acetylene gas." Dec. 8.
- 25,946.—HILL, H. C., "Acetylene gas generators and lamps." Dec. 8.
- 25,968.—CLAUDE, G. M. A., "Purifying, storing, and utilizing acetylene." Dec. 8.
- 25,982.—SALISBURY, H. P., "Burner for incandescent gas lighting." Dec. 8.
- 25,997.—JELLET, H., "Acetylene generator." Dec. 9.
- 26,011.—URQUHART, R. J., "Lighting lamps and lanterns." A communication from M. Rete-Meyer. Dec. 9.
- 26,018.—ADAMSON, A. G., "Holders for supplying high-pressure gas to incandescent mantles." Dec. 9.
- 26,034.—COLBRAN, J. B., "Anti-vibration cup and ball and anti-vibration connector gas-fitting." Dec. 9.
- 26,061.—BRADLEY, C. S., and JACOBS, C. B., "Manufacturing benzene, anthracene, and other polymerized products of acetylene." Dec. 9.
- 26,141.—JOSELIN, J. E. & E. L., and WILD, M. B., "Washing coke and other materials." Dec. 10.
- 26,152.—ABEL, C. D., "Liquid-meters." A communication from La Compagnie Generale des Compteurs (Société Anonyme). Dec. 10.
- 26,155.—HOOKER, W., "Incandescent gas-burners and apparatus used therewith." Dec. 10.
- 26,165.—GLOVER, R. T. & J. G., "Time measures for gas-stoves and other lighting with coin-freed mechanism." Dec. 10.



CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

The Carburation of Coal Gas.

SIR,—I appreciate the courteous manner in which Mr. Botley replies to my letter of last week; and if it can be called a controversy, it is gratifying to have it conducted on such friendly terms. I have to thank Mr. Botley for his invitation to visit the works at Hastings.

Mr. Botley is not disposed to accept the theory that his process and that of Mr. Beilby, referred to in my letter, are substantially identical, both in their mechanical and physical modes of action, and that both are processes of scrubbing the gas; but I am yet hopeful that those interested and engaged in the gas industry will be fairly satisfied regarding the matter. Mr. Botley tries to differentiate his own and Mr. Beilby's process, and their possible action, by a reference to the relative fineness of the states of the division of the solvent oil sprayed into the gas; but the following extract from Mr. Beilby's patent specification shows that even in this respect the processes are practically identical. Mr. Beilby says: "A stream of compressed gas or air issues from the jet-piece in such a manner as to break and carry forward the solvent in the form of a cloud of spray. This cloud of spray may be allowed to mingle with the gas to be acted on in a tower or other chamber; the mixed gas and spray being afterwards led into a succession of vessels in which the spray may subside, carrying with it the soluble matters abstracted by it from the gas."

The fineness of the division of the solvent oil in Mr. Beilby's process is here described as a cloud. Mr. Botley describes it as a mist. Both words represent matter in an extremely fine state of division; and there can be no doubt that the oil present in the gas in both cases would have identically the same action. Mr. Botley practically admits as much, when he says that a spray of oil such as he uses in his process, however fine, will deprive coal gas of some of the hydrocarbons. This is substantially equivalent to saying that oil in the form of a cloud or mist will have this effect. It is, however, a fact that neither process attains its object; and Mr. Botley himself admits that his is defective, for he collects in his drip-wells oils which are loaded with hydrocarbons absorbed from the gas in sufficient quantity to make it worth his while to transfer them to his water-gas plant. But in his letter of last week, there seems to be an inclination to persuade the reader that the whole of this oil, except a portion "too small to be evident," is carried forward to the burners for the enrichment of the gas. The only essential difference between Mr. Beilby's and Mr. Botley's process is that the former purposely passes the gas through a succession of vessels to allow the cloud of solvent oil to be precipitated by gravitation out of the gas, while Mr. Botley passes his mist of solvent oil into the current of rapidly moving gas leaving the works, with a view that it may not permit its precipitation.

I have never questioned the success of Mr. Botley's process in preventing naphthalene being deposited in the solid form, when a sufficient quantity of oil is sprayed into the gas in a fine enough state of division. In a former correspondence which appeared in the "JOURNAL," I tried to explain the physical reasons why lighter oils than those used by Mr. Botley with a high vapour tension, when used as carburetting agents in the gas, in the form of a true vapour, had a different effect and failed to prevent naphthalene being deposited in the solid form. What I did question was Mr. Botley's theory that the success of his process was due to the creation of an artificial vapour tension, by spraying into the gas as a mist oils having a low vapour tension—a theory consistent with no known physical law. I tried to show that the result was due to another cause—the lowering of the vapour tension of the naphthalene, and to its being taken up in solution by the mechanical mist of solvent oils; and that, although the process prevented the deposit of naphthalene, it was not an ideal process due to the liability of the mechanically created mist of oil to be precipitated out of the gas, in positions likely to give trouble. It appears to me that Mr. Botley would do better by taking Mr. Beilby's plan, and getting the mist of solvent oil as far as possible precipitated before the gas leaves the works, unless his object is to get the solvent oil brought into contact with solid naphthalene that had been previously deposited in the mains, so as to dissolve it and carry it to the drip-well.

Priorsford, Peebles, Dec. 16, 1898.

WM. YOUNG.

Prepayment Meters.

SIR,—Now that so much useful information has been written respecting the "forging ahead" of the slot meter and cooker, it may encourage the managers of many small towns, with a population of 10,000 and under, to see what has been done during the past four years in Aylesbury, where gas is sold to the prepayment consumers at the rate of 19 cubic feet for a penny. The results are as follows:—

|         |          |
|---------|----------|
| In 1895 | £20 18 3 |
| " 1896  | 228 11 7 |
| " 1897  | 665 3 11 |
| " 1898  | 1100 8 2 |

The above represents the amount taken from the meters each year, and has increased the number of consumers 100 per cent.; making a total of 570 prepayment meters. To obtain these results, two exhibitions and courses of cookery lectures have been given; and there has been a large distribution of specially prepared literature, which was considered necessary in a town which is purely agricultural. Yet there is still room for a much wider extension in this particular department of our business.

Now, what does this mean to the community at large? It means an expansion of trade throughout the country. The additional supply of gas creates more labour, demands larger mains, a greater number of services, increased manufacture of gas fittings and meters, additional retort power, and further storage room. This trade then goes out to the Black Country, to supply all the necessary ironwork for the different departments. It is the same with retorts and fire-bricks. The revenues of the railways are also increased by augmented freights. This is multiplied in proportion by every town in Great Britain which takes up the lucrative business of supplying gas in pennyworths.

Aylesbury, Dec. 14, 1898.

GEORGE LANE.

Slot Cookers and All About Them.

SIR,—In Mr. Richmond's concluding article on the above subject (see ante, p. 1286), I notice a remark respecting Huddersfield, that we are in harmony with Hull, Leeds, and other go-ahead towns. Passing over the fanciful pun of Mr. Richmond's wit with my name, I should like to say that Huddersfield was one of the first of the 33 large towns in the United Kingdom to supply and fix slot cookers free, with 30 cubic feet of gas for a penny. I was fully satisfied as to the advisability of doing so; and my experience since the adoption has fully justified the step.

In some towns, the penny-in-the-slot plan may be deemed undesirable. The ready-money payment system, however, so commends itself to many consumers that it is apparent this system will enormously extend, and is, indeed, only in its infancy. The economizing of gas, apart from the payment question, together with the possibility of an allowance per week for gas, will recommend it in cases where economy of consumption is especially desired. In some workshops, it is the practice to check the gas used by recording the registration of the meter periodically. With the slot meter the lessening of the light constitutes a gentle reminder that a definite quantity of gas has been used, which alone becomes a check. Possibly it is the absence of any such check or hint in the case of ordinary consumers, that leads to dissatisfaction when the account is presented. In cases where a slot meter has materially increased the consumption by the facility afforded through the medium of the cooker, there cannot arise any dissatisfaction with the amount. The consumer knows at the time the reason of the increase, instead of, as in the case of ordinary collection, when some months have elapsed, and he may be unable to recollect cases of illness, escapes, or exceptional circumstances which have been responsible for the additional consumption. It has occurred to me that an automatic arrangement might be fixed to ordinary meters for checking the consumption for (say) every 1000 or 10,000 cubic feet of gas, for the purpose of notifying to the consumer the consumption from time to time. In the vast majority of cases, such an arrangement would probably be a nuisance.

My experience is that supplying a free slot cooker ensures just double the gas being consumed through the automatic meter than was formerly the case. An approximate average in this town is 10,000 cubic feet per annum without the cooker, and 20,000 cubic feet with it. I am glad to hear that other places have obtained a much larger consumption. During the past two years in this town, nearly 3000 slot meters have been fixed, which are giving every satisfaction. In face of the keen competition of other illuminants, it is evidently desirable to do everything which can possibly be done to popularize the use of gas.

EDWARD A. HARMAN.

Huddersfield, Dec. 14, 1898.

Automatic Installations and Landlords' Consents.

SIR,—We have had considerable experience of the difficulties and delays attending the obtaining of landlords' consent to the fitting up of dwellings with gas-pipes, and also for the fitting up of houses with automatic installations. These consents we have, upon various occasions, been instructed to obtain by different gas departments. It is also, I believe, the custom of many gas companies, up and down the country, to issue a printed form for the landlords' consent.

I am writing to ask whether this is really required, as the Gas-Works Clauses Act of 1847, and also the Act of 1871 (under which the majority of gas companies work), requires all gas companies to supply gas upon application, providing the applicant complies with the conditions of the local gas department. The Act does not in any way refer to the landlord's consent; the tenant's application being the absolute factor in the matter. And further, seeing that the landlord must prove damage to his property by the installation before he can call upon the company to remove the pipes, it would appear that the time and trouble taken to obtain landlords' consents, are unnecessary.

The importance of this subject is, I believe, Sir, far-reaching; as you will agree that every obstacle should be removed from the path of a would-be consumer. I need only instance Manchester and Plymouth, where endless trouble is caused on this score; landlords having frequently refused their consent.

Then again in Mr. Andrew Dougall's paper on the "Popularization of Gas" (see "JOURNAL," June 16, 1896), reference is made to a form to which the landlords' consent is needed (proving the prevalence of this custom), as follows: "He shall also be paid an additional two shillings (2s.) as commission for each new consumer obtained by him, for which he shall obtain the signature of the landlord to the printed 'form of consent' provided by the company."

The topic possibly may be of sufficient interest to induce correspondence from your readers on both sides of the question, as to the right of gas companies to fix stoves and automatic supplies without the landlords' consent.

E. W. T. RICHMOND.

Dec. 16, 1898.

Fire Risks Attending the Use of Gas-Stoves.

SIR,—I wish to call the attention of gas companies and others to a case of what might have been a disastrous fire, only that it was noticed and checked in time.

It appears one day last week, at the house of one of our consumers, a gas-stove was in use in an upstairs kitchen. After it had been lighted some time for roasting, flames were observed coming out of the ceiling ventilator of the office underneath. On further investigation, the ceiling of this office and the joists were found to be on fire. The stove (which had been in constant use for nearly four years) stood on a large piece of sheet iron, resting on a boarded floor, which was covered with floorcloth. Between the joists and the floor was a layer of black roofing felt, which it is supposed was in some way the cause of the fire; but how, it is impossible to find out, as on the day in question there was nothing unusual being cooked, neither was there any escape of gas.

E. S. PIKE.

Reigate, Dec. 14, 1898.

The Assessment of the Prescott Gas Company's Undertaking.—At the last meeting of the Assessment Committee of the Prescott Union, Mr. Newbigging objected to the assessment of the Prescott Gas Company's undertaking. The Committee eventually decided to reduce the rateable value from £961 to £743.



## LEGAL INTELLIGENCE.

## HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, Dec. 13.

(Before Mr. Justice ROMER.)

**Incandescent Gas-Light Company, Limited, v. New Incandescent (Sun-light Patent) Gas Lighting Company, Limited.**

This was a summons on behalf of the defendants for leave to amend their statement of defence and particulars of objections.

Mr. BOUSFIELD, Q.C., Mr. ROGER WALLACE, Q.C., and Mr. WARD COLERIDGE appeared for the applicants; Mr. T. TERRELL, Q.C., and Mr. WALTER represented the respondents.

Mr. BOUSFIELD said the defendants had pleaded that the plaintiffs' patent was invalid because the patentee was not the first and true inventor, and, further, that the invention was not new at the date on which it was taken out—viz., Jan. 12, 1891. The patent under which the defendants worked—that of Carl Dellwik—was taken out on Feb. 8, 1890; and they wished to amend by pleading the specification as a prior grant. He submitted that he was entitled to raise any legitimate defence; and this being a good defence, he ought to be allowed to plead it.

His LORDSHIP said he was not in the habit of allowing amendments unless he saw there was some substance in them.

Mr. BOUSFIELD said an action on the same point came before Mr. Justice Wills; and, after evidence had been given, it was withdrawn. Since then the plaintiffs had amended their patent, and brought another action. The case made then was that, though the defendants had a combination which was included in Haitinger's patent, they had so many other combinations that one would have to pick out this particular combination, and find that it was the best. Dellwik's patent included, among other things, chromium, zirconium, and aluminium; and the defendants wished to say they had a grant to use these metals, and to show that the plaintiffs' patent had been anticipated.

His LORDSHIP: You should have pleaded user.

Mr. BOUSFIELD said he did not think there had been any user. The other side would say: "Although this was published, it does not publish the particular combination which we have found to be the best."

His LORDSHIP: If you have not used it, it must rest on the specification.

Mr. BOUSFIELD said he wished to raise the point of the difference between "prior grant" and "prior publication." The defendants had a prior grant of the right to use aluminium, zirconium, and chromium in combination.

Mr. WALLACE said, if publication were pleaded, the proper way to do it was by putting the prior specification in issue; but this did not put the patent in issue. Defendants were the owners of Dellwik's patent. The specification was merely a printed document, just the same as if printed in a book in the British Museum. Apart from any publication, defendants alleged that the Crown had made a grant to them which allowed the use of this combination; and this being so, the grant could not afterwards be made to someone else. That was the whole question.

Mr. TERRELL pointed out that Dellwik's patent had been amended by striking out the complete part of the specification, and there was no prior publication in the specification before amendment, because Mr. Justice Wills had held that the document was nonsense. Thereupon the defendants went to the Comptroller and the Law Officers, and persuaded them to so amend Dellwik's specification as to make the invention a different one; and they now wished to say that the invention as altered was a grant to them, and that the propriety of the amendment could not be questioned, as the date of it referred back to that of the original grant.

His LORDSHIP: You do not want the point raised, as it may be a difficult one to meet.

Mr. TERRELL: I do not say that. By raising the question of "prior grant" we shall have to tackle the validity of Dellwik's patent.

His LORDSHIP: All this seems to show that there is a serious point to be tried.

Mr. TERRELL remarked that the defendants wished to say that prior publication was not enough, because the invention was so concealed in the original complete specification that there was danger the Court might say it was not published; but, at the same time, they wished to say they had made an amendment.

His LORDSHIP said the argument appeared to amount to this—that there was a serious question to be tried; and the plaintiffs thought it hard that they should have to try it.

Mr. TERRELL contended that the amendment of pleading was a matter of discretion for the Judge; and the case having been set down for trial, the Court would not allow something to be pleaded which had arisen since the action, as it would involve the plaintiffs in enormous cost.

Mr. WALTER pointed out that there was a petition pending for the revocation of Dellwik's patent.

His LORDSHIP, allowing the amendment asked for, said he should order the petition for revocation to be tried before the action, as, in the event of the patent being revoked, it would dispose of the whole case.

## HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Thursday, Dec. 15.

(Before Justices WILLS and BRUCE.)

**The Stamp Duty on Policies of Insurance under the Workmen's Compensation Act.**

Their Lordships, sitting as a Divisional Court, had before them last week two appeals from decisions of the Commissioners of Inland Revenue raising an important question under the Workmen's Compensation Act. The first action was by the Lancashire Insurance Company.

Mr. COHEN, Q.C., and Mr. F. L. WRIGHT appeared for the appellants; the SOLICITOR-GENERAL (Sir R. Finlay, Q.C.), with Mr. DANCKWERTS represented the Crown.

Mr. COHEN, in support of the appeal, said the case raised a point of considerable importance to Insurance Companies and also to employers of

labour. It appeared that Messrs. Wren, Rogers, and Co., iron and metal merchants, of Smithfield Street, Birmingham, employed two workmen, to whom they paid £127 8s. per annum as wages. In consequence of the passing of the Workmen's Compensation Act, the firm took out a policy with the appellants indemnifying them against full liability under the Employers' Liability Act, 1880, the Workmen's Compensation Act, 1897, and also against liability at common law. The premium charged was 9s. 6d. per cent. The Commissioners of Inland Revenue held that the instrument was not "a policy of insurance for any payment agreed to be made upon the death of any person only from accident or violence, or otherwise than from a natural cause, or as compensation for insurance against accidents," as defined in section 98 of the Stamp Act, 1891, and was not chargeable by reference to the head of charge "Policy of Insurance against Accident and Policy of Insurance for any Payment agreed to be made during the Sickness of any Person, or his incapacity from Personal Injury," in the first schedule to the Act. They consequently decided that it was liable to a duty of 10s. as a deed. The learned Counsel admitted that, under the section, the policy in question was only liable to bear a penny stamp, because it merely indemnified the employer against payment in the event of an employee being killed or incapacitated by accident.

The SOLICITOR-GENERAL contended that the object of the section was to encourage individuals to effect insurances against accidents in order that their families might get payment in the event of their death. It was never intended to apply to the case of an employer who desired to be indemnified against any compensation he might be called upon to pay to any one of his numerous workmen.

The second action was brought by the Vulcan Boiler, &c., Company; but the question there was whether a penny or a sixpenny stamp was required—the policy not being under seal. In support of the appeal, it was urged that a penny stamp was sufficient.

Mr. JELF, Q.C., and Mr. J. E. BANKES appeared for the appellants; the SOLICITOR-GENERAL and Mr. DANCKWERTS represented the Crown.

In both cases their Lordships reserved judgment, which was delivered this morning in favour of the Commissioners.

Justice BRUCE said: In these two cases the instruments are chargeable respectively with stamp duty—in the one case as a deed, in the other as an agreement, unless the instruments fall within the description of "policy of insurance against accident" given in section 98 of the Stamp Act, 1891. "Policy of insurance against accident" means, according to the section, a policy for any payment to be made upon the death of any person otherwise than from a natural cause, or as compensation for personal injury. In substance, I think there is no distinction to be drawn between the two policies in point of form. But I will take the policy in the case of the Lancashire Insurance Company, the form of which is certainly quite as favourable to the appellants as the other. The proposal, which is declared in the recital at the commencement of the policy to form the basis of the contract, is described as a proposal for an indemnity against claims for compensation for personal injury sustained by workmen. The operative part of the policy binds the assurer "to pay for, and on behalf of, the employer such sums as the employer shall become liable to pay under or by virtue of the Employers' Liability Act, 1880, or the Workmen's Compensation Act, 1897, or under or by virtue of the common law in respect of personal injury caused in the business carried on by the assured in their business of metal merchants to any workmen in the employ of the assured, or of any sub-contractor, for injury to whose workmen the assured may be liable." It is quite clear, upon the wording of the policy, that the payment agreed to be made depends upon the liability of the assured to answer for the death of his workmen or for the personal injury sustained by them. The death of a workman in the employ of the assured might be caused by other than natural causes; or such workmen might sustain personal injury, and yet no payment would become due under the policy unless the death or the personal injury were caused in such circumstances as to render the assured liable to pay compensation. The payment, therefore, is not, I think, a payment agreed to be made upon the death of a person otherwise than from a natural cause, or as compensation for personal injury, but is a payment agreed to be made as an indemnity against claims for compensation for which the assured is answerable. Two things must happen. There must, first, be the death or personal injury of a workman; and, secondly, there must be a liability on the part of the assured to make compensation for the death or personal injury. It was argued by Mr. Cohen in the one case and by Mr. Jelf in the other that, though the two conditions must exist before the policy could become operative, yet the payment stipulated for by the policy was not the less a payment to be made upon death or as compensation for personal injury merely because some other condition than death or personal injury must exist before the policy could be enforced. They instanced the case of life policies and accident policies which commonly contain various stipulations requiring certain notices to be given within a stipulated time of the happening of the death or accident, the strict observance of which is made a condition precedent to the right of action on the policy; and they contended that such policies did not cease to be life policies or accident policies by reason of the right of action on the policies depending upon some event other than the death or accident. But the answer to the argument is, I think, this—that the conditions in such cases are incidental to the subject-matter of the insurance. The governing event in those cases is the death or accident; and the ordinary stipulations to which reference was made by the learned Counsel are stipulations made with a view to fence and protect the rights of the assurer, so as to enable him to require satisfactory evidence of, or to make due inquiry concerning, the facts upon which his liability depends. They do not alter the character of the risk upon which the assurance depends. Such conditions grow out of, and are subsidiary to, the subject-matter of the insurance. But it seems to me in the present case that the liability of the assured to compensate his workmen lies at the very root of the contract. It is the cardinal event upon which the liability of the assurer to pay the money under the policy depends. It is, in truth and substance, a contract of indemnity; and, though the indemnity is against liability arising from death or personal injury, and the death or personal injury is a *sine quâ non*, and the death or personal injury is one of the conditions of the liability of the assured, yet it is not the condition upon which the liability of the assurer depends—it is not the condition upon which, by the terms of the instrument, the payment agreed to be made depends.

Justice WILLS added that, even if the instrument fell within the first



part of the definition of policy against accidents, there would still remain another part of the policy which would not come within the rest of the definition. The liability of the employer to pay could not, by any reasonable stretch of words, come within the definition. The appeal must therefore be dismissed.

#### Incandescent Gas-Light Company v. Hawes.

This action came before Mr. Justice Romer last Saturday as a short cause upon motion for judgment in default of defence. The case had stood over on several occasions, as defendant (who appeared in person) said he had not been served with a statement of claim. He now said he did not wish to put in any defence. Mr. Walter mentioned that the action was brought to restrain infringement of the plaintiffs' 1885 and 1886 patents by the defendant, who carried on business at Finsbury Pavement. His Lordship granted the usual injunction, directed an inquiry as to damages, made an order for delivery up of the infringing mantles in the possession of the defendant, and gave costs as between solicitor and client.

#### Disputed Water-Rates at Eastbourne.

The action of *The Eastbourne Water-Works Company v. Sherrard*, which was brought to recover water-rates under circumstances already recorded in the "JOURNAL," was in the list for judgment to be taken by consent last Tuesday, before the Lord Chief Justice. Mr. Danckwerts said it had been arranged that judgment should be entered for the plaintiff Company for £19 7s. 6d., in addition to the amount paid into Court, and that the defendant should pay to the plaintiffs the sum of £75 on account of costs. His Lordship entered judgment for the plaintiff Company in the terms arranged.

#### Rent Collectors and Water-Rates.

During the hearing of a case brought against Mr. F. J. Pepper, of Colmore Row, Birmingham, by the South Staffordshire Water-Works Company at Smethwick last Wednesday to recover £6 4s., water-rate for two quarters, an interesting point was raised. Mr. Pepper admitted his liability for one quarter's rate—viz., £3 2s.; but only admitted liability for 19s. 3d. in respect of the other. He said he had been collecting the rents; but the property had changed hands in October and therefore he was no longer liable. He was not the owner; and he had no money of the owners with which he could pay the rate. Mr. F. W. Davies (collector) said that under the Act of Parliament the Water Company had a preferential claim upon the property, and had power to collect the rents in settlement of their account. Under the Act, the person collecting the rents was held to be the owner; and Mr. Pepper was collecting the rents for a month after the rate was due. Mr. Pepper contended that he was only liable up to the time he ceased to collect the rents. He would have to pay the rate out of his own pocket; and it was an important matter for agents and collectors, as they would be liable for every rate which the owner refused to pay. Mr. Parkes (the Presiding Magistrate) said they would have to decide in favour of the Company, as Mr. Pepper did not dispute the Act of Parliament. Mr. Pepper, having been told that he could not appeal against the decision, and that he would have to enter a claim against the owners, paid the money.

#### Disputed Meter Registration.

At the West London Police Court last Saturday, before Mr. Rose, a lady named Mrs. Edith Caroline Touzeau, residing in New King's Road, Fulham, appeared to an adjourned summons to show cause why she refused to pay £8 1s. 8d. claimed by The Gaslight and Coke Company. The question in dispute was as to the correct registration of the meter; the defendant resisting the claim on the ground that the amount for the supply of gas was considerably more than in corresponding periods. It was contended on behalf of the Company that the Magistrate was bound by the certificates of the inspectors stating that the meter registered correctly. Mr. Bodkin, for the Company, referred to the various Acts, and argued that the General Act of 1871 must not be considered in this case, as the Company did not come under its provisions. The Sale of Gas Act, 1859, contained the only provisions giving power to test the accuracy of the meter. Unless the Magistrate relied on the correctness of the meter, the Company would be at the mercy of any consumer who raised an objection. The defendant, in giving evidence, said she did not read the back of the meter registration card. Mr. Bodkin: You come here and complain of the Company without reading the directions. Defendant: I do not know anything about the meter. I wish I did. Mr. Rose came to the conclusion that the evidence of the defendant did not outweigh that of the inspector, and he made an order for the payment of the claim without expressing any opinion whether or not the meter was conclusive evidence.

**The London County Council's Water Bills.**—At the meeting of the London County Council last Tuesday, the Parliamentary Committee submitted for approval drafts of the Bills to be introduced by the Council in the ensuing session, to give effect to the resolutions already passed on the subject of the London Water Supply. Mr. Cornwall mentioned that the Bills clearly indicated the policy of the Council in regard to the London Water Question; and he expressed the hope that Parliament would next year see its way to pass them into law. Mr. Whitmore, M.P., desired to make it perfectly plain that, while not opposing the approval of the Bills, he did not in any way bind himself in regard to the action he might take upon them when they came up for consideration in Parliament. The drafts of the following Bills were then approved, and the Bills were ordered to be deposited: (1) London Water (Purchase of Companies) Bill, (2) London Water (Welsh Reservoirs and Works) Bill, (3) London Water (Aqueducts and Works) Bill, (4) London Water (Finance) Bill.

## MISCELLANEOUS NEWS.

### CONTINENTAL UNION GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, No. 7, Drapers' Gardens, Throgmorton Street, E.C.—Mr. ARTHUR LUCAS in the chair.

The SECRETARY (Mr. F. W. Himing) read the notice convening the meeting, and also the following report of the Directors:—

The Directors have to report that at Messina and Montargis, the two stations owned by the Continental Union Gas Company, the increase in the number of consumers has again been 9 per cent. The increase in the quantity of gas sold has, however, barely reached 2 per cent.

The total spent on capital account during the year at these two stations amounts to £1190; being entirely for new mains, services, and public lamps.

At Messina, the reduction in the price of gas of 2c. per cubic metre, referred to in the last report, has further affected the profits to the extent of about £260 for six months of the year ending June 30 last.

The commerce of Messina has suffered considerably from the large decrease in the export of oranges and lemons to the United States, due to the McKinley Tariff.

The Union des Gaz has renewed their Concession with the Town of Albi for a further period of thirty years, in exchange for a reduction in the price of gas both to the town and to the private consumers. They have also obtained concessions for the extension of their mains to Borzoli and Quarto in the outlying suburbs of Genoa. The average length of all the concessions of the towns lighted by both Companies is now 28 years.

The amount debited to capital account by the Union des Gaz, for works finished during the year under review, amounted to about £113,000. This amount is much heavier than usual, and comprises, besides the customary outlay for additional retort benches, mains, lamps, and services, the erection of a new gasholder and tank at Genoa, and of a small electric light station at Modena, the purchase of land at Milan, sufficient to provide for all future requirements there. It also includes the amount paid for the purchase of the competing Co-operative Company outside the City of Milan. The entire supply of gas to the city and suburbs of Milan is now vested in the Union des Gaz.

The working capital of the Union des Gaz has also very considerably increased, chiefly owing to the introduction of the system of furnishing consumers, at the Company's expense, with gas-fittings and prepayment meters. The results obtained up to the present have not, however, been entirely satisfactory; sufficient time not having elapsed to render this system fairly remunerative.

The following information relates to the working of the Union des Gaz stations: The fuel used for heating the retorts shows a considerable decrease at those stations, where an opportunity has occurred of introducing the system of regenerative furnaces. The salaries and wages per ton of coals distilled show an increase, chiefly on account of labour troubles at Milan. Steps have, however, been taken to meet this difficulty by the introduction of labour-saving apparatus there. The average cost of coal has further increased nearly one shilling per ton; and recent advances in freights point to a still further increased cost of coal during the current year's working. The net value of the coke sold has decreased to the extent of 3d. per ton. The values of tar and ammoniacal liquor also show a decrease. The bad debts incurred and written off profits amount to £516; being about the same as in the preceding year. There has been a net increase of 989 in the number of public lamps. The number of private consumers on the books of the Union des Gaz on June 30 last shows the satisfactory increase of 19,215; being rather more than 20 per cent.—making a grand total of 109,512 consumers supplied by that Company at their twelve stations. The quantity of gas sold for all purposes has increased to the extent of 7½ per cent. The accounts of the Union des Gaz show that that Company have lost about £700 more than in the preceding year, through depreciation in the rate of exchange from Italy. This loss, unfortunately, is likely to be further augmented in the current year.

It will be seen, on reference to the report of the Union des Gaz, that that Company have had to again reduce their dividend to the extent of 2 per cent. Some of the reasons for the reduced profits have been mentioned above, but the principal cause is due to the fact that the reduction in the price of gas at Milan, referred to in the last report, has affected the receipts and profits during the whole twelve months of the year's working under review as against five months only in the accounts to June 30, 1897. The recent renewals of the concessions at Modena and Albi at reduced prices have also had an adverse effect on the profits.

The general results of the year's working of the Union des Gaz may be summed up as follows: A large increase of business necessitating the employment of considerable additional capital; and, on the other hand, a heavy fall in the profits, due, in the main, to the lower price charged in Milan, in return for the extension of the concession.

Turning now to the accounts of the Continental Union Gas Company, Limited, the net profits for the year ending June 30 last amount to £88,832. The available sum to the credit of general revenue is £123,306, out of which the Directors recommend a dividend at the rate of 10 per cent. per annum on the ordinary stock and of 7 per cent. on the preference stock. After deducting the interim dividends paid in July last, and paying the balance of 5 per cent. on the ordinary, and of 3½ per cent. on the preference, stocks, the amount carried forward to the new account will be £35,306. It is proposed to pay the dividend on the 4th of January next, free of income-tax.

The Director who retires by rotation is N. E. B. Garey, Esq., and the Auditors (A. T. Eastman, Esq., and I. A. Crookenden, Esq.) also retire; all of whom, being eligible, offer themselves for re-election.

The CHAIRMAN said that, as reference had been made in the report to the Union des Gaz, as well as their own Company, he thought it would be convenient, for the information of new shareholders who might be present, to explain the relations existing between the two. Their Company held 36,950 shares, or about seven-tenths of the 50,000 shares of the Union des Gaz, whose share capital was a million sterling. Their debentures stood at £729,380; and the Continental Union Company held £66,385 of this amount. The Directors of the Continental Union Company were also Directors of the Union des Gaz. There were six Directors of the Continental Union Company and four of the French branch; so that their own Company always held the majority. Nevertheless, it was satisfactory to know that they were always in the most harmonious relation with their French friends; and whenever there was anything to discuss, they either went over to Paris, or their French colleagues came over to London. Referring to the accounts, he said the profits for the year had been £88,832; and inasmuch as, in order to pay a dividend of 10 per cent. on the ordinary stock and 7 per cent. on the preference stock, £88,000 was required, they would be able to pay this, and at



the same time put £832 to the amount previously carried forward—£34,478, making it £35,306. Some proprietors might think that the Board should have declared a larger dividend, and carried forward a smaller amount. The Directors, of course, gave the matter much anxious thought; and they came to the conclusion, considering the affairs of the Company and the Union des Gaz, and the state of affairs, politically and commercially, it was wiser and more politic to recommend the dividend they had proposed in the report—viz., 10 per cent. for the whole year. He was bound to mention the reduced profits, which reduction amounted for the year to £14,464. This led him at once to speak of the condition of matters at Milan; because it was chiefly due to the lowering of the price in that city that the reduction in the profits was due. Last year he explained that, in order to obtain an extension of the concession to the exterior portion of Milan to 1925, they had to concede some of the great demands made by the consumers, and so reduced the price. They had to lower it very considerably at the time, with further gradual reductions spread over a period of thirteen years. But he would not trouble the proprietors with this matter at greater length, as it was a most complicated arrangement, dependent partly on the cost of coal, and partly on the quantity of gas consumed. The first great reduction took place in 1897; and if the proprietors would permit him, he should like to quote from what he said a year ago. The exact words were: "A reduction took place in February, 1897; and therefore it only affects five months of the accounts of the past year. It follows that it will have a greater effect in the current year; so that it is my duty to tell the proprietors that there is no prospect of an increase this year. But it is almost certain there will be a further decrease in the dividend." These were the words he used last year. The Board knew that they would have to make a reduction in price; and they also knew that they would have to pay a certain amount to the small Co-operative Society who gave the Company some little trouble on the outskirts of Milan. They were further aware they would have to pay extra wages, and a larger sum for interest on the extra amount of capital raised. All this they foresaw; but what they did not foresee was that there would be an extraordinary mild winter, that there would be riots of exceptional severity in Milan, and that there would be a strike in the coal trade in England, affecting the price of freights and of coal. Now as he had said, the reduced price of gas in Milan, Albi, and Modena affected the profits for the whole twelve months under review; and the diminution was a serious matter, amounting to £29,000. Then they had had the full effect of the 1897 strikes, which, of course, gave the Board a great deal of trouble and anxiety; and, had it not been for the energy and ability shown by all who had the management of the works at the time, the Company would have been in great difficulty—indeed, it would have been almost impossible to supply the city of Milan with gas. The result of the strikes was that the wages bill amounted altogether to £1000 more than in the preceding year. There was another matter that had given, and was giving, them a great deal of trouble and anxiety; and that was the question of taxation in Italy. The existing state tax in Italy was 2 c. per cubic metre; and there was in Milan an extra 2 c. per cubic metre which was levied by the Municipality. The Company had the right to exact the repayment of these taxes from the consumer; but naturally it did their business an immense deal of harm, as the consumers did not reason about it. They simply looked at the total of the bill, and grumbled at the amount, which they said was always increasing. The 4 c. per cubic metre might be a little confusing to the proprietors; but when he told them that it was equal to 11d. per 1000 cubic feet, they would easily understand how grave a cause the consumers had for discontent. He was sorry to say that, within the past month, they had had an intimation that the Italian Government were seriously considering increasing the state tax from 2 c. to 5 c. per cubic metre. This would affect the five towns lighted in Italy by both Companies. He need hardly assure the proprietors that the Directors would use all the means in their power to resist the imposition of this taxation. It would be in the interests of the consumers that they should oppose it. They paid the taxation; the Company did not. The Company only had the onus of collecting it. But it was extremely disheartening after they, on the one side, did their best to lower the price of gas, for the Government on the other side to increase it by these enormous taxes. Gas, of course, was now the poor man's light; and it always would be so. It would be used by all classes for other purposes—for cooking and heating—and by manufacturers; but it would essentially be, he might almost call it, the poor man's necessity. Now the Italian Government had always said that they wished to lighten the burdens on the poor. The Directors understood that they were now contemplating increasing the taxes on both gas and electricity; but mark the effect of it: On electricity, they proposed to make an increase of 66 per cent., and on gas as much as 150 per cent. He asked, Is this logical; is it fair? He could almost use the strong term that it was unjust. The Directors would use their best endeavours, in conjunction with other companies in Italy, to induce the Italian Finance Minister to reconsider the injustice and inexpediency of the proposed tax. He had spoken of the foreseen causes that had led to the diminution in the profits; and it was now his duty to speak of the unforeseen ones. There was the mild winter, which affected the sale of coke as much as 3d. per ton at all stations; and, of course, with the extended use of gas-fires, they would now feel the variations in temperature more and more. The proprietors would remember how extraordinarily warm it was during last winter; and he was afraid, so far as their selfish interests were concerned, there was not much prospect of there being any difference this winter. Then came, as if they had not had misfortunes enough, the Welsh coal strike. They had made their contracts, and favourable ones, although the price of coal went up in the North considerably, because of the want of supply in the South, while all the ships were much more employed in the North and elsewhere. Consequently, where the Company had been paying 6s. or 7s. per ton for conveying coal to the Mediterranean, they had recently to pay as much as 10s. 6d. As to the residuals, tar did badly, and ammoniacal liquor was about 3d. less per ton of coal carbonized. Then came the terrible riots in Milan; and nobody could sympathize more than the Board did with the respectable inhabitants of Milan, and the Government of the city, for the fearful bloodshed that took place. It naturally affected the Company's business. Less gas was consumed, and the street-lamps were smashed; and the Company had to pay a bill of between £300 and £400. There was also great interruption of business in the city—very much to the Company's detriment. These were the chief reasons why the Union des Gaz profits decreased, as they did, to the

amount of £27,000 last year, and why they had to draw £14,000 from the reserve in order to pay the dividend, which was 2 per cent. less. Of course, there was a corresponding reduction in the amount of dividend received by the Continental Union Company from them. He must now say something about the large capital expenditure. No less than \$113,682 had been required for enlarging and improving the works at all the stations of the Union des Gaz. This expenditure was, of course, needed because of the much larger demand for gas. A further amount of £156,000 was being spent for works sanctioned and authorized. The previous sum was an amount actually paid; but the other was a liability which they would have to face. Taking this into consideration, the Directors, after consulting their French colleagues, came to the conclusion that the only way out of the difficulty, as capital must be raised, was to issue new bonds. The sum of £269,682 had thus to be raised; and it would be satisfactory for the proprietors to know that these bonds, which were 500 fr. bonds, were issued at 485 frs., and with the small interest of 3½ per cent., which showed the good position in which the credit of the Union des Gaz stood in Paris. Of the large sum mentioned as having been spent, £68,980 was required in Milan; and the Directors were justified in spending this, because the increase in business in Milan was as much as 10 per cent. last year. Therefore they had had to buy a large amount of land on which to put new plant. At Genoa, as much as £12,960 had been spent on a new large holder and other apparatus. At all the other stations, too, of the Union des Gaz, there had been, he was happy to say, an increased consumption of gas. There remained, in addition to the amount of bonds issued, a balance required of £82,000; and this was met by the sale of sundry securities which had appeared in previous balance-sheets of the Continental Union Company, and which the Directors had lent to the Union des Gaz at the rate of 4 per cent. Notwithstanding all the losses and extra charges, he looked very hopefully to the future; and he did so with the firm conviction that, while they might not earn as much immediately as they expected ultimately to do, yet they would have a fair return on their capital. He was justified in saying so, because last year the increase in the consumption in the Union des Gaz alone had been upwards of 4 million cubic metres, which was equal to an increase of 7½ per cent. In the preceding year, it was much less—only 4 per cent. The increase in the number of consumers, too, had been remarkable—as much as 20 per cent. last year, against 12 per cent. the previous year. Of course this increase of one-fifth was due in a measure to the prepayment meters; and at the same time it showed that the business was in a very advancing state. The fact was the whole nature of the gas business was changing. In former years, gas was used only by those who were comfortably off; now it was used by all classes and for a great many purposes. The incandescent burners had given a great impulse to the whole business. But gas would now have to be supplied at a cheaper rate; a much larger capital would be required; and it would take some time before a fair return could be obtained for the capital. All industries must have their ups and downs, and their times of prosperity and adversity. He could assure the proprietors that the Company's business was in a perfectly sound state. They might not next year be able to pay so large a sum as they had during the past few years; but the dividend was quite safe. The profits which had been made for many years had been on the whole satisfactory. The dividend this year should not be considered a standard one; it was a dividend paid during times of exceptional trouble. The trouble might not pass away this year or next, as Italy was in a very unsatisfactory state. The proprietors must, however, remember that the Company had many other towns in France and one large town—Strasbourg—in Germany, where they were not inflicted with crushing taxes; and in these cities their business was prospering successfully. He could say—although it was a most dangerous thing to prophesy with regard to profits—that they would not pay next year a larger dividend than they were doing this year. This was certain; and they would consider themselves fortunate if they could maintain the dividend at the present figure. In conclusion he must ask the proprietors to have that confidence in the directorate that they had had in the past. The Board would do their best for the interests they had so sincerely at heart. They endeavoured always to carry out their contracts loyally—not only to the letter, but in the spirit; and he hoped this feeling would be appreciated by the foreign countries with whom they had to deal. His remarks had perhaps been somewhat discouraging; but the Board did not feel discouraged. He could only hope that, when they next met the proprietors, they would have a better report to present than they had had that day. He then moved the adoption of the report and accounts.

Mr. H. WOLLASTON BLAKE seconded the motion.

Mr. H. D. ELLIS, referring to the increased taxation on gas at Milan, said they had the right to recover the tax from the private consumers; but was he correct in saying that this was not so with regard to the public supply contract. He supposed the tax had to be paid on the gas consumed by the public lamps, and that it was the Company's loss.

Mr. LEES said it appeared from the Chairman's statement that the gas was already taxed to about 11d. per 1000 cubic feet; and now there was a prospect of further taxation to the extent of 8½d. The Company, he understood, submitted to the 11d. tax without increasing the price to the consumers; and he asked whether the Directors intended to increase the price to the consumers if a further tax was imposed, or was it to come from the shareholders. He also expressed the opinion that, with only a balance of £800 to add to the undivided profits, the Directors were paying too high a dividend.

The CHAIRMAN, in reply, said the Company had to pay the tax to the Government. They had the right to collect it from private consumers; and this they did. There was no tax on the public lighting. Answering a further question, he said they were charging the maximum price for gas at present.

On the proposition of the CHAIRMAN, seconded by Mr. N. E. B. GAREY, the dividends recommended in the report were declared.

The retiring Director (Mr. Garey) and the Auditors (Messrs. A. T. Eastman and L. A. Crookenden) were unanimously re-appointed.

The CHAIRMAN having moved a vote of thanks to the Secretary, Managers, and staffs at home and abroad for the able services rendered during the past year,

Mr. J. HORSLEY PALMER seconded the motion. He stated that during last spring he had a somewhat eventful journey on behalf of the Company, because he was summoned to Milan just as the riots were beginning to break out; and they commenced by a strike among their own workmen,



He was exceedingly pleased with the way in which the Chief Engineer and other members of the staff were prepared to meet such a grave difficulty. He also found that the other Italian stations were well manned in every respect.

The motion was unanimously carried, and duly acknowledged by the SECRETARY.

A vote of thanks to the Chairman and Directors was moved by Mr. A. T. EASTMAN, and seconded by Mr. H. D. ELLIS. Their expressions of sympathy with, and confidence in, the Board were heartily endorsed by the proprietors.

A response by the CHAIRMAN concluded the proceedings.

### SOUTHWARK AND VAUXHALL WATER COMPANY.

The Half-Yearly General Meeting of this Company was held last Tuesday, at the Offices, Southwark Bridge Road—Alderman Sir HENRY E. KNIGHT in the chair.

The SECRETARY (Mr. Montague Watts) having read the notice calling the meeting, the report of the Directors, referred to in the "JOURNAL" last week, was taken as read.

The CHAIRMAN, dealing with the accounts, said he thought the outlook must be pre-eminently satisfactory to the shareholders. They had spent the whole of the £100,000 of debenture capital issued last year, with the exception of £3483. Consequently, they had expended capital at rather a larger rate during the past twelve months than before; and this became necessary because the works required to bring the Company into the pre-eminent position in which it now was, and to maintain it there, had had to be executed with greater rapidity. This showed that they were advancing more rapidly in the construction of works for which the Company had obtained the assent of Parliament; and they were therefore placing the Company in a more impregnable position. While calling attention to the question of capital expenditure, he might also refer to the position of the Company among the Water Companies of London; and he did not think he could do better than compare the amount of capital they had invested in the undertaking with the amount sunk in the undertakings of other Companies. The capital spent by them was £2,960,000; and beyond this they had parliamentary powers for another £1,000,000. Therefore, with their existing parliamentary powers, they had a concern with a capital at present of about £3,000,000 spent, while in a few years this amount would be increased to £4,000,000. Comparing this with other Water Companies (he put aside the New River Company as to capital, as that Company were in a different position to the others), they would find that the Southwark and Vauxhall Company had the largest expended capital of any of the London Companies excepting the East London; and that Company's capital was so little in excess of their own that it was about equal. The Southwark and Vauxhall Company had expended £2,960,000, and the East London Company £3,012,000. To show how pre-eminent the former Company stood in his view beyond the other Companies, he would only point out that the Company with the next largest capital expended was the Lambeth, whose outlay, however, had been £1,800,000; while the Company with the smallest expended capital was the Kent, with £1,009,000. These figures he was sure would be interesting, because they showed the important position which their Company now occupied in connection with the Water Companies of the Metropolis. As regarded the bulk of water delivered, they supplied the third largest quantity of any Company in London; and for the purposes of comparison in this respect, he included the New River Company. The figures were interesting because they brought home to the minds of the shareholders the importance of maintaining a concern which had so much more capital than other Companies, and one which supplied so much more water to London than some of them. It would also bring home to their minds the greater responsibility and difficulty which existed in connection with the management of the business. Not only so, but their business was in a district of London which was the poorest of all—just on a line with the East London Company. Their difficulties were, of course, greatly enhanced by this fact. Turning to the accounts, the first item on the debit side of the revenue account was "maintenance;" and the total of the account was £55,458. Comparing this, according to custom, with the amount for the corresponding half of last year, when it was £46,143, there was shown an extra expenditure on maintenance account this time of £9315. The increase was to be attributed to the extra amount expended on the strengthening of the 42-inch main from Hampton to Nunhead. He mentioned last year that there was some difficulty with the Government Auditor (Mr. Allen Stoneham) with reference to this matter; and they had come to a conclusion which he (the Chairman) felt was not altogether satisfactory, though it was one which he thought might be accepted. The matter involved a charge to maintenance account this half year of £5627; but it wiped away the question entirely, and removed all doubt, because it was arranged in the settlement how any further work on this main that might be necessary was to be done. This question would therefore not arise again, and the matter would adjust itself in each half-year's accounts. As he had said, this accounted for £5627 out of the total increase of £9315 under the head of "maintenance." Then they had spent a further £1500 in alterations to the boilers at their Streatham station, which was a very important one. They were now getting more than 2 million gallons of water daily from it; and they would most likely obtain more. Important alterations were wanted to the boilers there; and they had to lower the mains, which became frozen in the winter. They had done this work, and it had cost £1500, which brought up the outlay to more than £7000 out of the £9000 odd increase. Then, pumping and engine charges were £864 more; this being caused mainly by the coal strike. They were in great difficulties through this strike; and unusual care and attention were required to get fuel at all. Next there was the payment to the Thames Conservators of £525 in excess. This was in consequence of the Company's Act of 1897, under which they had to pay the Conservancy for water taken from the Thames in excess of 24½ million gallons. Rates and taxes were also again higher; the excess for the past half year being £629 as compared with the amount they paid for the six months to September, 1897. Adding all these figures together, they would find that he had accounted for the whole of the increase in the maintenance charges; and they would see that the greater part of it represented expenditure

which could not come into the account again. With regard to management, the excess of expenditure over that of the corresponding half of last year was only £590; and when they looked at the law and parliamentary charges, and saw that they were £698 in excess of what they were for the corresponding period of 1897, he did not think he need go further into this account. The excess of the parliamentary charges was mainly caused by the very large expenses they were put to in order to appear before the Government Commission on the water question, so that the shareholders' interests might be properly looked after. He turned, and with very much greater pleasure, to the other side of the revenue account, where they would find that the item which was the real test of the way their business was conducted—the first item, which had to do with surcharges and allowances—showed a saving. They had saved, upon the £4500 brought forward, no less than £1579, as against a saving of £1350 in the corresponding period of the previous year. They therefore had an improvement there of £229 on this half year. The water-rents accrued to the date of the account stood at £137,960, against £131,889 for the corresponding half of last year; showing an increase of £6071 for the six months. The rents for the whole year ended Michaelmas, 1897, were £253,484; while for the year ended Michaelmas, 1898, they amounted to £264,443—being an increase in the past year of £11,000. This was a figure of startling importance to them. He had told them year after year of the almost unlimited scope that existed for increase in their undertaking; and the shareholders had had confidence in what he had said. It must, therefore, be gratifying to them to see that he could now report an increase of £11,000 in water-rents in one year. This had not come from assisting the East London Company. They did not agree to help the Company until the 18th of September; and therefore they only had what was due to them on this account for the fortnight to the 30th of the month. The £11,000 was really due to the innate prosperity of their concern. He did not say that they would always have a similar increase in twelve months; but they might rest satisfied that there would be a large increase in their water-rents year after year for many years to come. Adding the increase of £6071 which they had in the rentals, as compared with the corresponding half of the previous year, to the £229 saved from incidentals, they got a surplus on this side of the account of £6300 as compared with what they had in the corresponding period of the previous year. He then came again to the other side of the account—to the dividend and interest account for transfer of profits; and he found that this amount was £72,744, against £76,445 at the corresponding date of 1897—in other words, £3700 less was carried to dividend account than at this time last year. They would ask how it was that, when they had a surplus on the other side of £6300, they had less to take to the dividend and interest account. Well, it was through the extra expenses of maintenance and the extraordinary charges he had been speaking of; and they could test this thoroughly if they would only take out the figures themselves. They had £9315 more for maintenance, and £590 more for management charges; and the additional amount of revenue was £6300. This left £3600 *plus* for charges; but they had to take into account the difference in rents and transfer fees, and they were then brought to the exact figure of £3700, which was the amount they carried to the interest and dividend account less than at this time last year. With reference to the dividend and interest account, they were paying more for interest accrued on their debenture stock, because they had a larger amount of it issued; and a difference of £1500 more for this had to be paid. They had also paid £600 more interest on temporary loans from their bankers. This gave them a balance applicable to dividend of £52,700, against £44,633 in the corresponding period of last year. So that, though they brought down a smaller amount, they had a balance available for dividend no less than £8000 in excess of what they had in the corresponding period of 1897. The question was what they were going to do with this money—a matter over which the Board had thought very carefully; and they had decided to pay a dividend at the rate of 7½ per cent., as compared with 6 per cent. This increased distribution would leave them £14,126 to carry forward. Passing to the Directors' report, he remarked that it was a good deal longer than usual. The circumstances were, however, of such a character that they had thought it necessary to point out to the shareholders something of what they had done in the course of the past few years. They would notice that the increased rental from the domestic supplies kept up satisfactorily, as well as all other sources of revenue. He also congratulated the shareholders on the fact that, when they obtained their Act of Parliament last year, the Board rather thought it was the last of the long series they had been working for in the past twenty years—Acts which had enabled the Company to take the position they were in at the present time. They had not only during the recent drought been enabled to supply their own district thoroughly and efficiently, but at a time when, through circumstances beyond control, a sister Company found their supply reduced to such an extent that they could not satisfactorily serve their own district, the Southwark and Vauxhall Company offered their aid at the first possible opportunity, and said to the East London Company: "Lay your main through the Tower Subway, and we can let you have some 6 or 10 million gallons of water a day." He could not help remarking that the East London Company did not break down, as had been sometimes said; it was Nature that broke down, in giving them only 14 inches of rain, as against an average of 27 inches. The breakdown was also due to the dreadful system of building houses without cisterns, against which common sense revolted; and he believed this state of things would be altered. The position of the Company had not been arrived at except after years of very great and close application and promoting Bills in Parliament. Having referred to these, and also to the later measures which had been brought forward, and to the powers contained in them, he stated that the Company now had mains, reservoirs, filters, &c., as well as water. They were therefore safe in their supply; and he could see his way perfectly clearly for the next forty or fifty years. The various Bills he had mentioned were not obtained without enormous expense and labour. They were obstructed at every stage by the London County Council and others, especially the County Council. The Company never obtained power to spend a shilling of capital without proving the utmost urgency for the outlay. Coming to the present year, he said the Council had deposited Bills not only for purchasing the Water Companies' undertakings, but to bring water from Wales, though the question of purchase was still being inquired into by a Royal Commission. Could they suppose for a moment that Parliament would consider this question until they had the report



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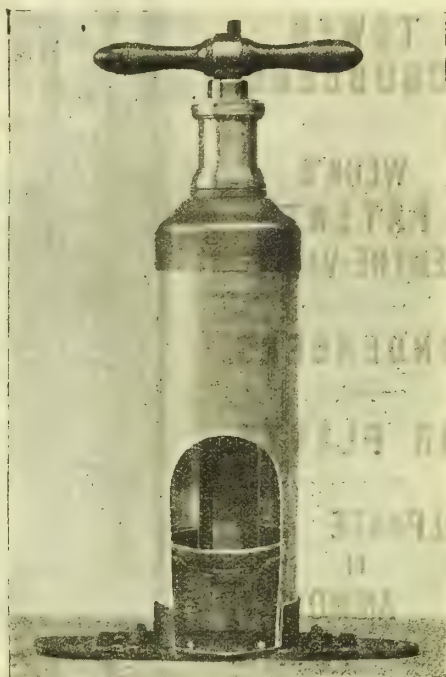
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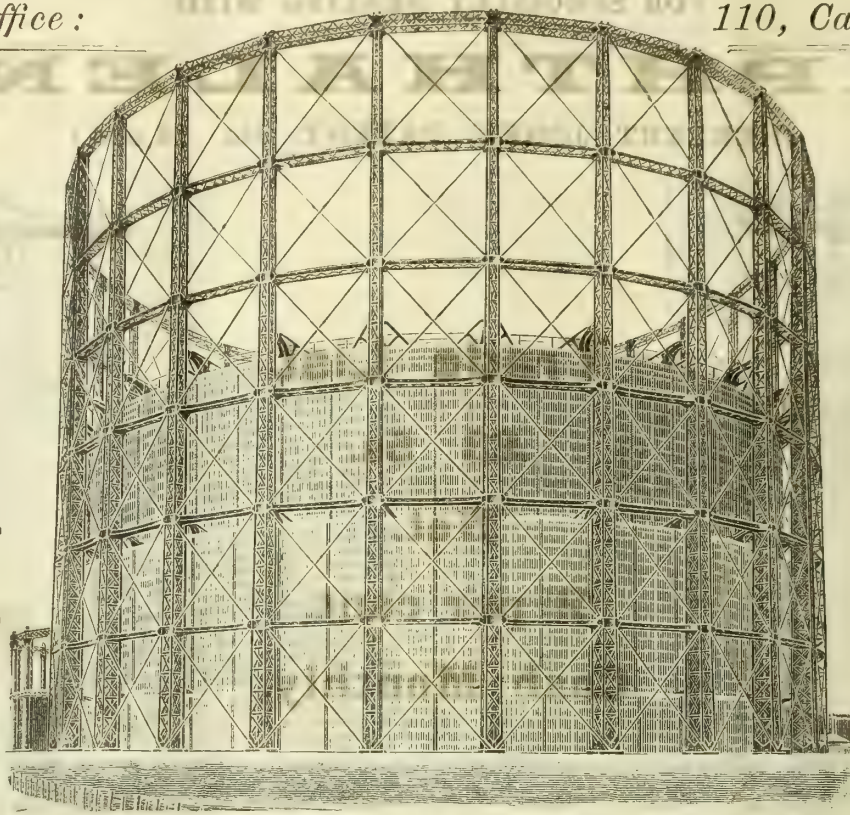
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of the Commission? The fact was that the Council were going out of their way to waste the ratepayers' money, and to put the Companies to expense in pursuit of their policy to damage the latter as much as they could. With regard to the idea of going to Wales for a supply of water to London, he could speak for hours; but in the article which appeared in "The Times" of the 12th inst. the question was answered most admirably. It had also been proved before the Royal Commission that there was ample water in the Thames Valley wherewith to supply London for the next hundred years, if not for all time. The Companies would have to fight the Council's Bills; and he believed that they would fight them as successfully as they had done before. He concluded by moving the adoption of the report and accounts.

Mr. C. M. VIALS seconded the motion.

A SHAREHOLDER urged that the revenue account might be published showing the comparative figures for the corresponding period of the previous year; but a motion submitted on the subject was lost.

The resolution adopting the report and accounts was then put and carried unanimously.

Dr. CHESHIRE remarked that the Company were now in an eminently proud position, for which they were indebted to the Directors; and he proposed that their remuneration should be increased by £1000 per annum.

Mr. DADSWELL seconded the motion, which was carried unanimously.

Resolutions were afterwards passed declaring the dividend recommended, and re-electing the retiring Directors (Mr. S. Green and Mr. Noel Whiting), and Auditor (Mr. J. D. A. Norris).

Mr. JEFFRIES proposed a vote of thanks to the Chairman, Directors, and officers of the Company; and the motion was carried.

The CHAIRMAN acknowledged the vote, and warmly recognized the services of the officers.

The proceedings then terminated.

### GRAND JUNCTION WATER-WORKS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the Office, No. 65, South Molton Street, on Wednesday last—under the presidency of Mr. FREDERICK TENDRON.

The SECRETARY (Mr. J. Goodwin) read the notice calling the meeting; and the report of the Directors was taken as read.

The CHAIRMAN said he thought the accounts for the past year must be regarded as satisfactory. There was an increase in the water-rental for the half year to Sept. 30 last, as compared with that of the corresponding period of 1897, of £5996; and though there had been special expenditure during the year to the amount of £7404, they were able to carry forward, in addition to the amount they had before, no less than £5072. He wished to call attention to the fact that this sum of £12,475 was very nearly a further 1½ per cent. on the dividend that had been paid, and which they proposed declaring that day. They sacrificed as it were 1½ per cent. of present income in payments on account of work that would be beneficial to the Company in the future. The large expenditure of a special kind which they had had ever since the frost of 1895, had been mainly in connection with the frost. First of all, about £19,000 of direct expenditure was caused by damage through the frost, and as nearly as possible the same amount for lowering the mains to secure their consumers as far as possible from such a disaster in the future. The total charges in connection with the frost had been £38,201. In this special expenditure, there were two items that had particularly to be taken into consideration, with respect to the value of the property should the undertaking at any time be bought up. So far as the frost and the lowering of the mains was concerned, there was not the slightest doubt that the outlay caused was a proper charge against the profits, but not to be spread over merely the particular years during which they spent the money. The frost was abnormal. It only occurred once in thirty years; and there could be nothing more unjust than the principle advanced by the London County Council of taking the particular figures of a couple of years, knowing all the time that these two years would have a most exceptional bearing on the revenue of the various Water Companies. With respect to the Staines reservoirs, in addition to the heavy expenses they were put to for parliamentary proceedings, which were wholly exceptional and only caused by the County Council, they were paying money which ought to be capitalized. It was most unjust that they should be bearing charges out of revenue which would only be beneficial to them when the Staines works came into operation, and which would then be of assistance to them for nearly forty years. He wished to put this matter clearly, and have it recorded that they would have a claim, should they be bought up, that this payment should not affect the income of the Company during any particular year or two that might be chosen, and that they had in addition an actual revenue claim for the payments they were now making for interest and management on account of the Staines reservoirs. The expenditure during the same period—the frost—on capital account, and which had been incurred to increase the pumping power, make additional filter-beds, duplicate mains, and lay down new mains in new districts, had come to nearly £150,000; the interest or dividend on it being charged against revenue. After they had made these various efforts to improve the supply, and to show that they were worthy of the task given them to perform by Parliament, the County Council were going to bring in another Bill for the purchase of the undertakings. The Chairman of the West Middlesex Company (Mr. Boulnois) had had the advantage of seeing the Bill; and he had characterized it as containing the most bare-faced proposal ever made by a public body. He (the speaker) thought this a sweeping conclusion; and he thoroughly endorsed it, though he could not say that he had studied the matter in the same way. He did not believe that such a Bill had the ghost of a chance of being accepted by Parliament. He now came to a matter of the greatest importance to the Water Companies—the present Royal Commission. It was not for one moment to be supposed that the men who formed the Commission had a prejudice or a desire to favour the Companies. He thought their one aim was to get information which would enable them to form a sound judgment on the main issue before them—as to the desirability or not of purchasing the water undertakings, either by the County Council or a public body. But as the Companies to a great extent were identified with

the system of providing for the future by storage reservoirs in the Thames Valley, and as the County Council had almost pledged themselves to sink or swim by the scheme of water from Wales, the probability of the Commission's judgment in favour of one or the other scheme became of importance; and to the Water Companies it was of almost vital importance. If they watched the proceedings of the Progressive party of the County Council, they would realize that the quiet hostility of a very influential part of the Moderate members of the County Council was not clearly shown in the division lists, though it had been sufficiently proved that it was by a small majority that the Progressive party were able to thrust their schemes forward. Why were they so intent on pushing this Welsh scheme? and why were they so intent on getting a particular clause? Not satisfied with the ordinary clause that had for many years governed the purchase or sale of property taken compulsorily, they wanted to introduce a clause which somehow should enable the arbitrators to take into consideration a variety of points which otherwise would not be admitted; and the most important of all these points would be the cost of bringing in a fresh supply. They would say: "You have to buy these Companies not solely upon the income they have been earning, or the income they are earning, and which they will earn for a certain number of years, but you have to face that with their enormous liability to spend an amount necessary to continue their supply for the increased population in the course of the next thirty or forty years." If, however, they got their purchase, they would be ready to throw this all on one side, just as they were ready now to take 185 million gallons from the Thames, although they had characterized the supply for years as diluted sewage. He did not believe that they would be ashamed, if once they got hold of the Companies, to throw over the Welsh scheme in favour of Thames Valley storage. Mr. Hunter, who was under examination before the Royal Commission on Monday and Tuesday, submitted figures, which he (the speaker) did not seriously think were called into question, as to the relative cost of the two schemes. In both cases there was a set-off. The interest on the Welsh scheme was enormous, compared with that on the Thames Valley scheme; but the latter had so large a sum for the capitalization of the pumping compared with the gravitation of the supply from Wales, that they could set the £3,250,000 of the one against the £3,500,000 of the other. Therefore, in the figures he was going to give them, he left out entirely the capitalized cost of pumping; and he also omitted the interest. He would deal with the works alone, and on a basis of 100 million gallons a day passing over Teddington Weir in such an extraordinary season of drought as that which they had gone through. During this period, far less than 100 million gallons passed over the weir on a number of days, and yet without any serious inconvenience of any kind—in fact, without even a complaint. He wished to record that as a Conservator of the Thames, when the figures were read as to the small amount of water that had passed over Teddington Weir on various days, he asked what inconvenience had been sustained by the Conservancy. He was at once opposed by a Progressive member of the County Council and others, to prevent this question from being answered; but he insisted on a reply—if not to that question, at least to this: What complaints had the Thames Conservancy received in consequence of 52 million gallons only passing over on one day, and 70 million gallons and so on for a number of days? "Not one" was the answer of the Engineer. This point was of immense importance; and unless the question were studied, one could not realize that it would make a difference to the Water Companies of more than £2,000,000 whether the Royal Commission decided that 100 million gallons should be the limit in so exceptional a year as 1898. The public might place great reliance on the figures submitted to the Royal Commission; for the estimated cost of storage reservoirs, &c., in the Thames Valley was based on their actual contract for the Staines reservoirs. Messrs. Aird and Sons, who were the Contractors for the Staines reservoirs, would not do work without a profit; and the payments which the Water Companies would make to them were based on these figures. They could not therefore have a better ground for calculation in estimating what similar reservoirs would cost. Including with the outlay on the reservoirs all the pumping necessary to convey the water to the service reservoirs of the various Companies, and the mains that were necessary to be laid, the expense to the Companies for the Thames storage would be £4,483,000; and on the same basis the cost of a supply from Wales to Elstree, and for conveying it from Elstree reservoirs in like manner to the service reservoirs of the various Companies, would be £20,600,551. This estimate was not a fancy one; it was based on the actual experience of three great similar works which supplied Manchester, Liverpool, and Birmingham. If the County Council could get their scheme passed, they would deduct—or would, at all events, try to deduct—from the value of the Companies' properties the cost to which they would be put to bring the water from Wales. This was a point they had been driving at all along. If the supply was to be derived from the Thames Valley, even taking the necessities of those Companies who had the greatest increase, the first additional reservoir need not be commenced until 1916, so as to be finished by 1920, to meet the needs of the population based upon the calculations made by Lord Balfour's Commission. He wished the shareholders of their Company to realize what a splendid position they were in when he was able to tell them, on Mr. Hunter's authority—and their colleague had now had so much experience in all these matters—that the Company would be able to provide for the increased population in their district, by their share of the Staines reservoirs, right up to 1937.

Mr. HUNTER: The assumed increase.

The CHAIRMAN assented. Continuing, he observed that he wished the public and the ratepayers would take to heart what he was now about to remark, as showing the spirit which animated the Progressive party (the working man's representatives) on the County Council. They did nothing to assist the East London Water Company in their troubles, and they did nothing to lessen the sufferings of the people who were short of water. They tried, however, to make political capital out of it. With reference to the Council's Bill, did they suppose that the first condition in it was to make provision for the East London supply? On the authority of Lord Onslow, there was not a word in the Bill about the matter. They were themselves bringing in a Bill which would enable all the Companies to have their various systems combined; and although the cost would be heavy, they were ready to face it. So far as East London was concerned, the Southwark and Vauxhall, Grand Junction, and West Middlesex Companies were going to take the responsibility of spending money at once,



even before they had parliamentary authority, if they had the proper promise he trusted to have from the President of the Local Government Board that day, so that East London would not, under any circumstances, go through such a terrible experience as that of last summer. He concluded by moving the adoption of the report.

The Right Hon. Viscount KNOTSFORD, G.C.M.G., seconded the motion.

The CHAIRMAN, in answer to questions, said no one knew when the report of the Royal Commission would be published. With regard to the assistance rendered by them to the East London Company, and the cost at which they supplied their water, it was impossible to get their work done faster than they did, and they were able to give the East London Company but little help. They made the very moderate charge of 6d. per 1000, or £25 per million gallons; but when they found that the East London Company took 129 million gallons, they voluntarily reduced the rate to 4½d. per 1000 gallons.

The motion was then put and carried unanimously.

The CHAIRMAN next proposed the declaration of a dividend for the last financial half year at the rate of 7½ per cent. per annum on the £50 "A" shares and on the £25 "B" and "C" shares, and of 7 per cent. per annum on the £50 "D" shares; together with interest and dividend, in accordance with the conditions of sale, on the 600 new £50 "D" shares offered at public auction on the 18th of May last.

Mr. H. MOTT seconded the motion, which was carried unanimously.

Dr. LEESON then proposed a vote of thanks to the Chairman and Directors for their arduous services. They were greatly indebted to Mr. Hunter for having saved the Water Companies; and he considered that everything was due to his and the late Mr. Fraser's scheme, which was so ably carried out.

Mr. PEARCE seconded the motion, and it was carried unanimously.

The CHAIRMAN, in acknowledging the vote, said they would go on fighting their friends the London County Council as long as they had any strength left.

The proceedings then terminated.

### FALMOUTH CORPORATION AND THE GAS AND WATER COMPANIES.

Now that the vote of the ratepayers has disposed of the scheme of the Falmouth Town Council for the purchase of the gas and water works some members of the Corporation seem anxious to harass the Companies and take up a hostile attitude in the hope that something may ensue. At a meeting of the Council on the 8th inst., Dr. Banks proposed that a Water Committee should be elected, "whose duties amongst others shall be to report frequently to the Council on the quality and quantity of the water supply of the borough; and to confer with the Board of the Falmouth Water Company on all matters affecting the supply." His object was very reasonable; for, as he explained, it was thought by himself and others that as the question of the proposed purchase of the water-works was decided, a conference with the Directors as to the supply would result in good. The idea was simply to keep the Council in touch with the Water Company. Mr. T. G. Mead seconded the motion, and expressed surprise that the idea of taking such a step had not occurred to any of them before. Other members, however, were not in this conciliatory mood. Mr. W. J. Coombes said the proposal was very crafty, but the effect of it would be to relieve the Water Company of their responsibility for the maintenance of a pure and abundant supply of water. As an amendment, he proposed that the suggested Committee should be called the Water and Gas Committee; and that their duties (among others) should be "first, to obtain when requisite, analyses of the water supplied to the Company, and also to periodically inspect the sources of supply; secondly, to ascertain the illuminating power of the gas supply, and the amount of impurities contained therein—such as sulphur compounds, the amount of hydrocarbons other than those derived from the destructive distillation of coal, and also the amount of that most deadly and poisonous gas known as carbon monoxide; thirdly, to meet when convenient and formulate a mode of procedure, and submit the same to the Council for their approval." Mr. Mackenzie, who seconded the amendment, revived the memories of recent controversies by his assertion that the quality of the gas was "worse than very poor." Mr. Grose, who acted as Chairman of the Gas and Water Purchase Committee during the two abortive attempts to win the support of the ratepayers to the scheme, asked if the resolution would empower the proposed Committee to go in for the purchase of the water-works. Dr. Banks replied that that was not his intention at all. To remove any doubts upon the subject, he proposed striking out the words "amongst others," and adding to the resolution: "It being understood that the Committee shall in no way interfere with the functions of the Gas and Water Purchase Committee." On a vote being taken, six voted for the resolution, and six for the amendment. The Chairman gave his casting vote for the resolution, which was accordingly carried. Mr. Grose will, however, move at the next meeting that it be rescinded.

**The Rating of Reservoirs and Mains in Various Townships.**—The Dewsbury and Heckmondwike Water Board are about to appeal against the rating of their reservoirs and mains in the townships in which they are situated. The Board have contributed rates to several Local Authorities; but the Clerk (Mr. G. Trevelyan Lee) has advised them that the reservoirs and mains are not liable to be rated. We learn that Mr. Balfour Browne, Q.C., who has been consulted on the matter, agrees with Mr. Lee. Notices of the appeal have been served; and should the Board be successful, about £1100 a year will be saved.

**Brigg Gas-Works Purchase.**—A poll of the inhabitants of Brigg has been taken in connection with the proposal to purchase the gas-works, and has resulted in a majority of exactly two to one in favour of the Council proceeding in the matter. The figures were: For the purchase 386, against 193. The cost of the undertaking, as estimated by Mr. E. H. Stevenson, the Engineer retained by the Council, will be £15,000, exclusive of law expenses. On the other hand, those opposed to the proposal say that the total cost to the town will be nearer £25,000. The shareholders of the Company have, it is reported, authorized the Directors to spend £2000 in opposing the Council's Bill.

### ELECTRIC LIGHTING NOTES.

The Bradford City Council have decided to spend £4150 on two additional engines and dynamos for their Valley Road electricity works.

The Shrewsbury Town Council have received a letter from the Local Government Board sanctioning a loan of £30,463 for the purchase of the local electric lighting works.

Through a singular freak in the electric light supply of High Wycombe, Bucks, on Monday night last week, the place was suddenly plunged into darkness. The lamps in the main streets of the borough and on the highway from London went out, with a few exceptions, just before ten o'clock, those which remained only making the surrounding gloom more apparent.

Last Thursday witnessed the completion of the purchase of the Yorkshire House-to-House Electricity Company's undertaking by the Leeds Corporation. At the Company's offices in Whitehall Road, possession of the works and premises was formally handed over to Mr. J. G. Hirst, Deputy-Chairman of the Lighting Committee, acting on behalf of the Corporation, in the presence of representatives of both parties. The total amount of the purchase money was £222,987 18s.

Mr. E. A. S. Fawcett conducted a short inquiry at Chester last Friday into an application by the Corporation for authority to borrow £20,000 for electric lighting extensions. The evidence laid before him showed that loans amounting to £45,000 had been already obtained; but the total expenditure incurred, owing to extra mains, lamps, &c., required, amounted to above £48,000. The Lighting Committee, it was also mentioned, were constantly receiving applications for the installation of the light in different districts. There was no opposition.

For the second time within three months, the electric light failed last Friday night at Norwich. About five o'clock the light was very irregular—almost dying out, and then suddenly giving an intense light. After this erratic behaviour, it collapsed entirely at six o'clock. Two hours afterwards an attempt was made to restore the light; but, by some mistake (as a local reporter puts it) "a too strong current was put on," and considerable damage was done. Several explosions took place; ceilings, plates, and fuse-boxes being blown off, and woodwork scorched.

The "Financial News" last Tuesday reported that a good deal was doing in electric shares, and went on to say: "St. James's, Westminster, Chelsea, and City were in demand; but Metropolitan were ¼ lower. The fact that in many City offices gas was being used yesterday (Monday) afternoon and evening, owing to the bad light supplied by the Electric Companies, makes the strength of their shares all the more remarkable, unless, indeed, some of them hope to profit by giving a poor supply." On the following day, our financial contemporary explained that the bad supply of electricity previously referred to was "caused by the enormous demand for current." The machinery is stated to be overloaded, owing to nearly 3000 new lamps per week having been added. The blame for the present deficiency is laid on the engineers' strike.

The borough of Eccles was put in possession of the electric light last Wednesday. The undertaking has been carried out by the Corporation at a cost of something like £12,000. The plant consists of two Lancashire boilers and two steam alternators, each of 200-horse power, and each capable of supplying 4800 8-candle power lamps. The engines are of the marine inverted type; and the accumulators are of a capacity to maintain 1000 8-candle power lamps for seven hours. The system of distribution adopted is the high-tension alternating current, at a pressure of 2000 volts, which is reduced on the consumers' premises to 200 volts. It is intended to carry out the whole of the public lighting of the borough by electricity; and this will involve a supply of some 1700 lamp columns. At the present time, there are about five miles of mains laid in the district; and applications have been received for about 4000 lamps. In all, 30 miles of streets will eventually be lighted.

The expediency of applying for a Provisional Order to authorize the supply of electricity for public and private purposes in the borough and carrying into effect any agreement which might be arrived at for purchasing the undertaking and works of the Electric Lighting Company was considered at a special meeting of the Eastbourne Town Council on Monday last week. Several members were absent owing to their connection as shareholders with the Company. Mr. Maude moved a resolution in accordance with the object of the meeting. He sketched the history of the subject from March last; and, with regard to a complaint that the Corporation were proceeding with the Order when negotiations with the Company were in progress, he pointed out that, if the Council did not do so, they would lose a year of precious time, while they might any moment abandon the Order if, as they all hoped, they should come to an amicable arrangement with the Company. The resolution was carried.

The wisdom of the policy of the Electricity Committee of the Liverpool Corporation in laying down small generating stations instead of making one huge establishment of them was questioned by a member at the meeting of the Council last Wednesday. The Committee had recommended that a contract be entered into for the supply and delivery of four sets of plant, at £6939 per set, for the equipment of a new station in the neighbourhood of Green Lane. Mr. Rutherford raised a protest against the order on the ground that the Lighting Committee persisted in the system of manufacturing electrical power in retail fashion with small units of machinery. In New York a new power station had been built with 70,000-horse power. It was important that the Tramways Committee and manufacturers should get electricity at the lowest possible price. After further discussion, the Chairman of the Committee (Mr. Petrie) said that, as soon as they had the Pumpfields station and the Green Lane station, they would be able to supply electric power as cheaply as any town in the kingdom. Already with the small station in Paradise Street, from which they were supplying the trams, they proposed to do it at 9-10ths of a penny per unit. When the whole of the tramway system was completed, they would require 10,000-horse power, while for lighting purposes something like 25,000 to 30,000 horse power would be needed. What then was the use of going in for the heroic ideas of Mr. Rutherford? It was owing to the danger of fire, as had been shown in the case of Hamburg, that they were adopting the separate stations. The recommendation was agreed to.

The proposed electric lighting reserve fund was the subject of a report which the Hampstead Finance Committee presented to the Vestry last Thursday. They stated that they had considered a report from the Vestry Clerk, and found that the net profit on the undertaking from its



inauguration to Lady-day, 1898, was £2820 13s. 1½d., which does not include the aid received from the lighting-rate—an additional £1659 5s. 11d. After some discussion, the Vestry first decided that this latter sum should be recouped to the lighting-rate out of the electric light revenue account; Sir Henry Harben very ingeniously expressing his own "pious opinion" that the Committee ought to charge as much of the electricity expenses as they possibly could to the revenue account and not to capital, for "it would be better for the future interest of the Vestry." The Vestry then passed almost unanimously the following resolution: "That the whole of the net profits from time to time arising from the electric lighting undertaking be set aside to form a reserve fund until the same reaches 10 per cent. on the capital outlay; and that such profits be invested as and when the Finance Committee shall decide, and in such securities as the Vestry may from time to time think fit." After thus satisfactorily dealing with their prospective profits, the Vestry digested a volume of figures prepared by the Lighting Committee to prove that "the time had now arrived when it was necessary to make provision for the extension of the buildings at the central station, to enable the Vestry to cope with the probable increase in the demand for current which will be made upon them." They pointed out that at present there were 1145 consumers, 313 of whom were added during the first nine months of the present year—a largely increasing ratio. Having considered various alternative schemes, they recommended the erection of buildings capable of containing 4000 additional horse power. This would give about 2500 kilowatts capacity, and with the present plant would supply a total of about 248,000 8-candle lamps. The Vestry eventually authorized the Committee to prepare and lay before them plans of the proposed extensions. After such a decision, it was curious to find the Committee stating that "they had considered the question of the advisability of placing arc lamps in the business portion of Flask Walk, and were of opinion that it was not advisable to do so, but that it would be preferable to improve the gas lighting of that thoroughfare." So gas evidently has its uses, even in Hampstead.

At the meeting of the Court of Common Council of the City of London last Thursday, Mr. E. Lee presented a petition from the Charing Cross and Strand Electricity Supply Corporation, Limited, stating that they were desirous of supplying electrical energy within the whole of the City and its liberties, and duly made application for the assent of the Corporation to such powers being granted. The reasons for so doing were set forth in the memorial referred to in our "Electric Lighting Notes" last week. The petitioners had been informed that the Corporation found themselves unable to assent; but they asked that, notwithstanding such inability, the Corporation should cause the memorial to be put upon their records. Replying to questions by members, the petitioners said they would not be able to supply the public lamps cheaper than 2½d. per unit—the present rate. They wished to enter the City for the purpose of giving light to the signatories to the memorial and others. The desire to make a profit for their shareholders out of the City lighting incidentally entered into their calculations, as they did not claim to be philanthropists. Being asked if they knew that 7000 consumers now obtained their electric light from the existing monopoly, they said there would be 30,000 consumers if a healthy competition were permitted. They hoped to charge a maximum of from 4d. to 5d. per unit for private electric lighting, and from 2d. to 3d. for motive power. The memorialists and others were dissatisfied with the present price; and if the Company were permitted to undertake business in the City, they would accept any reasonable conditions which might be imposed on them. Mr. Lee moved that the memorial should be referred to the Streets Committee for consideration and report. Mr. A. C. Morton, in seconding the motion, characterized the petition as the most important one ever presented to the Court, and pointed out that none of its signatories were adventurers, speculators, or promoters of companies. They were dissatisfied with the present arrangements for electric lighting, as well as with the price. Within the previous five or six days, the whole circumstances connected with electric lighting in the City had changed. The verdict of the Jury in a recent libel action had rendered the Court free to give their consent to the admission of any other Company into the City, or even to undertake the electric lighting themselves. By clause 42 of the Sewers Act, 1848, it was enacted that no person, being a Commissioner or a member of the Courts of Aldermen or Common Council, should be directly or indirectly interested or concerned in any contract for the execution of any works, upon pain that every such contract should be null and void, and that the person who should be interested should forfeit £100. He had recently heard a member of the Court state on oath that he was directly interested in the existing lighting contract to the extent of £625. That being so, the contract was null and void: and the Court were perfectly free to do as they chose. The verdict of the Jury freed the City from the captivity imposed upon it in 1891. Mr. Brooke-Hitching said the Judge at the trial alluded to especially exonerated Sir Joseph Savory from any imputation of corruption. Mr. Morton (interrupting) said he never accused him. Mr. Brooke-Hitching said if it were possible to invalidate the existing contract, he hoped the electric lighting would be undertaken by the Corporation. To throw themselves into the arms of another Company would only make matters worse. Mr. Wallace said in 1882 the present Lord Mayor moved that the Corporation should undertake the electric lighting of the City. But Colonel Haywood, their Engineer at that time, strongly recommended them not to do so; and the Lord Mayor's motion was defeated by a majority of one. Mr. W. H. Pannell supported the proposition. He said the Commissioners of Sewers considered the matter for nine years, and, after deciding not to undertake the lighting themselves, advertised for contracts, which resulted in the present arrangement. It was all very well, eight or nine years afterwards, when the industry was greatly advanced, and experiments had cheapened the production, to criticize the Commission adversely; but he believed they acted honestly and according to their lights at the time. He advised them not to hold out any fresh inducements to electric lighting companies, but, if they could legally do so, to do the work themselves. If they were legally bound by the present contract, they could emancipate themselves in fourteen years without disbursing a penny. The motion was then put and carried unanimously.

**The Public Lighting of Grays.**—The Grays Urban District Council have withdrawn the notice given to the local Gas Company that they intended to terminate the present agreement on the 31st inst.

## SALES OF STOCKS AND SHARES.

The sale conducted by Mr. Alfred Richards at the Auction Mart, Tokenhouse Yard, E.C., last Tuesday was not of such magnitude as the one noticed in the "JOURNAL" last week. Acting upon the instructions of the Directors of the North Middlesex Gas Company, he offered for public competition 500 ordinary £10 shares in the undertaking. They ranked for a standard dividend of 7 per cent., subject to the sliding-scale; the last dividend on similar shares having been at this rate. The highest price realized per share was £16 12s. 6d.; the lowest, £15 10s.; the average being £15 14s. 2d.—yielding the purchaser £4 9s. 1d. per cent. per annum upon his investment. The total amount produced by the sale was £7855. Some fully-paid "B" £10 shares in the Bournemouth Gas and Water Company, entitled to 7 per cent. dividend (which has been paid for several years past), were sold at the following prices per share: Highest, £17 10s.; lowest, £17 5s.; average, £17 5s. 9d.—yielding £4 1s. per cent. on the investment. The sale of these shares produced £2265, and the total realized by the entire sale was £10,120. On the same day, £40,000 of new 7 per cent. stock of the Liverpool United Gaslight Company was offered for sale by auction by Messrs. Branch and Leete. It was put up in lots of the nominal amount of £100 each, and was disposed of at prices averaging £172 8s. 1d. each. Last Tuesday evening Mr. W. E. R. Randall publicly sold, at the Chatham Auction Mart, nine original £5 shares in the Brompton, Chatham, Gillingham, and Rochester Water Company, for £15 9s. each; three similar shares fetching £15 10s. per share. Last Wednesday, Mr. Morrison, auctioneer, Airdrie, offered for sale, on behalf of the Coatbridge Gas Company, in Coatbridge Lesser Town Hall, 500 new £10 shares of the Company, bearing dividend at the rate of 7 per cent. The upset price was £12 per share. One lot sold at £14 5s., 38 lots at £14 7s. 6d., and eleven lots at £14 8s. 6d. The average price per share was £14 8s. 2d. On Thursday afternoon, eight 4 per cent. preference shares of £10 each in the Maidstone Water Company were sold for £11 5s. per share; 23 original ordinary 10 per cent. shares of £10 each in the same Company realized £20 each; 15 ordinary 7 per cent. shares of £10 each fetched £16, and nine similar shares £15 apiece; while three others were sold for £15 10s. each. A hundred £20 5 per cent. "B" cumulative preference shares in the Farnham Water Company were disposed of by auction last Friday, and realized £2835 10s.

## STOCKTON AND MIDDLESBROUGH WATER BOARD BILL.

At the Meeting of the Middlesbrough Town Council last Tuesday, attention was drawn to the Stockton and Middlesbrough Water Board Bill, by which powers are sought for the construction of Grassholme reservoir, in the valley of the Lune, Upper Teesdale, at a cost of £580,000, owing to the necessity of providing an additional water supply on Tees-side. The General Purposes Committee recommended that the Board proceed with the Bill, provided that they could obtain an increased price for the water from larger consumers, and that such increased price remain in force until the Corporation have been recouped their loss. On the adoption of the minutes being proposed, Mr. Mateson moved as an amendment that a price be named to the large consumers—viz., 5d. per 1000 gallons, instead of 3d., which is the rate at present charged them for water for manufacturing purposes. The amendment having been seconded, Alderman Bell, the Chairman of the Water Board, gave some statistics showing that the cost of the water undertaking was being gradually lessened year by year, and that, in the course of a few years, owing to the growth of the population and trade of the district, it would become a paying concern. The price to the large consumers of water was now very little above 3d. per 1000 gallons. He considered the three Corporations who owned the water undertaking (Stockton, Middlesbrough, and Thornaby) had two things to consider—first, their position as persons bound to do the best they could for the ratepayers, and, second, as persons bound to do the best they could for the district; and they would best fulfil these two obligations by consenting to the Bill passing into law with such moderate addition to the 3d. clause as would help the ratepayer through in time of difficulty, and permit the growth of the district to continue unimpaired in the future as it had proceeded in the past. The minutes were adopted.

The Bill is exercising very considerably the minds of the ratepayers in the districts of the Authorities composing the Water Board, seeing that the income of the undertaking does not balance the outgoings; and, consequently, inasmuch as the deficit has to come out of the rates, there is some objection to the Board entering upon the construction of new works under present circumstances. The argument of the Board, briefly stated, is this: The cost of every 1000 gallons of water supplied, including interest and redemption, is about 5d., and the revenue nearly 4d.; leaving a deficit of 1d. to be made up from the rates. But this calculation is based on the present supply. Were the delivery as much more as it is, the average outgoings per 1000 gallons would be 4d.; and thus income and expenditure would be equal. The Board evidently have the very best of reasons for believing (or knowing) they could sell more water; but under the circumstances of a rapidly growing district, 20 million gallons is too little a margin to work on. Thus they recommend fulfilling the obligations they definitely undertook to construct the Grassholme reservoir, and calculate that, by the time it is finished, the sale of water will have grown so considerably as to provide nearly as much more revenue as will suffice for the interest and redemption charges which they will then, and not till then, be called upon to pay. If at the same time they can get an increased rate from the ironmasters—3d. per 1000 gallons producing £6000 per year—this consummation becomes more easily assured.

**Hull Corporation Gas Supply.**—The subway which is to be constructed under the Queen's Dock basin at Hull for the pipes to convey gas from the mains of the British Gaslight Company into the gas-supply district of the Corporation will cost £3480. A tender to do the work for this sum has been accepted.



## METROPOLITAN WATER SUPPLY COMMISSION.

Fortieth Day—Monday, Dec. 12.

(Viscount LLANDAFF, Chairman, Sir JOHN E. DORINGTON, Bart., M.P., Sir G. B. BRUCE, M.Inst.C.E., Major-Gen. A. DE COURCY SCOTT, R.E., Rt. Hon. J. W. MELLOR, Q.C., Mr. A. DE BOCK PORTER, C.B., Mr. H. W. CRIPPS, M.P., and Mr. R. LEWIS.)

The Commission sat at the Guildhall, Westminster.

The following are the Counsel engaged: Mr. POPE, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., for the New River and the Southwark and Vauxhall Companies; Mr. LITTLER, Q.C., and Mr. LEWIS COWARD for the Kent Water Company; Mr. PEMBER, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. RICKARDS for the Chelsea Water Company; Lord ROBERT CECIL for the Hertfordshire County Council; Sir JOSEPH LEESE, Q.C., M.P., for the Kent County Council and Kent Local Authorities; Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN, Q.C., for the London County Council; Sir R. NICHOLSON for the Middlesex County Council; and Mr. GABRIEL P. GOLDNEY (Remembrancer) for the Corporation of the City of London.

Mr. R. E. Middleton, further cross-examined by Mr. BALFOUR BROWNE, said the point of a table of rainfall at Greenwich which had been put in was that the rainfall during the last fifteen years was 22.25 inches; while for the previous eighteen years it was 26.03 inches, or 3.78 inches more. This amply accounted for any lowness of water there might have been in the Kent streams and water-courses. Witness agreed that to increase the supply from Staines for any given quantity would involve storage in far greater proportion than the first quantity involved; and in succeeding quantities the storage would be in much greater proportion. The question was, however, really one of supply. The Staines aqueduct was not being fenced, though witness had talked in Parliament about doing so, to prevent flood-water from the Thames getting into it. He could not say how many thousand acres of land in the Thames Valley were now under water. If many thousand were under water, he did not think a great deal of farm land manure would be brought down which would get into the aqueduct. He had the figures of various items in his estimates of the Staines scheme, but did not feel called upon to give them. At present the Water Companies paid to the Thames Conservancy about £25,450 per annum for the supply of 185½ million gallons daily. He dared say they would have to pay some £34,365 per annum when the quantity taken was increased. Therefore in comparing the two schemes—the Welsh and the Staines—it must always be remembered that a payment would have to be made to the Thames Conservancy which would not be necessary in the case of the Welsh water. His Welsh estimates were not made on any survey of the ground. In other water schemes, he naturally used surveys and levels if he had them, and checked them by analogy. The use of analogy was perfectly legitimate. In calculating the expense of bringing 123 million gallons daily from Wales, witness thought the cost of works in progress should be included. He agreed, however, that no part of the £7,000,000 he had allowed for this item was to be expended in obtaining this 123 million gallons. He had also included an item of £13,916,000 for accumulation of interest calculated to the year 1936. This was the year when the reservoir would be exhausted; it would then be supplying all the water it could. Against this sum, he had not put down a penny for receipts. If the interest until 1936 and the cost of works in progress were to be eliminated from the calculation, his estimate of £42,000,000 would be reduced to £21,000,000. But he did not see why this should be done. Witness was then cross-examined with a view to showing that the analogy afforded by the Birmingham supply and the supplies of Manchester and Liverpool were misleading; but he maintained that they afforded reliable data. The figures of these schemes included the cost of purchasing the watersheds.

Mr. BALFOUR BROWNE: There is not a penny in the Staines scheme for the purchase of one acre of the watershed?

Witness: We have had to pay a very large sum for the watershed by way of a rental to the Thames Conservancy for inspecting it, and preserving the water pure for the use of London.

Why, in your progressive Welsh estimates, do you include the Irfon reservoir?—Because it was included in Sir A. Binnie's report.

Do you know Sir A. Binnie has never suggested that it should be construed as part of the present scheme at all?—So I believe.

In answer to further questions, witness said he agreed that the total present supply from the Thames and other sources was a little over 202 million gallons daily, and that the quantity which would be required in 1931, according to Lord Balfour's report, would be 415 million gallons. In order to double the supply, the Companies would probably have to double their capital expenditure, which was over £16,000,000 in 1896. He did not think it was necessarily true that if droughts and frosts prevented a Company giving a proper supply, the Company were not in a position to earn their dividend.

The CHAIRMAN remarked that it had been the contention of the Companies all through that if frost or drought occurred, they need not supply any water at all.

Witness said a corporation were surely in exactly the same position as a company. They were just as liable to make default; and there could be no doubt the ratepayers would have to pay under the circumstances. Among the matters giving a prospect of increase of income, was the quinquennial valuation; but against this must be set the increased consumption per head of the population—supposing there were any. He did not think there would be any such increase per head. The Companies had an adequate supply of water—even having regard to what had happened this year—but they had not the means of dealing with it. If they carried out the enormous scheme of eventually supplying 400 million gallons a day to the Metropolis, he should think the sinking fund clause would be done away with, and the Companies would have to raise the money by giving persons subscribing a profit. As to whether the money for the Welsh scheme could not be raised at a cheaper rate by the County Council, he believed there would be little, if any, difference.

Mr. Walter Hunter, Engineering Director of the Grand Junction Water-Works Company and Joint Engineer to the Staines Reservoirs Joint

Committee, examined by the CHAIRMAN, said whether the Companies were purchased or not, the Staines scheme, with the added Thames supply, must be adopted, or water must be obtained from Wales. The Staines scheme would be much the less costly. Originally, in conformity with a suggestion from the Local Government Board, it was held that no flood-water should be impounded for the first fifteen days; but subsequent reflection and discussion had led him to the opinion that no arbitrary line should be laid down—that the time of such pumping should be left to the engineers in charge, who would always be unwilling to take flood-water unnecessarily, owing to the additional work it would throw on the filters. Witness was fortified in this opinion by experience at the Grand Junction Water-Works at Hampton, where, by using a 45-million gallon storage reservoir as a subsiding reservoir, and drawing off the water from the surface instead of from the bottom, the work of the filters had been so lightened that they had gone much longer than was previously possible without the necessity of cleansing them. The rejection of the first two days of any flood would be quite sufficient to cleanse the surface of the land and wash out the ditches; but even this restriction was rather a precaution than a necessity. He, however, allowed six days in his calculations. Sir E. Frankland, Sir W. Crookes, and Professor Dewar were also of opinion that no advantage was gained by the rejection of flood-water. Witness held that, for the protection of the river and the equalization of its flow, it was desirable that as much water as possible should be taken from it in periods of flood. Even during the drought of the past summer the quality of the water had not fallen off. With regard to the minimum of 200 million gallons daily at Teddington Weir, witness said he took it originally as the basis of his calculations because it was the limit fixed by the Thames Conservancy in their instructions to Messrs. Marten and Rofe for the storage scheme in the Upper Thames Valley. He had never, however, seen any logical grounds for fixing a limit, and none was fixed by Lord Balfour's Commission. Sir A. Binnie wished it to be 250 million gallons daily, and the Thames Conservancy 200. When 200 million gallons were flowing over Teddington Weir in 24 hours, or 100 million gallons per tide, 1480 million gallons were flowing at Putney on the ebb of an ordinary tide. The difference between the Conservancy figures and those of Sir A. Binnie at Putney would therefore be only 1.65 per cent.; and at London Bridge, only 0.6 per cent. Similarly, if only 100 million gallons were flowing at Teddington in 24 hours, the diminution in the tide at Putney would be 3.4 per cent.; and at London Bridge, 1.2 per cent. A reduction of 100 million gallons at Teddington made a very small difference in the bulk of water running through London Bridge; the scour being mainly effected when the river was running in flood. The doing away with old London Bridge had a great effect on the flow of the river, causing a sudden fall in the low-water line of from 5 to 6 feet; and the high-water line rose by the water being heaped up. The Thames Embankment had also increased the scour of the river very largely. No harm was done, and no inconvenience felt or expressed, when, on July 28, 1896, the flow at Teddington fell to about 108 million gallons; and in the present exceptional year, when the rainfall for the twelve months ended Sept. 30 had been less than for 82 years—the total from Jan. 1 to Sept. 30, being only 44.5 per cent. of the average—not the slightest inconvenience was felt, and hardly a complaint was made to the Thames Conservancy as to the quantity of water in the river. This was not to be wondered at, seeing that above Teddington Lock the abstraction of all the water coming down the river, with the exception of that required for lockage (about 3 million gallons daily), would cause no difference in the appearance and navigability of the river. Below Teddington, the channel was filled to high-water line twice every 24 hours by the tidal wave. As the average flow at Teddington of only 76.98 million gallons in September, with a minimum of 42.3 million gallons on Sept. 13, had caused scarcely a single complaint, obviously if the average flow were raised by 30 per cent., and the minimum flow by 136 per cent., the condition of the river must have improved. The drought of this year showed that a limit at Teddington of 200 million gallons daily was much too high. When the storage proposed was completed, the Companies would not deplete the river below 100 million gallons; but if the natural flow was below this figure, the Companies would not make the deficiency good. Witness's estimates of the Staines scheme were practically on the same basis as Mr. Middleton's; but they varied slightly in detail. Witness had taken out the figures a little differently. Like Mr. Middleton, he used the figures of actual contracts for work now in hand, plus 10 per cent. for contingencies. He had calculated on a flow at Teddington of 100 million gallons daily. On this basis, witness brought out that for an average daily supply of 130 million gallons, on the conditions of 1898, a storage of 920 million gallons would be required, against 8314 million gallons according to the calculation of Mr. Middleton; the latter reckoning on a flow of 200 million gallons at Teddington.

The CHAIRMAN: That makes your point of the 100 million gallons at Teddington one of the gravest importance?

Witness: It is, I quite agree. That is why I venture to say that the questions relating to the bodies supplying the water are side-issues; but that upon the proper solution of the question as to the minimum flow at Teddington depends the economical user of the magnificent natural water supply which the position of London, on the banks of a river with the largest watershed in England, should secure to its inhabitants.

In answer to further questions, witness said to supply 300 million gallons a day, on the conditions of 1898, he calculated would require 17,300 million gallons storage; but according to Mr. Middleton 30,468 million gallons storage would be necessary. In the same way, witness made the total storage required to supply 400 million gallons daily, 31,243 million gallons. He handed in a table showing the number of days on which the river would be drawn below a flow of 200 million gallons, with a supply first of 307 million gallons and then of 400 million gallons daily; the storage being fixed on the basis of a minimum flow at Teddington of 100 million gallons. The table went back to 1883; and it showed that in many years there would be no occasion to so draw the river down, while in others the occasions would be very few. The reservoirs already authorized would be sufficient, with a minimum flow of 100 million gallons at Teddington, until the year 1920—giving a supply of a little over 200 million gallons daily. His limit of 100 million gallons at Teddington would only apply when the 6176 million gallons of authorized storage were completed. As soon as this storage was provided,



the necessary supplies for London till 1948 could be given by the gradual construction of reservoirs, always leaving 100 million gallons flowing at Teddington. Witness handed in further elaborate tables giving his estimate of the daily supply of 121½ million gallons (beyond the 185½ million gallons already authorized) from the Thames; the total figure being £8,035,254. For a further supply of 93 million gallons (making a total of 400 million gallons), the figure was £7,463,857. These estimates were less than those of Mr. Middleton; the difference being chiefly due to the fact that witness had adopted the 100 million gallons limit, which meant the provision of less storage. He confirmed Mr. Middleton's calculation as to the cost of the Welsh scheme; agreeing that the estimate by analogy was reliable and sound. The total estimated cost of the Welsh scheme would be £37,169,165; and of the Thames scheme (under the conditions of 1898, with a minimum flow of 100 million gallons at Teddington, and to supply 214 million gallons daily beyond the 185½ million gallons already authorized), £15,499,111.

#### Forty-First Day.—Dec. 13.

All the Commissioners were present except Mr. Cripps.

Mr. Hunter attended for further examination.

The CHAIRMAN: I gather, from tables you have already put in, that you think the Welsh scheme is not in the least needed at present?

Witness: That is so.

Mr. DE BOCK PORTER: Do you think it would be desirable to take any steps to secure the area?

Witness: I think it might be desirable in the interests of London to secure an area, supposing that it may hereafter be wanted.

Then you are not of opinion that it will never be wanted under any circumstances?—That is very difficult to answer. It depends on the real growth of London. Some people think that London will not increase in the future as it has in the past; and therefore that the Welsh scheme will never be wanted at all. The view I have taken generally with regard to the utilization of the Thames or bringing water from a distant watershed, may be summed up generally in this way: We have a river at our feet which at any rate has an average flow of something like 1300 million gallons a day. It is suggested that we should go to Wales and open up a supply from an area or watershed which at most, according to evidence, will be able to afford 415 million gallons a day. The promoters of the scheme proposed to abandon the Thames and the Lea altogether. What would happen would be that the 415 million gallons a day would be used up within a certain definite period; and then, having incurred all the expense of bringing the water from Wales or elsewhere, they would have to go back to the Thames. I have always felt that it is a question of expense between the two schemes. If the Thames can be developed and give water at a less expense than the Welsh scheme, it is absurd to go to a distant watershed until you are compelled.

The CHAIRMAN: But if you put it off too long, you may lose your area altogether?

Witness: That is so.

In reply to Mr. DE BOCK PORTER, who asked whether his proposal as to the 100 million gallon limit was likely to commend itself to the Thames Conservancy, witness said that save in exceptional years the limit would be sufficient for the river; but what the views of the Thames Conservancy might be, he could not say. The position of the Lea was not an ideal one; and he should not like to see water pumped back into the Thames as had been done in the Lea.

By the CHAIRMAN: If a rule were made that the limit should be 200 million gallons at Teddington, capable of suspension by some Government official in case of emergency, it would rather lie with the Companies to show it was necessary to go below this figure. Taking into consideration interest and sinking fund charges, the additional annual cost of the Welsh scheme, as compared with the Thames scheme, for the same quantities of daily supply, would be: From 1920 to 1936, £520,165; from 1936 to 1980, £700,201; and from 1980 to 1996, £180,036. The Directors of Water Companies were to a large extent a permanent body, and therefore gained a valuable insight into matters connected with water-works and their economical administration. As to whether such a body as the London County Council were likely to administer the undertakings well, he said necessarily with such a body the Committees were more ephemeral and were larger than Boards of Directors, and therefore not so efficient. With a large Board, they had not that rigid inquiry into everything that they had with a smaller body. With regard to the variation of rates over London, witness thought Parliament had wisely exercised its judgment. He agreed that if the undertakings were all in one hand the charge could be averaged; but those who were paying the lower rates would grumble very much if this were done. A capitation charge for water, if it could be levied, would be the fairest method; but as this was impracticable, the only way was to put a higher charge on the rateable value of a house in one district than in another, because the number of persons inhabiting a house would be larger in one district than the number inhabiting a house of similar rateable value in another. This should be considered in settling the matter. Rateable value, though clumsy, was the most practical method of levying the charge. Whether or not the Companies would like to supply by meter, depended on the price they obtained. The fairest way of charging would be a rate, with a meter-charge above a certain amount, so as to make each consumer his own waste inspector. He was clearly and strongly of opinion that the supply from the Thames would be the most economical for the next fifty years, in that it could, and would, be carried out by instalments if and when actually required.

Cross-examined by BALFOUR BROWNE: If any supply beyond the Thames were sought, that from Wales would be the best. So far as his experience went, the Companies were always ready to spend whatever money was needed for the protection of the consumers. His estimate of the Welsh scheme, like Mr. Middleton's, was based on the analogy of the Manchester, Liverpool, and Birmingham schemes; and he thought it was in no way exaggerated. His tables also assumed that the Welsh expenditure would have to be repaid in sixty years. He was not aware that this was a shorter period than the County Council proposed.

Sir Frederick Bramwell, Bart., in reply to the CHAIRMAN, said he had for many years been consulted about works in connection with the problem of water supply. The consumers of water and the ratepayers might be

taken as practically identical. As regarded non-domestic supplies, there were very many large undertakings where the owners had private sources. As long as the Companies continued in existence, it seemed that there could not possibly be a rate-in-aid; but if a municipal authority managed the concerns, there might be one, which would fall very heavily on these business undertakings.

The CHAIRMAN: You know the subject committed to us—viz., whether purchase by any one or more authorities is financially expedient. Would you kindly give us the result of your judgment in the matter?

Witness: My opinion is that it is not expedient that the Companies should be acquired, either in the interests of the water consumers, or, in so far as they are separate, in those of the ratepayers. I assume that they could not be acquired without the purchasing authority or authorities paying for them such a sum as would represent the profit income they now derive. Anything else, it appears to me, would be unfair to the persons who originally embarked their money under the parliamentary sanction and guarantee of the income—if it could be earned—and to those who subsequently bought shares at enhanced prices due to the increase in the value of money. I presume, therefore, they would have to pay the full value. If this be done, and taking into account the sinking fund, it seems to be perfectly certain that the purchasing authority could not afford to make a less charge for water than is made now. Therefore, there is no saving to the consumer. As regards the ratepayer getting any profit out of the transaction, I think it extremely problematical, because, as I say, the full value would have to be paid. I do not see where the economy is to come from, if, in extensions, the Companies can, under the sanction of the Auction Clauses Act, raise their money by debentures as cheaply as the others; and there is no sinking fund to be paid except the particular one I may have to talk of hereafter. If it be under the notion that there will be economy in management, I do not believe it. I do not see where the economy is to come in. London is so vast that the eight Companies do not appear to be in any way in excess of the management needed. The officials, if the Companies were purchased, would be equally numerous; and they would have to be equally well paid. There might be a saving in Directors' fees. This, however, would be more than counterbalanced by the compensation to be paid the Directors, besides which there would have to be officials appointed as heads of departments.

In further examination witness said that the interest on the capital necessary to purchase the undertakings, and the payment to be made for sinking fund, would absorb all the profits which would be made out of the sale of water. No reduction of rates would be possible. If the income grew, it would only be on account of new capital expended. No municipal body would raise capital at a much lower rate than the Companies. He was not at all sure that in other cases of water-works purchase reduction of rates had followed. He was consulted about a rate-in-aid at Liverpool; and he thought there was one at Manchester. He would not, however, say that in a number of instances the water charge and rate-in-aid did not form a reduction on the old price. He doubted very much whether a public authority would be more efficient in preventing waste than were the Companies; and, in support of this opinion, he referred at length to instances which had come under his knowledge in America. As to what ought to satisfy all reasonable requirements per head for such a city as London, he put the figure before Lord Balfour's Commission at 20 gallons for domestic and 6 gallons for manufacturing purposes; but owing largely to the increase of baths in houses of comparatively low value, he accepted the figure of 35 gallons, which he thought ample. Witness had acted for Bradford, where Sir A. Binnie came from, in respect of several of their Bills. In that town, failure appeared to be perennial; and he quoted from an issue of July last of the "JOURNAL," in which the possibility of the town being put on short supply was foreshadowed.

Mr. DE BOCK PORTER: Would you say that this is the result of municipalization?

Witness: I think so. If the water undertaking had been in the hands of a Company bound to keep up the supply, they would have done it. I should not say the condition of East London was worse during this year than that of any municipality.

By the CHAIRMAN: He thought what happened in East London was not to be wondered at, if the way in which the Company had been treated was considered. He referred to the fact that when the Company went with a Bill in 1893, Parliament would not even let them go to a Committee to say whether or not their statement that they required more storage was correct. He called that bad treatment. It was extremely undesirable that the control of water should be in the hands of a fluctuating body, because with such a body they could not get unity of purpose, as with a continuing one. To split the undertakings among the various authorities would be confusion worse confounded. With regard to giving every county its own water supply, witness asked where the division was to stop. Why not give Islington, with its 300,000 inhabitants, its own supply, and treat the other parishes and localities similarly? He doubted the contention of the counties that they had ample water at home. The body of all others to which he would not give control of the concerns was the London County Council, because of their avowed disbelief in the propriety of the present supply. He did not even believe in the sudden conversion of this body to regarding the Thames as a supplemental source. Further, the business of the Companies was so vast that it ought to be confided to a body having nothing else to do, and not to one already overburdened with work—a body not subject to periodical change by election, and having its conduct influenced thereby. The quality of the Thames water was perfect. He was not prepared to give detailed evidence of the Staines scheme; but, speaking broadly, he entirely approved it as being sufficient. From an engineering point of view, the circumstances were most favourable. If necessity arose, the Companies ought to be allowed to take all the water at Teddington except what was required for navigation, rather than incur all this extra expense for the mere purpose of having ornamental water—for it was nothing more—going over the weir. He was not sure whether it would be an improvement or not for the eight Companies to be fused into one. To his mind, London was so large that the eight managements were entirely justified. Witness was then examined at some length as to whether, if the Companies were purchased and managed by a body of experts specially for the benefit of the consumers, financial advantage would not result to the latter. He did not see why it should. The purchasing body would only deal with extensions; and he did not see that



they could possibly do so more economically, or any more in the interest of the consumers, than the Companies did at present. The Companies managed their business better than experts would. All possibility of future profit would have to be paid for by the purchaser. He had no doubt an arbitrator would allow for profit on capital not yet raised, if it could be shown that it would yield a profit. He did not think the impression that the Companies did not come up to the standard of their duties was well founded. Even in the case of the East London Company, there had been no lack of foresight in the extension of their works. With regard to the imposition of the sinking fund, he found it difficult to speak without temper. It was a contrivance by which, when a Company were trying to raise money for something that was needed, a heavy fine was put upon them—a fine which, if he was right, in the case of the New River Company would cause money to be raised at 8 per cent. instead of 3 per cent. The extra amount to be earned, and which was to go into the sinking fund, was only to be earned at the expense of the dividend on the existing capital; and this he called an instance of parliamentary bad faith.

Mr. DE BOCK PORTER: The effect of the clause has been that it will moderate the price of the undertakings if purchased?

Witness: I have no doubt that is the case, because it reduces the dividend on the existing shares.

Mr. LEWIS: The great objection is that when a Company raises capital for any purpose—whether it is to be productive or otherwise—Parliament steps in and punishes the existing dividend?

Witness: That is precisely it.

In further examination by the CHAIRMAN, witness expressed the opinion that the control provided by existing enactments was ample.

Witness having been briefly cross-examined by Mr. FREEMAN, on behalf of the London County Council, the Committee adjourned.

The forty-second sitting of the Commission was held yesterday, at the Guildhall, Westminster—Lord Llandaff presiding. Mr. Charles Hawksley was called, and, in replying to the Chairman, gave evidence regarding the future requirements of London, based on the rate of increase of population adopted in the report of Lord Balfour's Commission, and assuming the consumption to be 35 gallons per head daily, though he thought this quantity might be excessive. The growth of population, so far as it had been ascertained since 1891, showed that the estimate of Lord Balfour's Commission of the rate of growth of population was a perfectly safe one.

#### THE DERWENT WATER SCHEMES.

The Sheffield Corporation met last Wednesday to consider the various Bills of which notices have been given, relating to the schemes of water supply from the Derwent Valley. In the first place, a resolution was passed declaring that it was expedient for the Corporation to promote their own Bill; and two others asserted that it was similarly expedient to oppose the Leicester and Derby Bills. Alluding to the Derby Bill, Alderman Gainsford remarked that the opposition to this measure did not stand on quite the same footing as in the other case. The Sheffield Corporation would be prepared to entertain proposals and make arrangements for the supply of a proper quantity of water to Derby and the rest of the Derwent Valley, because it was obvious that they had a right to a supply of water from the area. The Derby Bill, however, proposed to take the whole of the area; and therefore Sheffield must oppose it. If it was a question of administering the area, Sheffield—both from proximity, size, and other considerations—was a more proper body to do so than the small Corporation of Derby. Further he claimed that the Sheffield scheme had merits which made it highly superior to that of Derby. On these grounds it was necessary that the Derby Bill should be opposed; but the opposition differed from the complete opposition to the Leicester Bill. Alderman Eaton considered it important that the Corporation should deal with this matter in a liberal spirit. It would be a mistake for Sheffield to go in entire opposition to Derby acquiring the right of water supply from the Derwent Valley. Alderman Gainsford endorsed this sentiment.

On the same day the Derby Town Council had their own scheme introduced to them by Alderman Bemrose, who moved the adoption of a report on the subject. He said that, generally speaking, the Council had made up their mind that an increased supply of water was wanted, and that they meant to obtain it from North Derbyshire. They found that Sheffield and Leicester were hankering after the same waters. It was quite true that Sheffield was not in Derbyshire, but still the Sheffield people seemed to have the spirit of annexation; and as some of the water trickled from Yorkshire into Derbyshire, they urged that they were entitled to it. At the same time Sheffield admitted that they had water sufficient for 25 or 30 years, and that they were also now constructing a large reservoir. Leicester undoubtedly was in the watershed of the Derwent and the Trent; and, therefore, Leicester might be considered to be more in the running than Sheffield. But the Committee, in weighing the matter over, came to the conclusion that the authority having the first claim to the waters was the town and county of Derby. It might be said that Derby did not want all the water. That was quite true; and thus the question came up of a Joint Board. To this, however, there were serious objections; and he did not think that they would be able to agree at all on such a Board. Leicester claimed that they were a larger borough than Derby. This was true; but it did not always follow that size was a gauge of capability, either of individuals, communities, or corporations. They (Derby) claimed that they had so far administered the water-works in a very proper and profitable manner to the town. During the past twenty years, they had spent £49,000 on capital account, and had had a supply of excellent water. Leicester were depending upon receiving £15,000 a year from Derby. If they assumed in the first instance that there must be reservoirs sufficient for 12 million gallons of water per day (it was estimated that the whole yield of the watershed would be 30 million gallons), the cost would be £1,200,000. Taking the cost for Derby at an excessive rate—say at £750,000—and the fact that they were not bound to make provision for a sinking fund for ten years, that the interest on capital expenditure had to be added with the capital after these ten years, that the term allowed for the repayment of the loan was sixty years reckoned from the expiration of the first

ten years, and that the profits were to be funded for ten years, the result would be that the capital expenditure, with compound interest at the rate of 3½ per cent. per annum, would be, at the end of ten years, £912,000. He went on to show that, by the accumulation of the net profits, the aid of the reserve fund, and the natural growth of the revenue of the undertaking, it might be safely reckoned that the scheme would not necessitate a call upon the rates. Alderman Newbold seconded the motion, which was carried.

#### THE PURCHASE OF PRIVATE WATER-WORKS IN NEW YORK.

We learn from the "Engineering Record" that the New York Legislature have passed an Act authorizing towns "to purchase the works, property, and franchises" of any companies supplying them with water. It forms Chapter 554 of the Laws of 1898, and is as follows:—

1.—Any town in this State which has a contract with a water-works company for supplying such town, or any portion thereof, with water, may acquire the works, franchises, and property of such water-works company in the following manner.

2.—Upon the written petition of not less than one-tenth in number of the taxpayers of such town, who shall be assessed for at least one-tenth of the total amount of the property assessed in that town, the supervisor of the town shall ascertain the price which the water-works company will accept for its works, franchises, and property, and shall submit to the lawful voters of such town at the next town meeting the question whether such works, franchises, and property shall be purchased at the price specified as aforesaid.

3.—Notice that such question will be so submitted to the voters of the town shall be given by publishing the same once a week, for at least four weeks, immediately preceding the election, in every newspaper published in the town, and by posting a copy of such notice conspicuously in the office of the Town Clerk at least 30 days prior to the day of voting; and the Clerk shall see that such notice is so published and posted.

4.—At such election, each qualified voter shall be given an opportunity to vote either for or against such proposed purchase. If a majority of the votes cast on the question shall be for making the proposed purchase, the supervisor of the town shall forthwith make and enter into a contract with such water company for the transfer of the company's works, franchises, and property to the town. The town officers are hereby authorized and empowered to enter into such contracts and to bind their respective towns thereby; and such companies are authorized and empowered to make such contracts and to do whatever is necessary to fulfil them.

5.—At the time of making such contract, the water-works company shall make and deliver to the officers of the town a full, true, and accurate statement in detail of all its debts, contracts, obligations, and responsibilities of every sort; and such statement shall be verified by the President or Treasurer of the company. The amount of such liabilities shall be carefully estimated by the officers acting on behalf of the town, and the gross amount thereof shall be deducted from the purchase price named. Should there be any difference between the town officers and the company as to the amount of such liabilities, the same shall be referred by them to the County Judge of the county, and be decided by him.

6.—As soon as the amount of the company's liabilities has been thus ascertained and deducted, and the net amount remaining to be paid for the company's works, property, and franchises has been thus determined, the Town Board of the town shall proceed to raise the money and carry out, on behalf of the town, the contract so made.

7.—Such Town Board shall make and issue bonds of the town for the entire amount of the purchase price of the property, works, and franchises to be purchased as agreed upon and voted for as aforesaid. Such bonds shall run for not more than 30 years, and shall bear interest at a rate not exceeding 5 per centum per annum, and shall be a valid and binding obligation upon the town on behalf of which they shall be issued. They may contain such provision as to payment of a part of those issued at such times, short of the full term for which they might run, as in the judgment of the Town Board issuing them would be advantageous to the town bound thereby.

8.—The Town Board shall proceed to sell such bonds, at either public or private sale, for the best price obtainable, not less than par. Out of the proceeds of such sale, the Board shall pay to the water-works company that portion of the purchase price, agreed on and voted for as aforesaid, which remains due to the company, after making the deductions mentioned in the fifth section of this Act, upon receiving an assignment or transfer of all the works, property, and franchises of the company, duly executed by the company or by the proper officers thereof, in its name and behalf. The balance of the proceeds of such bonds shall be used as far as and when necessary to discharge the debts, liabilities, and obligations of the water-works company.

9.—Before naming the price for the property, franchises, and works of any company under this Act, as contemplated in the second section, the officers thereof must obtain authority so to do from a majority in number and amount of the stockholders. Such consent shall be given in writing, and be duly signed and acknowledged by the stockholders.

10.—Upon making such transfer and conveyance to the town, the debts, liabilities, and obligations of the company, which have been included in the statement referred to in the fifth section of this Act, shall become a charge upon the town, and may be enforced against it. And if the company should be called upon to pay any claim, or to do any act on or on account of such debts, liabilities, or obligations, it may enforce the same against the town.

11.—The works, franchises, and property purchased shall be managed and controlled for and on behalf of such town by the Town Board which purchased the same, and their respective successors in office.

**The New Water Scheme for Ledbury.**—The money required for the new water supply for Ledbury (£5500) was the subject of an inquiry by Colonel W. L. Coke, of the Local Government Board, last Tuesday. The principal witness was the Engineer (Mr. R. E. W. Berrington); and his outline of the scheme showed that duplicate engines were to be erected at a new well, and the water pumped to a reservoir at the Cross Hands to hold 75,000 gallons. Thence it would pass by gravitation into the old reservoir, which has a capacity of 99,000 gallons.



## NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

An extraordinary case of an incorrect gas-meter has come to light in the Sheriff Court at Perth, where the Bridge of Earn Gas Company sued Mr. Dunbar, of Earnbank, for £26 odd as the price of gas which they said they supplied to him through a meter. Mr. Dunbar is Assistant Under Secretary for Scotland; and he first occupied Earnbank in 1895. In that year he and his household resided there for a period of nearly five months. During these months, Mr. Dunbar consumed 5000 cubic feet of gas, for which he paid the Company nearly £2. In 1896, Mr. Dunbar and his household resided at Earnbank for a little over six months; but the Company's bill for the gas consumed in that time amounted to over £26—the quantity charged for being 80,200 cubic feet. Mr. Dunbar was satisfied that so much gas could not possibly have been consumed. He, however, offered to pay for 21,000 cubic feet, or, if the Company preferred it, to allow the matter to stand over until the quantity of gas consumed at Earnbank in 1897 was ascertained. The Company, who had had the meter tested in the usual way, declined to accept either of Mr. Dunbar's offers, and took out a summons against him. They also cut off his gas supply. Accordingly, Mr. Dunbar, in his own interests, as well as in those of the gas consumers, resolved to defend the case. In the proof that was led, the Gas Company relied entirely on the test which they had had made; while the defender's evidence was to the effect that the gas consumed at Earnbank could only have been proportionately the same in 1896 as in 1895. Sheriff Grahame, before whom the proof was led, thereafter remitted the meter to Mr. John Jack, Inspector of Meters, of Edinburgh. Mr. Jack was requested to report upon the character of the meter, and its efficiency as a trustworthy instrument for measuring the quantity of gas passing through it. In his report, Mr. Jack stated that the meter had a reverse action—that is, instead of 10,000 it would register 90,000, and so on till it became a jumble; and that the correct reading of the index should have been 13,800 instead of 80,200 cubic feet—the overcharge on the total being 71,400 cubic feet. This entirely corroborated the evidence which Mr. Dunbar had led. The Company consequently abandoned the action, and have now paid Mr. Dunbar's expenses. Can anyone explain what this reverse action can be? To me it is a mystery. It could scarcely have been caused by faulty construction of the meter, because it would have surely been discovered at the first testing. Then it must have been an intermittent action, or it would have been detected at the testing after Mr. Dunbar challenged the meter. Could it have been the result of the action of some one tampering with the mechanism? The Company have acted very fairly in the matter, in the end, by withdrawing their action. It is a pity they did not display the same spirit of fairness earlier. In a case which was manifestly one for inquiry, and in which they had so handsome an offer, it seems to me that they were not justified in cutting off the gas supply.

The want of stopcocks upon the gas-services in Glasgow was the subject of comment in the Glasgow Town Council on Thursday. It was introduced by Bailie Battersby, who asked to what extent the Gas Department had the power, in the case of fires, to turn off the gas. He understood that there were no stopcocks; and he asked the Convener of the Gas Committee to take the matter into consideration. Mr. R. M. Mitchell, the Convener, said he thought that a Sub-Committee had been appointed in connection with this matter; but, if not, he would be happy to take up the subject. Now, to put stopcocks upon every service-pipe in Glasgow is so gigantic a work as to make it almost impossible. There are about 180,000 consumers supplied with gas by the Corporation.

The Monifieth Police Commissioners are a youthful body; the burgh having been created only a year or two; and it seems they have not yet got into the way of conducting public business. As is known, the community, by what is generally looked upon as a catch-vote, rejected the Burghs Gas Supply Act after it had been adopted. Following this, a Gas Company was started, with Provost Stewart at the head; and the Corporation have entered into an agreement with the Company for the lighting of the streets. This agreement is loathed by the party who were instrumental in preventing the erection of a corporation gas-works; and they have made several attempts to have it set aside. The last was on Tuesday, when a motion was made by a Mr. Anderson that they refuse, in the meantime, to recognize the agreement which was made by the last Commissioners as binding upon them; and that the opinion of a legal gentleman of standing, who had no connection with the burgh, should be taken as to their future action. Bailie Robertson, who was in the chair, ruled the motion to be incompetent. He would have acted wrongly if he had done otherwise. The agreement is binding upon the Commissioners for the time for which it provides, and can only be set aside by mutual consent. There is a doctrine that members of a corporation cannot bind their successors; and it would almost seem that this was what the opposition stumbled upon, as they attempted to set up a distinction between the Commission which existed before the last election and the present one. Of course, this was an erroneous view to take; and the Chairman pointed out the mistake. The doctrine is one which cannot be applied generally. As a matter of fact, every corporation does each year bind its successors in regard to contracts entered into; and to admit the possibility of a commission having power to overturn contracts which may be distasteful to new members would be to introduce confusion into public business.

The Town Council of Aberdeen on Wednesday made their annual inspection of the gas and electricity works. Lord Provost Fleming switched on the electric current to the west-end of the city, the supply of which is to be obtained from a 650-horse power steam-engine which has just been put in. At the close of the inspection, a light luncheon was partaken of; and one or two toasts were drunk. The speaking to these was of the customary congratulatory order, for which there is room, so far as regards the gas-works at least, the condition of which is in reality second to none. There was a remark which struck me, made by Mr. A. Smith, the Gas Engineer, who said that he had been at the works now for a long time, and that he thought he was eligible for a pension. The statement was received with laughter, as if to the Corporation the idea of the undertaking being carried on without Mr. Smith's supervision was too ludicrous to be entertained. In all probability Mr. Smith spoke in jest; but coming events do sometimes cast their shadows before them, and it

is not beyond possibility that he may be beginning to entertain ideas of taking things more easily.

Mr. S. Stewart, the Engineer and Manager of the Greenock Corporation Gas Department, presided at the annual social meeting of the gas-works employees this week, and gave an address upon the growth of the gas business in the town. The works, he said, were opened seventy years ago. In the first year, 3,200,000 cubic feet of gas were consumed, at a cost of 12s. 6d. per 1000 cubic feet. The make this year would be about 270,000,000 cubic feet, with 11,500 customers; the price being 2s. 11d. per 1000 cubic feet. The demand had increased twofold since Mr. Stewart became Manager; and he saw no reason why the annual increase should not continue. Though the Police Board were introducing the electric light, he did not anticipate that it would affect the annual demand for gas. On account of the continued progress of the undertaking, Mr. Stewart has reported upon the necessity for an extension of the works. These, he states, were designed for a maximum make of 300 million cubic feet per annum, and the production now nearly equals this amount; so that it has become a necessity to prepare for an extension, especially in the carbonizing department. The proposed extension has been estimated to cost £30,000. The subject will come up for consideration shortly.

A fatal case of suffocation by gas occurred in Stirling on the morning of Saturday last, when a female servant was found dead in bed. The occurrence did not take place on account of any defect in the gas-fittings, but because the gas was found to be turned full on. What led to its being so, is not explained.

The owners of lime-works in the Lothians have resolved that, in consequence of the increased cost of labour and fuel, the price of lime is to be advanced by 1s. a ton; the increase to take effect as from the 15th inst.

Somewhere about the beginning of 1884, I think, the Corporation of Arbroath were greatly exercised over the town's water supply, which was then being pumped from a well at Nolt Loan. A report on the general question of water supply was obtained from Mr. G. Wilson, of Edinburgh, which was altogether in favour of a gravitation scheme. Mr. Wilson's report was thrown over; and the Corporation resolved to sink another well, at Warslap, to catch the same underground flow of water, which is supposed by some to exist in great quantity. The well was sunk, and it proved disappointing. It was then resolved to excavate adits to the east and west of the new well. This work has been proceeding, with sundry hitches, for nearly two years. Some 500 yards of adit were to be driven; but in the contract there was a saving clause to the effect that 1000 yards should be driven east and west respectively, on the completion of which the Commissioners would meet and consider what further steps they would then take. Some 300 yards having been driven each way, a fortnight's meter test was agreed upon. This having been completed, the Sub-Committee who were appointed to take the readings of the meter met, and drew up the result of their findings. These readings were communicated to the whole Board sitting as a Committee, when the yield was, for the last nine days of the test, stated to amount to 276,000 gallons per day, or 11½ gallons per day per head of the population. After considerable discussion, it was decided that the adit should be continued eastward to the extent of 300 yards. This recommendation recently came before the Police Commissioners, and was adopted. In the minority was Provost Grant, who declared himself in favour of Mr. Wilson's scheme being again considered; and after the vote was taken, three of the Commissioners recorded their dissent, on the ground that, in their opinion, the further prosecution of the adit scheme would result in useless expenditure. I entirely agree with the minority. The adits, so far as constructed, have raised the supply from the well from about 7 to nearly 12 gallons per head of the population per day. Proportionally, other 300 yards of adit will increase it from 12 to 21 gallons, which is altogether inadequate, according to modern requirements; and there is this further to be considered, that as it approaches the old Nolt Loan well, the adit will draw off water which should flow into it, and any increase in the Warslap well will consequently be at the expense of the Nolt Loan well. The cost of a gravitation supply would be more than the well scheme; but, as it is almost inevitable, looking to the future, it will be matter for regret if large sums should be spent upon the wells and pumping plant, to be afterwards found to have been money thrown away.

**The Lighting at Carlton Colville.**—At a recent meeting of parishioners of Carlton Colville, it was decided by 44 votes to 25 not to adopt the Lighting Act in the village. A poll was thereupon demanded; and last Thursday week the result was made known—the majority against the lighting being only two.

**Explosion of Gas at Tunbridge Wells.**—On Thursday, the 8th inst., an explosion of gas took place on the premises of Messrs. J. G. Murdoch and Co., music warehouse, Chapel Street, Tunbridge Wells, whereby all the windows were blown out, and Mrs. Barnard, wife of the resident Manager, received severe injuries on the face and hands. Mr. Barnard promptly turned off the gas at the meter, and, notwithstanding her injuries, Mrs. Barnard helped to extinguish the flames. The explosion is believed to have been caused by a volume of gas coming into contact with the by-pass flame of an incandescent gas-light.

**The Gainsborough Gas-Works Purchase Question.**—On Friday, the 9th inst., a meeting of owners and ratepayers was held at Gainsborough to consider the proposal of the District Council to purchase the gas-works undertaking. The Chairman of the Council, Mr. J. Dixon—presided, and explained the circumstances which had led up to the proposal being made. The Clerk, Mr. D. M. Robbs, submitted that the Council could at the present time make a fair bargain with the Company, that money was cheap, and that the Committee believed the works could be made profitable. Their value would be assessed on the net maintainable profits. He expressed the opinion that if the Council's predecessors had had a little more pluck, the ratepayers would have been reaping the advantages of the works to-day. Mr. J. D. Sandars spoke against the proposed purchase, and Mr. E. Pearson delivered a long speech—arguing that, though he was in favour of buying the works at a fair price, it was not right to saddle the town with a large expense. Mr. Housham replied to this, and gave a number of facts and figures showing how gas-works had been made to pay in other places. He advised the ratepayers to take no notice of the croakers who would not buy the concern 25 years ago. The result of the voting was a majority of five to one in favour of the Council; but Mr. Sandars demanded a poll.



## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Dec. 17.

**Sulphate of Ammonia.**—The market has been steady throughout the week with increased firmness towards the close; the quotations being £10 to £10 1s. 3d. per ton f.o.b. at the ports. Makers are pursuing a consistent policy of selling their production as it becomes available. Consumers are still taking a fair share of the output; and there has been more buying for "covering" purposes, in anticipation of the holidays and consequent interruption of transit. In the forward position, makers are firm at £10 5s. per ton, ordinary terms, f.o.b. Leith; and at £10 per ton, Beckton terms, London. Speculators continue to offer abroad at below the equivalent of these prices; but they are less persistent than they were a week or two ago.

**Nitrate of Soda** is firm at 7s. 6d. per cwt. for good up to 7s. 7½d. for fine quality.

LONDON, Dec. 17.

**Tar Products.**—A little more life characterizes benzol; and buyers are easier to deal with. It may be that the bottom price of benzol has been reached, in which case better prices may come with the new year. The excellent demand for creosote which has obtained now for some little time continues, notwithstanding the increased production. It is a perfect godsend to distillers, as their other products are difficult of sale, and some absolutely unsaleable at all. The present lot of the tar distiller is an unhappy one; but, buoyed up with never-failing hope, expectations for the coming year keep him going. Carbolic acid moves off freely; and values are maintained, while a reasonable demand continues for solvent naphtha, as well as for heavy naphthas. Prices, however, are low and unprofitable.

Average values are as follows: Tar, 14s. to 19s. 6d. Pitch, east coast, 24s. 6d.; west coast, 22s. Benzols, nominal, both 90's and 50's, 8½d. Toluol, 1s. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 2d. Crude, 30 per cent., naphtha, 3½d. Creosote, 3d. Heavy oils, 50s. Carbolic acid, 60's, 1s. 10½d. Creosote salts, 30s. Anthracene, nominal, "A," 3½d.; "B," 2½d.

**Sulphate of Ammonia** is steadier; and slightly better prices are being paid. The outlook for the spring is encouraging; and the sphere of consumption is undoubtedly much larger than it has ever been before. Notwithstanding the enormously increased production from coke-ovens, all that is being made is being taken up; and stocks in makers' hands are dangerously low. The value at all ports is £9 17s. 6d. to £10 per ton, less 8½ per cent.

## COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—There is a fairly active demand generally for the better qualities of round coal; and with all other descriptions of fuel in brisk request, there is an exceedingly strong tone through the market. Some of the leading Lancashire collieries are decidedly in favour of a further upward move in prices at the close of the month; and the ques-

tion has been under discussion during the past week, both by the principal colliery firms in the Manchester district, and also by those in South-West Lancashire. Nothing definite has so far been decided; but any sudden advent of severe weather would almost unquestionably bring about a more or less general upward move. House-fire qualities are exceedingly firm at the full quotations of 11s. to 11s. 6d. per ton for best Wigan Arley; 9s. 6d. up to 10s. 6d., for Pemberton four-feet and seconds Arley; and 8s. to 8s. 6d., for common house-fire descriptions. Steam and forge coals, with a pressing demand for inland requirements and for shipment, tend to harden; and in some instances slightly higher prices are already being secured. For inland sales, ordinary steam and forge coals are fetching 7s. 9d. to 8s. 3d. per ton at the pit; while on shipping orders, steam coal ranges, according to quality, from 9s. up to 10s. per ton delivered at the Garston Docks, the High Level, Liverpool, or the Manchester Ship Canal. Engine classes of fuel are fully maintaining the recent advance; and in some instances special prices above present list rates are quoted, where new business comes forward. There is a continued shortness of supplies; and the lower qualities of slack are scarcely obtainable under 4s. to 4s. 3d. per ton, with medium sorts 4s. 6d. to 5s., and the very best slacks quoted at 5s. 3d. to 5s. 6d. For coke there is a brisk demand; and ordinary foundry qualities are fetching about 16s. per ton at the ovens in this district.

**Northern Coal Trade.**—There has been an exceedingly brisk demand for coal in the last few days, in preparation for the holidays; so that the whole of the northern collieries have been very fully employed. The heavy business has necessarily stiffened the prices of coal. Best Northumbrian steam coals are quoted at 9s. 9d. per ton f.o.b.; second class, at about 9s.; and steam smalls, at about 4s. 3d. In the gas coal trade, there is a very full demand; and nearly 25,000 tons daily are being sent on the average from Tyne Dock—the chief of the shipping places for Durham coals. Prices of gas coals are now quoted at about 9s. per ton for occasional cargoes, promptly; but for delivery over next year, about 8s. per ton is the f.o.b. quotation. Very large local coal contracts are pending. Gas coke is steady; and the very heavy production seems to be well taken up, especially near the shipping places. There is no alteration in prices this week.

**Scotch Coal Trade.**—With a continuing good business, prices are rising. The demand is, in fact, so heavy that manufacturers have in some instances difficulty in getting supplies. Splint is in greatest request, and is fetching the highest price. The rates quoted are: Main, 8s. 6d. to 8s. 9d. per ton f.o.b. Glasgow; ell, 9s. 6d. to 10s.; and splint, 9s. 9d. to 10s. The shipments for the week amounted to 150,814 tons—a decrease of 2700 tons on the previous week, and of 836 tons on the corresponding week of last year. For the year to date, the total shipments have been 9,461,094 tons—an increase over last year of 1,689,091 tons.

**The Assessment of the Bury St. Edmund's Gas-Works.**—The Bury St. Edmund's Gas Company have given notice of their intention to appeal against the increased assessment of their property by the Borough Assessment Committee. The assessment has been nearly doubled; and this, notwithstanding that the gas-works will need extensive alteration and improvement before long.

## GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1405.

| Issue.    | Share. | When ex-Dividend. | Dividend or Bonus. | NAME.                      | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue.    | Share. | When ex-Dividend. | Dividend or Bonus. | NAME.                            | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|-----------|--------|-------------------|--------------------|----------------------------|-----------------|---------------------|------------------------|-----------|--------|-------------------|--------------------|----------------------------------|-----------------|---------------------|------------------------|
| £         |        |                   | p. c.              | GAS COMPANIES.             |                 |                     | £ s. d.                | £         |        |                   | p. c.              | GAS COMPANIES.                   |                 |                     | £ s. d.                |
| 530,000   | 10     | Oct. 13           | 10½                | Alliance & Dublin 10 p.c.  | 21-22           | +½                  | 4 15 5                 | 75,000    | 5      | Nov. 30           | 6                  | Malta & Medn., Ltd.              | 47-54           | ..                  | 5 14 3                 |
| 100,000   | 10     | "                 | 7½                 | Do. 7 p.c.                 | 16-17           | ..                  | 4 8 3                  | 541,920   | 20     | Nov. 11           | 5                  | Monte Video, Ltd.                | 13-14           | ..                  | 7 2 10                 |
| 300,000   | 100    | July 1            | 5                  | Australian 5 p.c. Db.      | 105-107         | ..                  | 4 13 6                 | 617,945   | Stk.   | Aug. 31           | 9½                 | Newcastle & Gateshead Con.       | 232-238         | ..                  | 4 2 8                  |
| 200,000   | 5      | Nov. 11           | 6                  | Bombay, Ltd.               | 61-63           | ..                  | 4 2 11                 | 252,355   | Stk.   | Jan. 3            | 3½                 | Do. 3½ p.c. Db. Stk.             | 113-117         | ..                  | 2 19 10                |
| 40,000    | 5      | "                 | 6                  | Do. New, £4 paid           | 43-44           | ..                  | 5 1 1                  | 150,000   | 5      | Nov. 30           | 8                  | Oriental, Ltd.                   | 7-7½            | ..                  | 5 6 8                  |
| 880,000   | Stk.   | Aug. 12           | 12                 | Brentford Consolidated     | 275-280         | ..                  | 4 5 9                  | 135,000   | 5      | "                 | 8                  | Do. New, £4 10s. pd.             | 61-63           | ..                  | 5 6 8                  |
| 240,000   | "      | "                 | 9                  | Do. New                    | 210-215         | ..                  | 4 3 9                  | 15,000    | 5      | "                 | 7                  | Do. do. 1879, £1 pd.             | 13-14           | ..                  | 4 11 5                 |
| 50,000    | "      | "                 | 5                  | Do. 5 p.c. Prf.            | 140-145         | ..                  | 3 9 0                  | 60,000    | 5      | Sept. 29          | 7                  | Ottoman, Ltd.                    | 5-5½            | ..                  | 6 6 2                  |
| 159,375   | "      | Dec. 15           | 4                  | Do. 4 p.c. Db. Stk.        | 128-133         | ..                  | 3 0 2                  | 500,000   | 100    | Dec. 1            | 6                  | People's Gas & 2nd M. of Chicago | 102-106         | ..                  | 5 13 2                 |
| 220,000   | Stk.   | Sept. 15          | 11½                | Brighton & Hove Orig.      | 263-268         | ..                  | 4 5 10                 | 848,070   | 10     | Oct. 13           | 6                  | River Plate Ord.                 | 9-9½            | ..                  | 6 6 4                  |
| 226,320   | "      | "                 | 8½                 | Do. A. Ord. Stk.           | 190-195         | ..                  | 4 7 2                  | 250,000   | Stk.   | June 29           | 4                  | Do. 4 p.c. Db. Stk.              | 99-101          | ..                  | 3 19 3                 |
| 933,500   | Stk.   | Aug. 31           | 5                  | Bristol, 5 p.c. max.       | 125-130         | ..                  | 3 16 11                | 250,000   | Stk.   | June 29           | 4                  | San Paulo, Ltd.                  | 15-16           | ..                  | 6 5 0                  |
| 420,000   | 20     | Sept. 23          | 10                 | British                    | 45-47           | -3                  | 4 5 1                  | 250,000   | 10     | Sept. 29          | 10                 | Sheffield A.                     | 242-245         | ..                  | 4 1 8                  |
| 50,000    | 10     | Aug. 12           | 11½                | Bromley, Ord. 10 p.c.      | 26-28           | +1                  | 4 2 2                  | 135,000   | Stk.   | Sept. 15          | 10                 | Do. B.                           | 242-245         | ..                  | 4 1 8                  |
| 75,000    | 10     | "                 | 8½                 | Do. 7 p.c.                 | 20-22           | ..                  | 3 17 3                 | 209,053   | "      | "                 | 10                 | Do. C.                           | 242-245         | ..                  | 4 1 8                  |
| 500,000   | 10     | Oct. 13           | 6                  | Buenos Ayres (New) Ltd     | 92-10           | ..                  | 6 0 0                  | 447,427   | "      | "                 | 10                 | Do. C.                           | 242-245         | ..                  | 4 1 8                  |
| 98,122    | Stk.   | June 29           | 4                  | Do. 4 p.c. Db. Stk.        | 98-100          | ..                  | 4 0 0                  | 5,600,000 | Stk.   | Aug. 12           | 5½                 | South Metrop. 4 p.c. Ord.        | 136-139         | -1                  | 3 16 7                 |
| 150,000   | 20     | July 14           | 8½                 | Cagliari, Ltd.             | 29-30           | ..                  | 5 10 0                 | 1,460,000 | "      | July 14           | 3                  | Do. 3 p.c. Db. Stk.              | 102-105         | ..                  | 2 17 2                 |
| 100,000   | 10     | Sept. 23          | 7                  | Cape Town & Dis., Ltd.     | 14-15           | ..                  | 4 13 4                 | 60,000    | Stk.   | Aug. 31           | 12                 | Tottenham & A.                   | 280-290         | ..                  | 4 2 9                  |
| 50,000    | 50     | Nov. 2            | 6                  | Do. 6 p.c. 1st Mort.       | 57-59           | ..                  | 5 1 8                  | 60,000    | "      | "                 | 7                  | Edmonton B.                      | 200-210         | ..                  | 4 5 9                  |
| 550,000   | Stk.   | Oct. 13           | 13½                | Commercial Old Stock.      | 310-315         | ..                  | 4 5 9                  | 182,380   | 10     | June 10           | 7                  | Tuscan, Ltd.                     | 10-11           | ..                  | 6 7 3                  |
| 200,750   | "      | Dec. 15           | 10½                | Do. New do.                | 240-245         | ..                  | 4 5 9                  | 149,900   | 10     | July 1            | 5                  | Do. 5 p.c. Dbs. Red.             | 100-103         | ..                  | 4 17 1                 |
| 200,750   | "      | Dec. 15           | 4                  | Do. 4½ p.c. Db. Stk.       | 145-150         | +½                  | 3 0 0                  |           |        |                   |                    |                                  |                 |                     |                        |
| 800,000   | Stk.   | Dec. 15           | 10                 | Continental Union, Ltd.    | 200-205         | ..                  | 4 17 7                 |           |        |                   |                    |                                  |                 |                     |                        |
| 200,000   | "      | "                 | 7                  | Do. 7 p.c. Prf.            | 187-192         | +½                  | 3 12 11                |           |        |                   |                    |                                  |                 |                     |                        |
| 51,600    | Stk.   | Aug. 31           | 14                 | Croydon A 10 p.c.          | 305-310         | ..                  | 4 10 4                 | 746,184   | Stk.   | June 29           | 11½                | Chelsea, Ord.                    | 315-320         | +3                  | 3 8 9                  |
| 168,400   | "      | "                 | 11                 | Do. B 7 p.c.               | 255-265         | ..                  | 4 3 0                  | 150,000   | "      | "                 | 5                  | Do. 5 p.c. Prf.                  | 170-175         | ..                  | 2 17 2                 |
| 555,000   | Stk.   | Aug. 12           | 5½                 | Crystal Palace Ord. 5 p.c. | 125-130         | ..                  | 4 0 9                  | 160,000   | "      | "                 | 4                  | Do. 4½ p.c. Prf. Stk. 1875       | 148-152         | ..                  | 2 19 3                 |
| 60,000    | "      | "                 | 5                  | Do. 5 p.c. Prf.            | 140-145         | ..                  | 3 9 0                  | 175,785   | "      | Sept. 29          | 4                  | Do. 4½ p.c. Db. Stk.             | 157-162         | ..                  | 2 15 7                 |
| 486,090   | 10     | July 28           | 11                 | European, Ltd.             | 23-24           | ..                  | 4 11 8                 | 1,720,560 | Stk.   | Oct. 13           | 7                  | East London, Ord.                | 212-217         | ..                  | 3 4 6                  |
| 354,060   | 10     | "                 | 11                 | Do. £7 10s. paid           | 17-18           | ..                  | 4 11 9                 | 654,740   | "      | June 29           | 3                  | Do. 4½ p.c. Db. Stk.             | 158-162         | ..                  | 2 15 7                 |
| 5,922,230 | Stk.   | Aug. 12           | 12½                | Gaslight & Coke, A. Ord    | 285-290         | ..                  | 4 4 6                  | 390,000   | "      | "                 | 3                  | Do. 3 p.c. Db. Stk.              | 102-104         | -1                  | 2 17 8                 |
| 100,000   | "      | "                 | 4                  | Do. B, 4 p.c. max.         | 120-125         | ..                  | 3 4 0                  | 700,000   | "      | Dec. 15           | 7½                 | G'd Junction, 10 p.c. max.       | 112-115         | ..                  | 3 5 3                  |
| 665,000   | "      | "                 | 10                 | Do. C, D, E, 10 p.c. Prf.  | 303-313         | ..                  | 3 11 1                 | 310,000   | Stk.   | Sept. 29          | 4                  | Do. 4 p.c. Db. Stk.              | 138-143         | ..                  | 2 15 11                |
| 30,000    | "      | "                 | 7                  | Do. F, 5 p.c. Prf.         | 152-157         | ..                  | 3 3 8                  | 708,000   | Stk.   | Aug. 12           | 14                 | Kent                             | 365-370         | ..                  | 3 15 8                 |
| 60,000    | "      | "                 | 7½                 | Do. G, 7½ p.c. do.         | 233-238         | ..                  | 3 3 0                  | 160,000   | "      | "                 | 7                  | Do. New, 7 p.c. max.             | 212-217         | ..                  | 3 4 6                  |
| 1,300,000 | "      | "                 | 7                  | Do. H, 7 p.c. max.         | 195-200         | ..                  | 3 10 0                 | 1,043,500 | 100    | June 29           | 10½                | Lambeth, 10 p.c. max.            | 300-305         | ..                  | 3 8 10                 |
| 463,000   | "      | "                 | 10                 | Do. J, 10 p.c. Prf.        | 308-313         | ..                  | 3 3 11                 | 406,300   | 100    | "                 | 7½                 | Do. 7½ p.c. max.                 | 280-285         | ..                  | 3 9 10                 |
| 476,000   | "      | "                 | 6                  | Do. K, 6 p.c. Prf.         | 185-190         | ..                  | 3 3 2                  | 350,000   | Stk.   | Sept. 29          | 4                  | Do. 4 p.c. Db. Stk.              | 138-143         | ..                  | 2 15 11                |
| 1,061,150 | "      | Dec. 15           | 4                  | Do. L, 4 p.c. Db. Stk.     | 130-132         | +1                  | 3 0 7                  | 500,000   | 100    | Aug. 12           | 12½                | New River, New Shares            | 430-435         | -2                  | 3 0 11                 |
| 294,850   | "      | "                 | 4                  | Do. 4½ p.c. do.            | 145-150         | +½                  | 3 0 0                  | 1,000,000 | Stk.   | July 28           | 4                  | Do. 4 p.c. Db. Stk.              | 138-143         | ..                  | 2 15 11                |
| 958,000   | "      | "                 | 6                  | Do. 6 p.c. do.             | 195-200         | +3                  | 3 0 0                  | 902,300   | Stk.   | June 29           | 7½                 | Southwark & V'xhall, Ord.        | 177-182         | +2½                 | 4 2 5                  |
| 70,000    | 10     | Nov. 11           | 8                  | Hongkong & China, Ltd.     | 132-145         | ..                  | 5 10 4                 | 129,250   | 100    | "                 | 7½                 | Do. do. 7½ p.c. max.             | 167-172         | +3½                 | 4 2 3                  |
| 3,800,000 | Stk.   | "                 | 10                 | Imperial Continental       | 223-227         | +1                  | 4 8 1                  | 485,500   | "      | "                 | 5                  | Do. do. 5 p.c. Prf.              | 168-171         | +½                  | 2 18 6                 |
| 376,400   | 100    | Aug. 2            | 4                  | Do. 4 p.c. Dbs. Red.       | 98-101          | ..                  | 3 19 3                 | 1,019,585 | "      | Oct. 13           | 4                  | Do. 4 p.c. A Db. Stk.            | 138-143         | ..                  | 2 15 11                |
| 473,600   | Stk.   | Aug. 12           | 3½                 | Do. 3½ p.c. Db. Stk.       | 102-105         | ..                  | 3 6 8                  | 1,155,066 | Stk.   | Dec. 15           | 10                 | West Middlesex                   | 290-295         | ..                  | 3 7 9                  |
| 560,000   | 100    | Oct. 1            | 5                  | Met. of Mel- 5 p.c. Db.    | 110-112         | ..                  | 4 9 3                  | 200,000   | "      | "                 | 4½                 | Do. 4½ p.c. Db. Stk.             | 160-163         | +½                  | 2 15 3                 |
| 250,000   | 100    | "                 | 4½                 | bourne 4½ p.c. Db.         | 105-107         | ..                  | 4 4 1                  | 200,000   | "      | Sept. 15          | 3                  | Do. 5 p.c. Db. Stk.              | 102-105         | ..                  | 2 17 2                 |

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## EDITORIAL NOTES.

## A Retrospect of the Year 1898.

THE year that is now running through its last days has been marked by much incident of which historians will take serious account. In many respects it has been a wonderful year for the British Empire. We have a way of referring to the "spacious times" of Queen Elizabeth; but nobody can quietly think over the vast designs and great concerns that have engaged the attention and employed the energies of the English-speaking peoples during the passing year, and fail to perceive that the world of the Tudors was small in comparison with that in which we now live. The hitherto wasted and provisionally occupied parts of the earth have been reduced considerably during the past twelve months, by the extension of British and American conquest and permanent occupation. Savagery, barbarism, and mediævalism have been removed, to make way for Anglo-Saxon civilization, which means peace and fair-play all round. Consequently, the range of employment for British capital and labour has been, and will continue to be, increased. First the steamship and the railway, then the gas-works and the factory—such is the development of modern material civilization. The industry of gas lighting fully sustains its right to a place among the agencies by which enlightenment in every sense is being extended throughout the habitable world.

As regards the financial history of the past year, the story is one of continued reduction in the cost of capital for first-class enterprises. Proof of the decreased interest-earning power of safe money was afforded by the yearly report of the Public Works Loan Board, which showed that the Board had to completely alter the terms of their loans in order to attract borrowers. All loans on security of local rates, including loans on securities guaranteed by local rates, are now placed on the same footing as regards the rates of interest, without any distinction as to the purposes for which the loans are required; and the minimum rate of interest is 2½ per cent. Local Authorities have consequently been able to obtain gas capital in this way at 3 per cent., subject to repayment in forty years. Attempts to procure Municipal loans upon even easier terms in the open market, by the issue of Corporation Stock, were not always successful. Generally speaking, therefore, it comes to this—that the gas capital of Local Authorities stands them in about 4 per cent. for interest and sinking fund. Gas Companies' capital, not being redeemable, costs on the average less than this. It would not be out of the way to take the yield to investors in the ordinary stock of a good Gas Company at 4 per cent., and debenture interest at 3 per cent.; and one-third part of a modern Gas Company's capital may be in the latter form of security. So that, as regards finance, there could be no gain, but rather an immediate loss, in transferring a British gas undertaking, regulated by a modern Act of Parliament, to a Local Authority. This consideration has become one of the controlling factors of the problem of municipalizing gas undertakings. There is no general answer to this question, though a few American publicists have sought one by the *a priori* road. Every case must, according to English practice, be dealt with on its merits; and it is only found expedient to municipalize those undertakings which have not acquired the most modern type of statutory protection.

People with money to invest had a rough time of it in the past year, if they went outside the best securities. Some very big promotions of industrial and commercial concerns were successfully carried out; but a large number failed of their object. The sensational bankruptcy of the "leviathan" promoter of the hour, with the attendant revelations of the venality of the Financial Press and a discreditable traffic in directorships, caused a great scandal. A loud outcry against the joint-stock company system was raised by the Lord Chief Justice, and supported by many public journals and politicians. The newspapers were often full of suggestions for the amendment of the law in this regard; but the difficulties of grappling with the real source of evil—the desire to get rich by means of fortunate speculation in stocks and shares—remains untouched by proposed reforms of mere procedure. The year closes without any apparent rift in the cloud of suspicion engendered in the minds of capitalists, large and small, by the recent disclosures of the tricks of company promoters and their allies. With more money awaiting profitable employment



than has ever been collected before by the world's bankers, there has hardly been a time when it was more difficult to put a new undertaking upon the market in a reasonable manner.

The year's record of the London Gas Companies is of exceptional interest. The Gaslight and Coke Company succeeded in obtaining an Act of Parliament for consolidating and converting their stocks in accordance with a scheme described in our issue for the 6th inst., which is to take effect as from the new year. At the half-yearly meeting of the Company in February, however, the quality of the administration and management was severely criticized by Mr. George Livesey. An official reply by the Board to these strictures was published in our issue for April 12. Meanwhile, an agitation against the increase in the price of gas by the Company at Lady-day had been started among the Metropolitan Local Authorities and gas consumers affected, and culminated in the appointment of a Parliamentary Committee to inquire into the powers of charge of the London Gas Companies. The Committee held one meeting to consider the matters referred to them, and reported that the subject should be taken in hand by a Committee to be appointed at the commencement of the next session. The second general meeting of the Company was not of a very pleasant character. The Company have given notice of a Money and General Powers Bill for the coming session. The South Metropolitan Company have distinguished themselves by making both ends more than meet at the lowest price of gas on record for the Metropolis—2s. 3d. per 1000 cubic feet, which is to be reduced to 2s. 2d. as from the beginning of next year—and by putting into force the Workman Director scheme originally sanctioned by Parliament in 1896. According to this scheme, two Workmen Directors were elected in October by profit-sharing employees of the Company, and duly took their seats on the Board. All the London Gas Companies experienced a great demand for prepayment meters; and the popularization of gas by this agency progressed most satisfactorily.

The new experiences of the Provincial Gas Companies and Corporation Gas Committees have mostly centred in questions of carburetted water-gas supply, labour-saving stoking, and prepayment meter business. Great works extension schemes have taken shape at Glasgow and Edinburgh. The Belfast Corporation have almost come to regard their gas undertaking as very likely to last; and Manchester and Birmingham have had to face some fundamental economic and structural problems. The practice of English gas-owning Corporations in subsidizing their rate fund at the expense of the consumers, has attracted the notice of Parliament, which seems disposed to place a check upon the extension of the practice into other actual and prospective developments of municipal activity. Liverpool and some other places have been troubled over the increase of carbonic oxide in the gas supply, due to the extended manufacture of carburetted water gas; but the region that gets most of the product—the district of the Tottenham and Edmonton Gas Company—has been singularly free from all complaint of this nature. The vexed question of the expediency of gas consumers' discounts has been elucidated by the example of the Norwich station of the British Gaslight Company, where these allowances have been done away with by mutual consent. The gas-making arrangements at Hull have been greatly modified by the removal of the old Kingston works; and the gas supply of Redhill and Reigate has been re-arranged. The Swansea Gas Company have been compelled to put the Borough Funds Act into operation for their own protection. A vexatious and costly nuisance litigation was terminated by the Plymouth and Stonehouse Gas Company purchasing the opposing interest.

Abroad, the Imperial Continental Gas Association passed triumphantly through a long conflict with the anti-English Mayor of Vienna, Dr. Lueger, who sought to drive the Association out of the Austrian capital, and involved the Corporation in a heavy useless expenditure for competing works. The same Association's concession for Amsterdam expired at Michaelmas; and the Municipality entered into possession of the undertaking.

Sundry provincial gas undertakings came into the hands of the Local Authorities by legal process. The Ashford Gas Company passed out of existence in this way; and Driffield, Fylde, Morley, Malvern, Matlock, Yeovil, and other places, similarly received the benefits of municipa-

lization. An important gain in connection with proceedings of this order, begun at Ashford, was erected into a precedent by the example of Yeovil. This was the protection of the interest of the old employees of the Company in the event of transfer, which has been shamefully neglected in past dealings of the kind. Henceforward it is to be hoped that no mean "understanding" between small Gas Company Directors and the ruling spirits of Local Authorities will be permitted to operate to the despoiling of deserving officers and workmen of transferred gas undertakings. Some heavy arbitrations to ascertain the transfer value of gas-works were held; and prices ruled high. A curious point of law in connection with the Malvern Link purchase still awaits adjudication.

The gas legislation of the year does not reveal any very important reforms. There is still a good deal of discrepancy between the rights and privileges of gas suppliers and consumers in different places, as must be expected from the experimental nature of British statutory regulation. In the case of the Tottenham and Edmonton and the Southend Companies, advantage was taken of a Bill being on the stocks to include electric lighting clauses in the measure; but in all instances the utmost the Board of Trade have conceded in this respect is permission for the Gas Company to apply for and carry out a Provisional Order under the Electric Lighting Acts. It has become customary to limit the period of error in consumers' defective meters to the quarter preceding the detection of the mistake; and powers of inspection of consumers' internal fittings are also in general request. The exemption of gas-fittings belonging to the undertakers from the landlord's power of distraining for rent is also becoming general. Several Gas Companies have found it worth while to procure the extension of the main-laying facilities of the Gas-Works Clauses Act of 1847 to cover pipes for conveying oil and tar to or from the works.

Closely allied to the legislation of the year is its litigation. But we are glad to be able to report that, apart from the eternal question of assessment, there has not been much new gas law made this year by Her Majesty's Judges. An important case bearing upon the effect of a big gas-holder upon the amenities of a neighbourhood was that of *Jordeson v. The Sutton, Southcoates, and Drypool Gas Company*. There was some incandescent gas-burner litigation, as usual, but nothing that can be called decisive of any important point of gas law.

The business aspect of the gas industry of the country has been chequered by several conflicting influences. The tendency of gas prices has been downwards. In our General Index for the volume for the first half of the year, there are 27 entries under the heading "Reductions in Price;" and there were only 3 instances of any increased charge. The year began with an open season and a glut of coke and other residuals, which was followed by a sudden rise in the price of gas coals. Many Gas Companies were caught in this way, and had to pay 1s. a ton and more over the last year's contract rates. On the other hand, owing to labour troubles in South Wales, which stopped the supply of smokeless coals, the coke market improved; and most other residuals kept pretty firm, except benzols, which suffered much depreciation. Consequently, for the first time this product came into extensive use for carburetting purposes. Although tar was a drug, there was no revival of the practice of burning it for fuel. The recovery of the cyanogen of gas made no further progress. Coke breeze was largely employed for making light concrete for fire-proof building construction.

The great undercurrent of strength which supported the movement of the British gas industry throughout the year was the universally recognized truth that gas is the only kind of artificial lighting which is showing actual improvement in application. Neither electric lamps nor oil lamps exhibited any noteworthy advance; whereas by the introduction of the Kern burner, the Welsbach system of incandescent gas lighting received a strong impetus. A burner yielding a duty of 30 candles per cubic foot of gas consumed, would have been regarded as chimerical before it was realized. The Kern burner was first exhibited publicly in England last May, at the Niagara Hall, Westminster. A decorative addition to the new incandescent burner was made in the so-called "Jena" gas bulbs, which have proved very effective. While so much has been done to popularize gas consumption, ingenuity has not neglected the manufacture of the commodity. To say nothing of



carburetted water gas, which has become naturalized in this country, labour-saving stoking and carbonizing methods have made substantial progress. Nothing absolutely new has been introduced into gas-works routine; and most of the old manufacturers' troubles still remain more or less in evidence. But yet the march of technical improvement, perhaps more felt than seen, has continued in the forward direction. It was understood towards the close of the year that a determined effort was to be made to place gas-power tramcars upon the London lines.

The London Gas Referees were busy over the introduction of new methods of testing; and on May 31 we were able to publish their revised Instructions. This is the most important order of the kind that has been issued since the Referees began their operations, and is the outcome of many years of investigation and experiment. The subject of gas-testing outside the Metropolitan area has remained quiescent during the year; and nobody has suggested a new standard of light. The standardizing of gas-meter unions has been discussed.

So far as the industry of artificial lighting by means other than gas is concerned, the past year should be described as an acetylene year. An instructive exhibition of acetylene gas-generating apparatus was held during the summer at the Imperial Institute; and if it did not result in anything else, it at least showed that, under certain easy conditions, it is possible to use acetylene for lighting on a considerable scale with safety, and to good effect. The show was in the interest of the Acetylene Illuminating Company, manufacturers of carbide of calcium at Foyers, Scotland, who claim proprietary rights in the manufacture. Many acetylene patents were taken out for generating apparatus and burners; but no real advance was made, beyond the technic of the subject laid down by Professor V. B. Lewes, in the course of Cantor Lectures recently delivered by him, and published in the "JOURNAL." A good deal of factitious excitement was worked up by interested persons over the subject of the flashing-point of petroleum lamp oils; and a Parliamentary Committee reported in favour of raising this point to 100° Fahr., and at the same time preventing the sale of unsafe lamps. No commercial progress was made in the application of the incandescent burner principle to oil-lamps, although experimental success has for some time past been achieved in this regard.

In general science, the year has brought many notable triumphs. Several worthy men of science have in various fields of research justified Sir Archibald Geikie's noble description of their task, as being that of penetrating into the secrets of Nature, pushing back the circumference of darkness that surrounds us, disclosing "ever more and more of the limitless beauty, harmonious order, and imperious law that extend throughout the Universe." In May, Professor Dewar exhibited at the Royal Institution hydrogen liquefied in considerable quantity, and by its aid approached closer than ever before to the realization of the absolute zero of temperature. Professor Ramsay, about the same period, discovered another new gaseous constituent of the atmosphere, belonging to the helium family of elements, which has been called "krypton." Later in the year, yet another stranger—"neon"—was added to this select list. Research in the science of Röntgen rays and their analogues was incessant, and was not fruitless. Success has been registered respecting the application of water gas to the metallurgy of nickel. Advances have been made in the direct utilization of blast-furnace gases as a source of motive power. Arrangements were in preparation for the coal-pit-head generation of electricity in bulk, for distribution over large tracts of manufacturing country; but no scheme of the kind has actually so far obtained parliamentary sanction.

Labour questions, industrial disputes, and conditions of work and wages bulked very largely throughout the year. Trade being generally good, wages tended upwards in most trades. In October, for the first time for many years, the standard rates of wages for London carbonizing labour were raised in recognition of the fact that the wages of general labourers, from which class retort hands are chiefly drawn, have risen considerably of late years. Previously to this, Mr. George Livesey had effected a great amelioration of the terms of employment of the mechanics and yard hands of the South Metropolitan Gas Company, by gratuitously extending the breakfast interval from one-half to three-quarters of an hour; thus making the

mechanics' week 52½ hours of working time. A deplorable interruption of the work of the country was caused by the strike and lock-out of members of the Amalgamated Society of Engineers, which was in full swing when the year began, but which ended in complete defeat of the Trade Union before January was out. Ever since then the leaders of the Amalgamated Society of Engineers have been trying to rally their disheartened forces, and not succeeding very well. Spring had not advanced far before trouble, which had been brooding for some months, became acute in the Monmouthshire and South Wales coalfield. The prime cause of the mischief here was crude Socialism again. The men had no Trade Union; but they wanted to have their employment run on socialistic principles all the same. Their strike lasted right through the summer, and ended in defeat as signal as that of the engineers. Meanwhile, the coal markets were deranged. Coal prices rose nearly everywhere; and one result of the short supply of the best smokeless Welsh steam coal was the revival of the smoke nuisance in London. People then learnt, with disgust, that the comparative cleanliness of the Metropolitan atmosphere had not been due to the use of any improved "smoke-consuming" furnaces by the owners of London factories, but mainly to the facility with which inoffensive steam coal could ordinarily be obtained in this part of the world. At Midsummer, there was talk of a crisis in the coalfields dominated by the Miners' Federation. But the matter quieted down under wise counsels of the men's leaders; and what bids fair to be a lasting settlement was concluded between the parties concerned. It is so far satisfactory to record that all the really important labour questions of the year were disposed of by the principals, and did not provide any "platform" for the disport of outside "conciliators" or intermeddlers for notoriety's sake. The political side of labour questions, indeed, has dwindled very remarkably during the year. The Trade Union Congress at Bristol was a thinner piece of artificiality than ever; and the latest Trade Union programme of legislation which proceeded from it, is paltry and pettifogging in the extreme. The judgment of the Appeal Court in *Lyons and Co. v. Wilkins* strengthened the cause of employers against strike pickets.

Yet the year was marked for ever in the serious history of British industry by the coming into operation on July 1 of the Workmen's Compensation Act, the character and scope of which it is unnecessary to describe. At the time there was very much heart-searching among employers in regard to the manner in which the additional burden imposed upon them by the new law should be provided for. Insurance was attentively considered; but the Associated Offices took so high a view of the novel "risk," that the expected rush by employers for protection by policy did not occur. The fact of gas undertakings being able by statute to insure themselves, disposed many Gas Companies and Gas Committees of Corporations to bear their own risk; and we have no present means of knowing how the selection of methods has gone generally. As regards the workman's interest in the operation of the Act, it is too soon to strike a balance of profit and loss for any kind of employment. The criticism freely offered in some quarters, that the Act would be difficult to work, has not been justified. Where parties have honestly sought to have the law defined, this has been both quickly and cheaply effected under the Rules. Trade Unions have shown a disposition to ignore the Act, and proceed against employers under the Act of 1880, which offers more encouragement to litigation. It has been complained that elderly workmen, and men not strictly able-bodied, will experience greater difficulty in obtaining employment in factories to which the Act applies. On the other hand, the compulsion to put their works in order is more stringent on employers, which should tend to the better protection of workmen. The question of Old Age Pensions for the deserving poor has been much discussed this year; but a Royal Commission reported adversely to all suggested schemes of this nature.

Not many accidents of a serious character have attended the year's operations in gas lighting. During the last few days, a gasholder accident of some sort is reported from New York; but full particulars are lacking. Several nasty acetylene explosions were recorded; and there were disturbing instances of suffocation of members of the public, some of them being undoubted cases of suicide. This is quite a new-fashioned way, in this country, of "shuffling off this mortal coil;" and it is not a pleasant innovation.



A Home Office Committee have been engaged in collecting evidence as to the connection between these fatalities and the sending out of carburetted water gas by British coal-gas companies; but nothing definite has yet come of the investigation. A serious explosion and fire at the Saltley station of the Birmingham Corporation on Nov. 13 caused the death of a workman, and afforded the Assistant Engineer (Mr. Morrison) an opportunity for displaying high personal courage and great presence of mind, which were duly recognized by the Gas Committee. The working of the Accident Fund of the South Metropolitan Gas Company deserves mention in connection with the subject of gas-works casualties.

The various institutions and societies connected with the gas industry of the country did fairly well, on the whole, during the year. An old idea was successfully revived in the formation of a Gas Companies' Protection Association. The Sulphate of Ammonia Committee have worked energetically at the chief end of their existence; offering a prize of 500 guineas for the best essay calculated to commend sulphate to agriculturists. The Institution of Gas Engineers held a meeting, which had a distinct international flavour, in June, under the presidency of Mr. G. E. Stevenson. A reception of members of the Dutch Gas Managers' Association was combined with this meeting, which was well attended. The autumn meeting of the Institution was held in Manchester. The Gas Institute met in Belfast, under the genial presidency of Mr. James Stelfox. Several of the District Gas Managers' Associations thrive and prospered during the year; but others seemed to have become anæmic. All societies of the kind suffer from the apathy of Past-Presidents; but Gas Associations are afflicted with a combination of this kind of "decline" and the inflammatory irruption of outsiders. Those who should attend stay at home; and many of those who do attend would be better away.

Some prominent names appear in our death roll for the year. Mr. John Methven, the inventor of the handiest photometric appliance known to gas manufacturers, and Engineer of the Beckton station of The Gaslight and Coke Company, was regretted by all who knew the man or his work. Mr. Robert Hunter, of Chester, was another representative Gas Manager, in his degree. Mr. Ambrose Warde, of Maidstone, and Mr. R. Wallis, of South Shields, worked well for the gas industry in their day. Of the eminent dead, whose connection with the industry was less direct, there are Sir Henry Bessemer, Dr. John Hopkinson, Lord Playfair, Sir J. N. Douglass, Mr. A. M. Chambers, Colonel Dyer, Col. Sir V. Majendie, Sir Arthur Forwood, and only too many others by whose departure the world is the poorer.

And now our glance over the Old Year must turn again to mark the present and scan the opening future. The gas industry passes prosperously through one year to enter upon another of wider opportunities and possibly sharper trials. Every year that passes seems to bring a larger crop of technical literature for the "JOURNAL" to gather and distribute. Our journalistic task becomes heavier as time goes on; but, by way of compensation, it also grows more varied and interesting. The year 1898, unlike its precursor, ends amid profound industrial peace, the fruits of which should appear in due season.

#### THE "ROBERT HUNTER FUND."

##### SEVENTH LIST OF CONTRIBUTIONS.

The further contributions to this fund are as noticed below; and it will be seen that the amount now almost reaches the gratifying total of £300.

|                                  |            |
|----------------------------------|------------|
| Amount already acknowledged      | £267. 0. 0 |
| Jones, Mr. H. E., Stepney        | 13. 0      |
| Lees, Mr. John, Tonbridge        | 1. 1. 0    |
| Longworth, Mr. W., Guildford     | 2. 2. 0    |
| Woodall, Mr. Corbet, Westminster | 10. 10. 0  |

£283. 16. 0

**The Private Bill Legislation for Next Session.**—Saturday, the 17th inst., was the latest time for depositing in the office of the Clerk of the Parliaments copies of Private or Local Bills which it is proposed to introduce next session. The number handed in was 267, as compared with 249 last year—an increase of 18, a good proportion of which relate to gas and water supply.

## WATER AND SANITARY AFFAIRS.

### The Principal Events of the Year 1898.

AMONG the events prominent in connection with the Metropolitan Water Supply during the year now closing, mention is to be made of the proceedings of the Royal Commission, the interruption of the constant service in the East London district, and the decision of the County Council to introduce a Bill for the purchase of the undertakings of the Water Companies, as also a Bill to construct works by which to bring a supply from Wales. Other features of interest include the passing of a Bill during the past session, authorizing the Southwark and Vauxhall Company to construct additional works, in order to secure an adequate supply of water from the Thames. A Bill emanating from the Staines Reservoirs Joint Committee was also passed, providing for the enlargement of two reservoirs authorized by Parliament in 1896. In respect to the coming session, in addition to the action of the County Council, the eight Metropolitan Water Companies have combined to promote a Bill to provide for intercommunication between the various mains and works, so as to combine the entire supply in case of need—subject, in operation, to the authority of the Local Government Board. The East London Water Company have deposited a Bill in which they seek authority to construct additional works, including two new storage reservoirs. The West Middlesex Company also have a Bill by which they are to be empowered to lay an additional main, and to take a further supply of water from the Thames pending the completion of the works at Staines. The water supply of London is thus receiving attention on all sides. In the meantime, the Royal Commission, constituted in May, 1897, and holding their first meeting in the following November, now stand adjourned until a week next Monday, having had forty-two sittings for the reception of evidence. The terms of reference made to the Commission are grouped under three heads; and it is somewhat singular that the last, which inquires as to the practicability of connecting the different systems of supply, will be the first on which the Commission will furnish a reply—an interim report on the subject being promised in time for legislative action in the coming session, though it happens that the Water Companies have anticipated the Commission by the Intercommunication Bill which they are unitedly promoting. Mr. Chaplin, as President of the Local Government Board, when receiving a deputation from the East-end in September last, declared himself strongly in favour of thus connecting the different systems of supply. But with regard to the transfer of the property of the Water Companies to some public body, by means of purchase, Mr. Chaplin saw great difficulties in the way; the case of London being, as he pointed out, very different from that of other large towns. This question, however, as he ventured to remind the deputation, formed one of the subjects which had been referred to the Royal Commission.

There are many points involved in the inquiry which Viscount Llandaff and his colleagues have been called upon to make; and a mass of evidence has been accumulated which will tax the powers of the Commission to put into shape as the basis of a comprehensive and lucid report. The matter has to be gone into as affecting both the ratepayer and the consumer; and for this purpose the Commission have found it impossible to exclude a consideration of the Welsh scheme. The County Council have been strongly represented before the Commission; every effort being made to show that a supply from the Thames is insufficient for the growing wants of the Metropolis, and will in the end be more costly than a supply taken from so remote a source as the Welsh valleys. As yet the case of the Companies has not been fully heard; but it may be fairly said that the weight of evidence has gone very much against the Welsh scheme. Sir Benjamin Baker and Mr. Deacon have reported in its favour, but in terms which to some extent deprive their report of the authority which would belong to it as a purely engineering pronouncement. Somewhat curiously, there comes against them a witness who is not before the Commission, but who is very much before the public, and who, as the Special Correspondent of "The Times" on this subject, has thoroughly carried with him the judgment of the Editor. The statements produced from this quarter are so precise and clear, that the conclusions that are arrived at appear



to rest upon an actual basis of mathematical and physical truth. The supply from Wales is shown to be untrustworthy, and far more expensive than the ample supply available from the watersheds of the Thames and the Lea. It were to be wished that the articles in "The Times" could be put in as evidence before the Royal Commission. Certainly, whatever report the Commission may present, its acceptance by Parliament and the public will be greatly influenced by the facts and arguments which have appeared in the leading journal, and which in this case has rendered important public service.

The extraordinary deficiency in the rainfall, which affected the water supply of a large portion of England during the past summer, was particularly marked in the neighbourhood of the Metropolis. During a period of little more than sixteen months ending in the middle of September, the rainfall in London was more than 11 inches short of the usual amount. The River Lea was especially affected by the phenomenal drought; and the East London Company suffered serious embarrassment in consequence, especially as they had been thrown back in their storage arrangements by the opposition of the County Council. To avoid the entire exhaustion of their reservoirs, the Company found it necessary, towards the end of August, to interrupt the constant supply, limiting the service to six hours per day, divided into two equal portions. Subsequently, the Company were compelled to reduce the two portions to periods of two hours each. This quantity, which would have been ample under ordinary circumstances (amounting as it did to a daily average of 25 gallons per head) was rendered insufficient and the cause of much hardship, owing to the general absence of house cisterns—a defect for which the Company were in no wise responsible, but for which they did their best to provide a remedy by the distribution of thousands of capacious jars, and by defraying the cost incurred by the Vestries in the conveyance of water in carts to the inhabitants, as also by setting up an extraordinary number of stand-pipes. In order to supplement their resources, the Company obtained an auxiliary supply from the New River Company, subsequently enlarged by connections being made with the West Middlesex and Grand Junction systems. The Kent Company also rendered help by a supply sent through pipes in the Blackwall Tunnel. The most remarkable device of all consisted in the laying of a main in the Tower Subway, to connect the East London system with that of the Southwark and Vauxhall Company, by which a welcome supply of 5 million gallons per day was brought into the East London district. At length the drought abated, and by degrees the East London reservoirs began to fill, with the result that on the 7th of the present month the constant supply was resumed in part of the district, and in the course of a week extended over the whole of it.

So came to an end an extraordinary interruption to a portion of the Metropolitan Water Supply—an interruption occasioned by that which fully merits the term of a phenomenal drought. But the substitution of an intermittent for a constant supply in East London was made the basis of an agitation which served more than one purpose in party tactics. The Progressives in the County Council contended that what they called the "water famine" was due to greed and mismanagement on the part of the East London Company, though at the same time it was argued, with strange inconsistency, that the sources of the supply were failing, and that it was necessary to seek a fresh source, which, of course, was to be found in Wales, and was to be put in operation by the County Council. But as it was not possible to ignore the Metropolitan Water Companies, and it was scarcely practicable to introduce a competing supply, it was felt necessary to obtain possession of their undertakings—to be accomplished, of course, by some scheme of purchase, after the manner of the eight Purchase Bills of 1897. These ideas have resulted in the preparation of three Bills, to be promoted in the coming session—one for the purchase of the undertakings of the eight Water Companies, one for the introduction of the Welsh supply, and a third for the raising of the requisite funds. The preamble of the Purchase Bill is of extraordinary length, and states, *inter alia*, that the capital which the Companies have been authorized to raise since the date of the report of the Commission of 1892, and up to the end of last session, amounts to £6,020,000. The Bill provides that if the Companies, or any of them, shall not arrive at an agreement for a transfer of the undertakings

by a date which is not to be later than Dec. 25, 1899, in the case of the East London Company, Dec. 31, 1899, in the case of the New River and Kent Companies, and March 31, 1900, in respect to the remaining Companies, the undertakings shall become absolutely transferred to and vested in the Council, subject to the provisions of the Act, on terms to be determined by arbitration as provided. The Council are to pay for the transfer of each undertaking such a sum of money as the arbitrators determine to represent its "fair and reasonable value;" and in order to ascertain such sum, the arbitrators are to inquire into and consider all the circumstances of the case, and the contentions of the Council and the Company respectively. But with regard to the Staines Reservoirs Joint Committee, it is specified that such Committee shall be dissolved on March 31, 1900, and their property and powers transferred to the Council, subject to any obligations and liabilities of the Committee. As soon as the Act is passed, the Council are to proceed with all practicable despatch to connect the different systems of supply, except that there is to be no interference with the works of any Company before the date of transfer.

For the management of the water undertaking as possessed by the Council there is to be a Water Committee, on which the Corporation are to be represented. For the outer areas, it is provided that the County Councils or other authorities of such areas may, in the next or next succeeding session of Parliament, introduce any Bill amending the Act so far as relates to certain purposes. Provision is made for the sale or transfer to an extra-Metropolitan authority of the works connected with the water supply of an outlying area. Or there may be a sale of water in bulk for the supply of such an area. Both in the preamble and in the schedule attached to the Bill there is an attempt to show that Parliament has at different times "introduced and confirmed comparative powers of supply in London." The earliest date is 1721, and the latest 1884. Possibly this schedule is intended to furnish materials for a "contention" on the part of the County Council when before the arbitrators, if ever the Council should get so far. That Parliament will adopt such a measure before receiving the report of the Royal Commission, is in the highest degree unlikely. It is pleaded in the preamble that the Water Companies have not refrained from introducing Bills while a Royal Commission is sitting, and are giving notice of others for the coming session, seeking further powers over the Rivers Thames and Lea. To this argument there will, of course, be the rejoinder that the Companies' Bills are necessary for the proper maintenance of the supply—a matter in which the Council happen to be only adversely interested.

The preamble to the Welsh Reservoirs and Works Bill states that the works of the eight London Companies "are inadequate for the prospective requirements of the population within the Metropolitan water area." Hence it is declared expedient to confer powers on the London County Council for the taking of lands, the appropriation of water, and the execution of the works described in the Bill; the estimated amount of capital required being £3,750,000. Four impounding or storage reservoirs are provided for—a fifth being designated a compensation reservoir. The Council are to have power to abstract water from the Rivers Yrfon, Wye, Chwefri, and Towy, and the tributary streams thereof. The compensation water, to be furnished by the Doethie reservoir, amounts to 63,750,000 gallons per day, of which 33,000,000 gallons will flow into the Yrfon. The redemption of capital is to take place within a period not exceeding sixty years; but the Council are not to be bound to commence payments in respect of such redemption until after the expiration of fifteen years from the end of the financial year current on the passing of the Act. The Aqueducts and Works Bill provides for the construction of an aqueduct leading from the Yrfon reservoir to a reservoir at Boreham Wood, in Hertfordshire. From the latter reservoir an aqueduct is to extend to Edgware, terminating at the lands to be appropriated for filter-beds. Another aqueduct is to proceed from Edgware to Hendon. The works are to be completed within fifteen years from the passing of the Act, unless the period is prolonged by Parliament. The capital to be authorized for the purpose of constructing the works is not to exceed £13,250,000, which, of course, is in addition to the cost of the Welsh reservoirs; thus making a



total of £17,000,000. In the Purchase Bill, it is set forth that the expenditure on the present London supply has been £17,204,774. The period named for redemption of capital is sixty years; but nothing is said as to postponing payments in redemption.

An interesting incident in the history of the Provincial Water Supply took place at Plymouth in September last, when the annual "Fyshyng Feaste" of the Corporation of the borough was associated with the completion of the new storage reservoir constructed at Burrator, on the slopes of Dartmoor, a dozen miles from the town. Nearly five years ago Plymouth superseded its troublesome lead by a pipe-line; and now the supply is rendered still further secure by the formation of this splendid reservoir, holding a sufficient store for 130 days. Modern requirements are thus met; and after the lapse of three centuries a vastly increased population takes leave of the primitive provision which sufficed in former times. Highly satisfactory progress is being made with the works by which Birmingham is to have a supply from the valleys of the Elan and the Claerwen, tributaries of the Wye; the distance covered being about 80 miles, and the estimated cost of the works £6,600,000. The enterprise is designed to meet the wants of the city and the surrounding district for the next fifty years. The need of an enlarged supply has been rendered very evident by the straits to which Birmingham was reduced during the recent drought, although even the Welsh rivers were found to fail in some degree in consequence of the deficient rainfall. It will be four years, or nearly as long, before the new supply will be available; but the lesson of the drought will doubtless induce every effort to hasten the completion of the undertaking. Birmingham is said to have been quickened in the inception of its Welsh scheme by an apprehension that London would seek to appropriate the same sources. In like manner there seems now to be a rush for the waters of the Derwent; Leicester, Derby, and Sheffield being all eager in the race. Leicester seeks to include Derby in its plans; while Sheffield is the opponent of both, though not altogether unwilling to treat with Derby. The Corporation of each town has its own Water Bill; and Leicester proposes a Joint Board with Derby—the latter seeking for general power to unite with Corporations and Local Authorities. The Leicester scheme is on an extensive scale, and is intended to bring a supply of 14 million gallons per day from the Upper Derwent, 66 miles off. While Leicester is desirous of carrying Derby, Sheffield proposes a Joint Committee to include the Corporations of Rotherham and Doncaster, to which towns a supply of water would be given in bulk. The mustering of forces over this matter is rather remarkable, and a severe contest in Parliament may be expected. Among provincial undertakings authorized in the past session was one by which the Carlisle Corporation were empowered to obtain water from certain tributaries of the River Gelt, in Cumberland, the works to be completed within ten years. An Act obtained by the Corporation of Rochdale provided for the acquisition by the Corporation of the undertaking of the Todmorden Water-Works Company. The Halifax Corporation were empowered to construct three new reservoirs, the works to be completed in ten years. Powers for the extension of water-works were obtained in several instances, either by separate Acts or by the inclusion of clauses. The Newcastle and Gateshead Water Company were authorized to raise £480,000 of new capital for additional works, including tramroads. Nine Acts were passed providing for the transfer of water undertakings from Companies to Local Authorities. The latest event of the year in respect to the water supply of towns consists in the opening of the new water-works at Newport, in the Isle of Wight. The ceremony of turning on the new supply took place last week, being performed by the Mayoress in the presence of a large assembly. The supply is stated to be of absolute purity, and capable of being rendered sufficient for several towns the size of Newport.

In the autumn of 1897, a disastrous epidemic of typhoid fever prevailed in the town of King's Lynn. Between Sept. 1 and Nov. 30, as many as 453 cases were recorded, and 44 deaths. The Local Government Board report on the subject, by Dr. F. St. George Mivart, appeared early in the present year, showing that the disease was essentially due to the water supply, derived from the Gaywood River—a source which was known to have caused a similar outbreak as far back as 1892, and which was accountable

for the constant presence of enteric fever in the borough since that date. The case is remarkable from the circumstance that the water-works belonged to the Town Council, and though that body made repeated efforts to supersede the polluted supply by one that was pure, they were thwarted in their purpose by persistent opposition of the inhabitants, who preferred to drink unwholesome water rather than incur the risk of an increased rate. This last visitation brought things to a crisis; and the Local Government Board interposed with a Provisional Order enabling the Town Council to introduce a wholesome supply by means of wells sunk in the chalk. It was also in the autumn of 1897 that a serious epidemic of enteric fever occurred in Maidstone, concerning which the Local Government Board caused an inquiry to be instituted by three of their Inspectors acting as Commissioners—the proceedings commencing in January last. The report of the Commissioners was issued in August, and unhesitatingly pronounced that the epidemic was caused by the pollution of the water supplied by the Maidstone Company from their Farleigh sources. Still there were some contributory causes, to which the Commissioners made reference. "Grave sanitary defects" existed in the sewerage and house drainage of the town, and the Medical Officer of Health for the borough had frequently called the attention of the Town Council to the risk which the inhabitants incurred from these insanitary conditions. In fact, the Commissioners expressed their opinion that "many of the typhoid cases in the borough were due to defects of drainage and sewerage, with consequent pollution of the soil underlying the town." A point of general interest has arisen out of this inquiry—the Commissioners mooted the question as to how far the regulations of the Board relating to the duties of Medical Officers of Health and the statutes which regulate the power and obligations of private Water Companies, are sufficient to ensure a reasonable amount of protection to the public health. The legal right of access to a Company's works on the part of the Medical Officer appears to be in doubt, if indeed it can be said to exist at all. The case is ambiguous, and it may be expected that something will be done to remedy the apparent defect. But there is no doubt that in many instances the want of legal power is compensated for by the willingness of the Companies to submit to inspection. Perhaps the case is more critical where the local authorities possess the water supply and are thus their own inspectors.

**Joining Acetylene Gas-Pipes.**—M. Paradies, of Kiel, has devised a method of hermetically joining pipes for the conveyance of acetylene gas. It consists in the application inside the part to be joined of a ring threaded conically, and covered with a thin coat of lead. The pipe is threaded to correspond. When the parts are joined up, the screw-thread enters the lead, on the sides of which it exerts pressure, and forms a perfectly tight joint. Experiments made with a pressure of five atmospheres have, it is stated, given satisfactory results. The mode of applying the system is very simple indeed. When the pipes leave the factory, they can be threaded by any gas-fitter; and all packing is dispensed with.

**Progress in the Motor Car Industry.**—"Industries and Iron" for Nov. 25 was devoted to reviewing the progress of "motor road locomotion." Illustrated descriptions were given of all the motor cars to be seen upon the roads of England and France. As regards the means of propulsion of these machines, it is to be noticed that compressed gas, and air, are completely "out of it" as sources of the motive energy. They are not even mentioned. It is remarked that electrical road-cars have not progressed during the year. "The limit has apparently been reached; and until some entirely new form of accumulator or storage battery is brought to a successful issue," nothing further is likely to be done in this department. The accumulator is the trouble. "Its weight is excessive, its life and durability uncertain, and its potential efficiency evanescent." In the construction of steam road-cars, mainly for heavy work, English builders have eclipsed their Continental rivals and precursors, whose productions are comparatively clumsy, heavy, and complicated. In the construction of vehicles driven by petroleum spirit motors, of which the Daimler was the prototype, English engineers are also credited with having realized many improvements. Gas motors using heavy petroleum oils do not retain their place in public favour. The most successful road-motors are those driven by steam-engines, using oil fuel instead of coal or coke. Unfortunately, the petroleum burners are apt to smell very offensively—a reproach from which the heavy French vans, with their coke fuel, are at least free.



## ESSAYS, COMMENTARIES, AND REVIEWS.

### GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1482.)

THE week between the mid-December account and Christmas Day is usually a very quiet one on the Stock Exchange; and last week for some little time promised to be like its predecessors, especially as the Exchange was to be closed on Saturday. But after the normal holiday appearance had set in for a day or two, a surprise came in the shape of much excited dealing in the American Market, which proved that the old spirit of speculation was only lightly dormant, and was easily awakened. The consequence was that prices had a sharp boom, which, however, soon gave way to a swing of the pendulum in the other direction. Other markets remained quiet; but their general tendency was firm. In the Money Market, the demand for money steadily hardened; and this may be expected to continue up to the end of the year—the demand being sharpest on the closing day. Gas securities were in about the same mood as the majority of the other departments; business being very quiet, but the general tendency firm. Changes in quotation are few; but they are in the right direction. In Gaslights, the volume of transactions was only light; but the price was well maintained, and seemed rather disposed to rise. There was nothing in any of the debenture, preference, or limited issues. Hardly anything was done in South Metropolitan; but the tendency was firm. This characteristic may be emphasized by the ability of the Company to reduce the price of gas; but it does not necessarily follow that the dividend will be increased. Commercially were quite neglected. In the Suburban and Provincial group, Brighton "A" was put up more nearly abreast of the original stock. Among the Continental Companies, Imperial was in favour, and made a good advance. None of the rest presented any noticeable feature. Water was quiet; and movements were irregular. East London was down; and New River, after being put down, was marked up again. Both the Southwark issues made further advances in consequence of the large increase in the rate of dividend.

The daily operations were not of sufficient magnitude and importance to call for detailed notice.

### ELECTRIC LIGHTING IN 1898.

#### A Retrospect.

THROUGH the past year the growth and development of the electrical industries have been noted and discussed week by week in the "JOURNAL;" and we have now to take stock of the whole matter for the year. In what respects do the electrical industries differ at this time from their state a twelvemonth ago? The first fact to be noticed in such a survey is the condition of the electric light itself, which, whether produced by arc or incandescent lamps, remains practically unchanged. Within the last few days, two competent authorities, Messrs. Bernard M. Drake and H. R. J. Burstall, have stated, for the information of the Royal Institute of British Architects, a few data which we shall take as marking the best and latest electric lighting standards. Mr. Burstall asserted that a Board of Trade unit of electricity is enough to keep an 8-candle power lamp alight for about 35 hours. It also means 134-horse power for one hour. It is significant that electric light engineers are still wedded to the 8-candle power lamp as the unit of illumination for domestic purposes, and that the nominal efficiency of these lamps is no more than  $3\frac{1}{2}$  watts per candle. Practically, therefore, having regard to the falling off of illuminating power in use, the average efficiency of all the lamps throughout a house will not be more than 4 watts per candle power, which is the figure that has been taken for this purpose during the last fifteen years or so. The voltage at which incandescent lamps are worked from central lighting stations, has been raised very generally to 200 volts and upwards, which has been to the advantage of the suppliers of current. Inasmuch as everything tending to reduce the cost of carrying on an electric light undertaking eventually cheapens the service, this alteration will probably in the long run benefit the consumers also; but the new lamps are no better in brilliancy or economy than the old, if indeed they are equally good.

The cost of electricity supply from central stations in the United Kingdom is clearly shown by an admirable diagram given as a supplement to Mr. Garcke's valuable "Manual of Electrical Undertakings." In few areas of compulsory supply is the charge now more than 6d. per unit for lighting, though in some places it is as high as 7d. or 8d. There is not much difference between the average charges of local authorities and companies; the character of the district determining the price more than any other factor. Many local authorities contrive to charge low rates, or show a considerable profit, by subsidizing the electric lighting undertaking out of the rates in various ways—refraining from charging full administration and management expenses, and especially omitting to make provision for depreciation. It seems

to be pretty well established, however, that after four or five years' working in a suitable area, a central lighting station should be able to supply consumers for lighting at from 5d. to 6d. per unit, and pay its way at that. The cost of electric lighting privately supplied is considerably less in the case of town establishments of sufficient size and lighting requirements to provide work for a gas-engine and generating plant. In the case of country-house lighting, Mr. Drake puts the average annual cost for 150 lights fixed, at about £37 ros.

Some electricity supply undertakings charge for the service according to different systems based upon the principle of obtaining the highest price for current taken during the hours of heaviest demand. In the United States, the practice of charging for lamps by the hour is still continued. Something has been done in this country to apply the prepayment meter and free fittings system to electricity supplies; but the dearth and unreliability of any possible consumers' meter is against the idea. Very little has been heard during the year of the application of electricity to the purposes of cooking and house heating; but it has been claimed that electric lifts and small-power machines have come into use pretty generally where the current is cheap enough. The Corporation of Edinburgh are bidding for this class of business by offering current for power at 1½d. per unit; but in London the Electric Lighting Companies do not seem to care for it. The London Electric Cab Company, who have lost £6000 on revenue account for the year over the attempt to revive accumulator traction for hackney carriages, found it cheaper to generate their own electricity than to buy it of one of these Companies as a "day load."

During the year, many breakdowns of electric lighting plant and interruptions of the lighting service were chronicled in our pages. These mishaps showed that the largest and best appointed central stations have not grown out of this congenital weakness. Few conduit explosions were recorded; the electrical engineers having apparently succeeded in grappling with this once troublesome difficulty of electricity distribution. They were greatly worried, however—especially in London—with prosecutions for causing another kind of nuisance, in the shape of smoky station chimneys. It was decided by some of the largest Metropolitan Electricity Supply Companies that they must remove their generating stations to a distance. At the same time, proposals were made for an entirely new departure in the electricity supply industry of this country. Schemes were framed for the generation and supply of electricity in bulk over large areas covered by more than one local authority. These involve an important change in the law of electricity supply, necessitating powers of compulsory purchase of land, the grant of way-leaves, and modification of the rights of local authorities. A Joint Committee of the Houses of Lords and Commons considered the questions of principle raised by these proposals, and gave them a general acceptance.

The question of competition in statutory electricity supply was raised during the year in an acute form. The Marylebone and Bermondsey Vestries applied for Electric Lighting Orders, though Companies had powers for supplying the districts. The Board of Trade declined to prevent the question from coming before Parliament; and eventually the Marylebone Order was thrown out, while the Bermondsey Order was sanctioned in Committee. In the case of Marylebone, the Company were actually serving the district, which was not being done in Bermondsey. Owing to a Sessional Order applying to opposed business, the Bermondsey Confirmation Bill did not get through the House of Lords. Several important electric lighting schemes will be dealt with by Parliament next session. Among others, there is one for introducing a competing supply into the City of London.

With regard to the latter question, one of the sensational lawsuits of the year must be mentioned. This was the action for damages brought by Sir Joseph Savory, an ex-Lord Mayor of London, against a weekly periodical called "London," for an alleged libellous reference to his connection while in office with the promotion of the City of London Electric Lighting Company. It was asserted that Sir Joseph Savory, being actually Chairman of the City Commission of Sewers, was interested in the street lighting contracts of this department of the Corporation; and the allegation was found to be true so far as to deprive him of his remedy for the journalistic aspersion of his character.

A great deal of the electrical engineering movement of the year was in respect of power transmission and utilization for traction and factory purposes. Strong and persistent efforts were made to overcome the British objection to the overhead trolley-wire system of tramway working; and an electric railway was opened between the Waterloo terminus of the London and South-Western Railway and the Mansion House. A fine example of the transmission of power by electricity for factory use was afforded at the new works of the Linotype Company, at Manchester. On the other hand, Professor Kennedy has declared that the possibilities of this order of electrical transmission are strictly limited.

It would be impossible, within the limited space at our disposal for this purpose, to describe all the electrical enterprises and projects of the year. As usual, electricians talked of doing a great deal more than they actually achieved, and postponed many of their triumphs to an undated future. Yet they registered a substantial increase in the amount of money employed under their direction, which now, for lighting undertakings only, has nearly



reached the round sum of twelve millions sterling. With this capital, upwards of four million electric lamps are kept going every night; returning nearly three-quarters of a million of annual revenue. It is a respectable amount of business to have been created in a decade; and the workers employed in it are already a strong contingent of the British army of industry which is always on active service against the powers of darkness.

### PHOTOMETRY IN GERMANY.

THE publication of the Annual Report of the Photometric Committee of the German Association of Gas and Water Engineers, calls attention to the advances which are being made in Germany in the photometry of illuminating gas. The Committee have been labouring for some years; and their work now seems likely to be about to produce excellent results. It aims especially at the establishment of a uniform system of gas testing throughout Germany. The many different methods of photometry at present in use render comparisons of the results at different gas-works out of the question; while there is no recognized standard plan of carrying out the tests by which the controlling bodies supervise the gas supplies of the various towns. But the establishment of a uniform system of photometry cannot be hoped for until certain very debatable matters have been finally decided in one sense by a committee of experts such as that referred to, of which Herr Thomas, Herr Drehschmidt, Dr. Krüss, and Dr. Leybold are members.

One matter which has been the subject of a large amount of experimental work on the part of Herr Drehschmidt and Dr. Leybold, is the recognition of a standard gas-burner suitable for the consumption of gas at rates varying from 4 to 6 cubic feet per hour. The Elster standard argand burner, which has been very generally used for gas-testing in Germany, is by no means faultless. It cannot be easily manufactured with its essential parts of the specified dimensions; and at best it affords a very variable duty. It is suggested that the burner-ring should be made of steatite, in place of porcelain; but the Committee wish to continue their work in order to elaborate and recommend for adoption a better standard argand burner. They have already decided to recommend a hollow-top batwing as a standard flat-flame burner.

The manufacture of standard paraffin candles is supervised by Herr Thomas, on behalf of the German Association; and last year 1240 of these candles were disposed of. The Hefner lamp is, however, very commonly used in Germany as the standard of light in gas-testing; and the ultimate displacement of the candle by it appears imminent. The consideration of other suitable standards—such as Mr. Vernon Harcourt's 10-candle lamp, or Mr. Dibdin's 10-candle standard flame—does not appear to form part of the programme of the Committee's future labours. German photometrists, indeed, seem quite ready to accept the Hefner unit without any further discussion or trial, though their English and Dutch colleagues have shown incontestably that it has many faults and that better standards exist. The Hefner lamp threatens to become as much a national fetish in Germany as the Carcel lamp has been for many years in France.

In many other directions, however, the German Committee promise to do good service. They are publishing instructions for testing the illuminating power of gas. We shall give shortly a digest of these instructions, in which the form of the photometer, the pattern of the disc-box, the influence of temperature and atmospheric conditions and of the walls of the room on the tests, and the manipulation of the apparatus, are dealt with in a very thorough manner. We earnestly hope that the work of the Committee will tend to promote uniformity in the methods of testing gas, not only in Germany, but universally. Now that the instructions of the Metropolitan Gas Referees prescribe variation of the rate of consumption of the gas to enable a flame of 16-candle power to be obtained from it, the chief objection urged by Continental photometrists to the adoption of English methods of testing gas—viz., that the gas must be consumed at the rate of 5 cubic feet per hour—is removed. Translated into litres, 5 cubic feet appears to be an arbitrarily chosen and inconvenient figure; and gas engineers accustomed to the metric system of measures saw no reason why they should sacrifice the many advantages of this system in order to bring themselves in line with the English procedure. But now that the plan of varying the rate of consumption has been officially recognized in this country, it is not too much to hope that Continental methods of testing gas will be brought into close touch with the Gas Referees' new system. The substitution of a meter registering litres for one registering cubic feet does not alter the rate of consumption, but only the manner of expressing that rate. The consumption required to give a light of a certain candle power being known, exact comparisons of the quality of gas would be more nearly attainable, though one observer chose to read the rate of consumption in litres and another in cubic feet per hour. What is really needed is that Continental gas experts should accept the London argand burner as the standard burner for testing coalgas, and thus assure us that they burn the gas under test in a manner as favourable to it as that which has been adopted here. What reasonable objections have the German Committee to offer against the adoption of this burner by them?

### THE GAS UNDERTAKINGS RETURNS.

THE returns relating to the gas undertakings of the United Kingdom for the year ending Dec. 31, 1897, in the case of the Companies, and March 25, 1898, for the Local Authorities, were issued last Tuesday, pursuant to an order of the House of Commons dated the 8th of August. The returns for 1896-7, which were ordered on July 29 last year, were not published till the 26th of January in the present year; so that more promptitude has been displayed on the present occasion. But whether the returns appear late or early, they are always welcome, for they supply, as we have before remarked, by far the most trustworthy information of the kind that is to be obtained. Moreover, the value of these papers has lately been considerably enhanced by the inclusion of additional information with respect to raw material, &c. We shall not attempt any analysis of the mass of statistics contained in the returns, but simply indicate, as on previous occasions, the nature of the changes made, and give the principal totals.

The returns furnish particulars in reference to 436 authorized gas undertakings in the hands of Companies—being three more than in the preceding returns. Three of the Companies are in Scotland, and nine in Ireland. The Killamarsh, Sedburgh New, Tuxford, Westbury, and Wimborne Minster Gas Companies appear for the first time in the present returns. The particulars furnished by the first-named Company relate to the period from Nov. 23 to Dec. 31, 1897; those sent by the Tuxford Company merely give the amount of capital and the price authorized, as the Company did not supply any gas in the year for which the returns are made up; and those of the Wimborne Minster Company are for the six months ending Dec. 31, 1897. The Cowes and North Camp Companies drop out. The Local Authorities' returns refer to 212 gas undertakings, as compared with 208 for the year 1896-7, and 203 for the preceding year; the fresh places furnishing particulars being Ambleside, Ashford, Cowes, and New Hunstanton. Of the total, 38 undertakings are in Scotland, and 7 in Ireland. The amount of capital authorized by the 648 gas undertakings is £92,111,252, of which £78,636,518 has been paid up and borrowed. The previous amounts were £89,993,391 and £76,180,724. The receipts on revenue account are £20,207,453, as compared with £19,659,571; and the expenditure is £14,981,527, against £14,528,478. The amount of capital authorized for gas undertakings in the hands of both Companies and Local Authorities includes, in some cases, other purposes. Turning to the statistics of working, the quantity of coal and canal carbonized in the period covered by the returns was 12,616,153 tons; the bulk of gas produced being 132,692,734,427 cubic feet, of which 122,219,678,208 cubic feet were sold. The previous totals were: Coals, 12,296,739 tons; gas made, 127,041,603,412 cubic feet; gas sold, 116,883,313,734 cubic feet. At the dates to which the last returns were made up, there were 25,157 miles of mains in use for the supply of 3,025,376 consumers and 553,803 public lamps. The previous figures were: Miles of mains, 24,457; gas consumers, 2,845,728; public lamps, 540,644. As a rule, the returns are made up to the above-named dates; but where other periods have been taken the fact is indicated.

As in the returns for the year 1896-7, particulars are furnished as to the nature and quantity of other materials than coal used for the manufacture of gas, the supply of water gas, and the maximum proportion of its admixture with coal gas. The extent to which oil, petroleum spirit, carburine, or "other material," is now utilized for the production of gas will be seen from the following list of Companies and Local Authorities who make returns in regard thereto:—

#### Companies.

|                 |                    |                        |
|-----------------|--------------------|------------------------|
| Bath.           | Eton.              | Norwich (British Co.). |
| Bournemouth.    | Exeter.            | Preston.               |
| Brentford.      | Folkestone.        | Richmond.              |
| Bridlington.    | Gaslight and Coke. | Rochester.             |
| Brighton.       | Godalming.         | Snodland.              |
| Bristol.        | Gravesend.         | Southend.              |
| Broadstairs.    | Guildford.         | South Metropolitan.    |
| Bromley.        | Hastings.          | Staines and Egham.     |
| Canterbury.     | Hornsey.           | Swansea.               |
| Colchester.     | Hoylake.           | Taunton.               |
| Commercial.     | Huyton and Roby.   | Tonbridge.             |
| Croydon.        | Isle of Thanet.    | Tottenham.             |
| Crystal Palace. | Lea Bridge.        | Tunbridge Wells.       |
| Derby.          | Liverpool.         | Waltham Abbey.         |
| Dover.          | Longwood.          | Watford.               |
| Dublin.         | Maidstone.         | West Ham.              |
| Dundalk.        | Mitcham.           | Winchester.            |
| Eastbourne.     | Musselburgh.       | Windsor.               |
| Ely.            | Newport (I.W.).    | Yarmouth.              |

#### Local Authorities.

|                 |                |                   |
|-----------------|----------------|-------------------|
| Alloa.          | Darlington.    | Paisley.          |
| Alva.           | Dumfries.      | Perth.            |
| Arrossan.       | Edinburgh.     | Rochdale.         |
| Belfast.        | Falkirk.       | Salford.          |
| Birkenhead.     | Glasgow.       | Smethwick.        |
| Birmingham.     | Greenock.      | Southport.        |
| Blackburn.      | Hereford.      | St. Helens.       |
| Broughty Ferry. | Huddersfield.  | Stockport.        |
| Chorley.        | Ilkeston.      | Stockton-on-Tees. |
| Colne.          | Manchester.    |                   |
| Coventry.       | Middlesbrough. |                   |

With regard to carburetted water gas, the returns show that



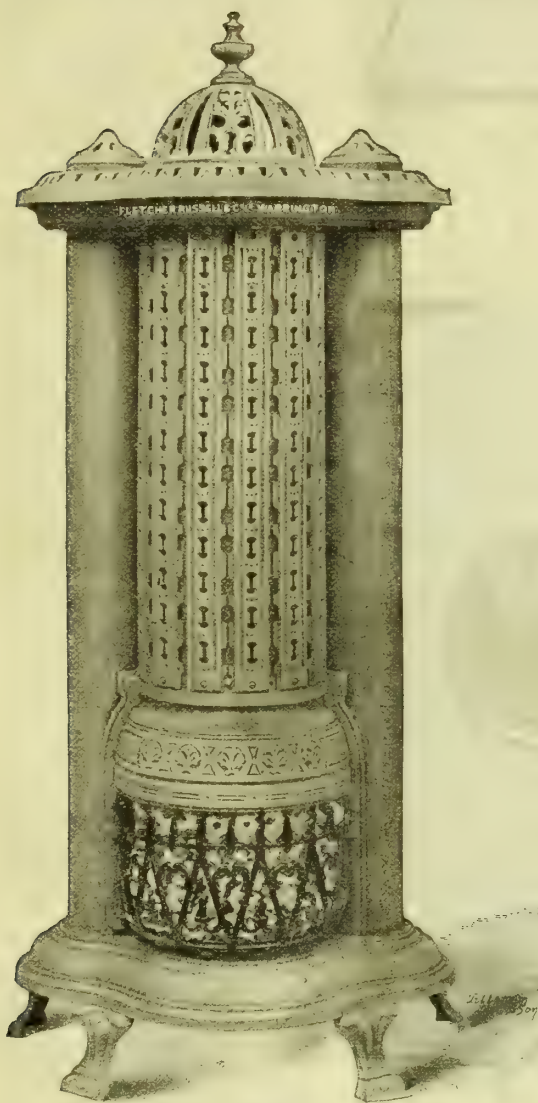
**FLETCHER, RUSSELL, & CO.'S**  
LTD.

# Fireglow Condensing Stoves

**PATENT 1898.**

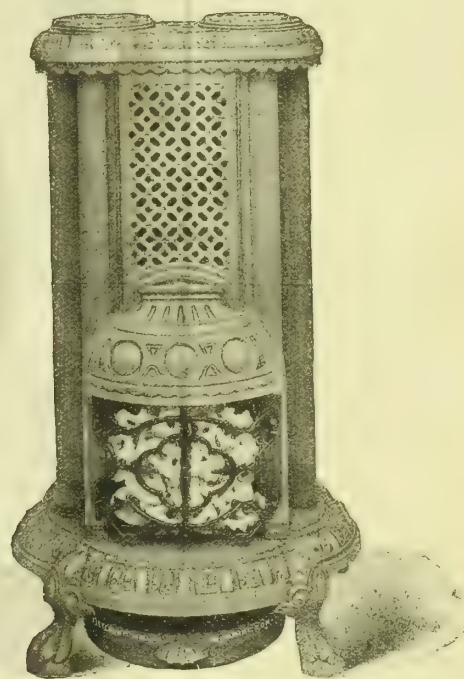
**T**HESE are an entirely new departure in Condensing Stoves, giving all the advantages of a flueless Stove with the brilliant appearance of an open Fire. The "Tower" is the most powerful Condensing Stove ever made. By a patented arrangement, the effective surface is nearly doubled without any enlargement of the Stove itself.

They are, unlike the ones at present on the market, free from the objectionable smells of the products of an Incandescent Fire.



**"TOWER."**

Size over all, 5 ft. 1 in. high, 2 ft. 6 in. wide.  
1 ft. 8 in. across the tubes.  
Total depth back to front of base, 15 in.  
Power sufficient to warm a room or entrance hall, 25 ft. square.



**"TURRET."**

Size: 2 ft. 6 in. high, 13 in. wide across the tubes.  
Total depth back to front of base, 14 in.  
Total width at base, 18 in.  
Power sufficient for an office or hall, 10 to 11 ft. square.

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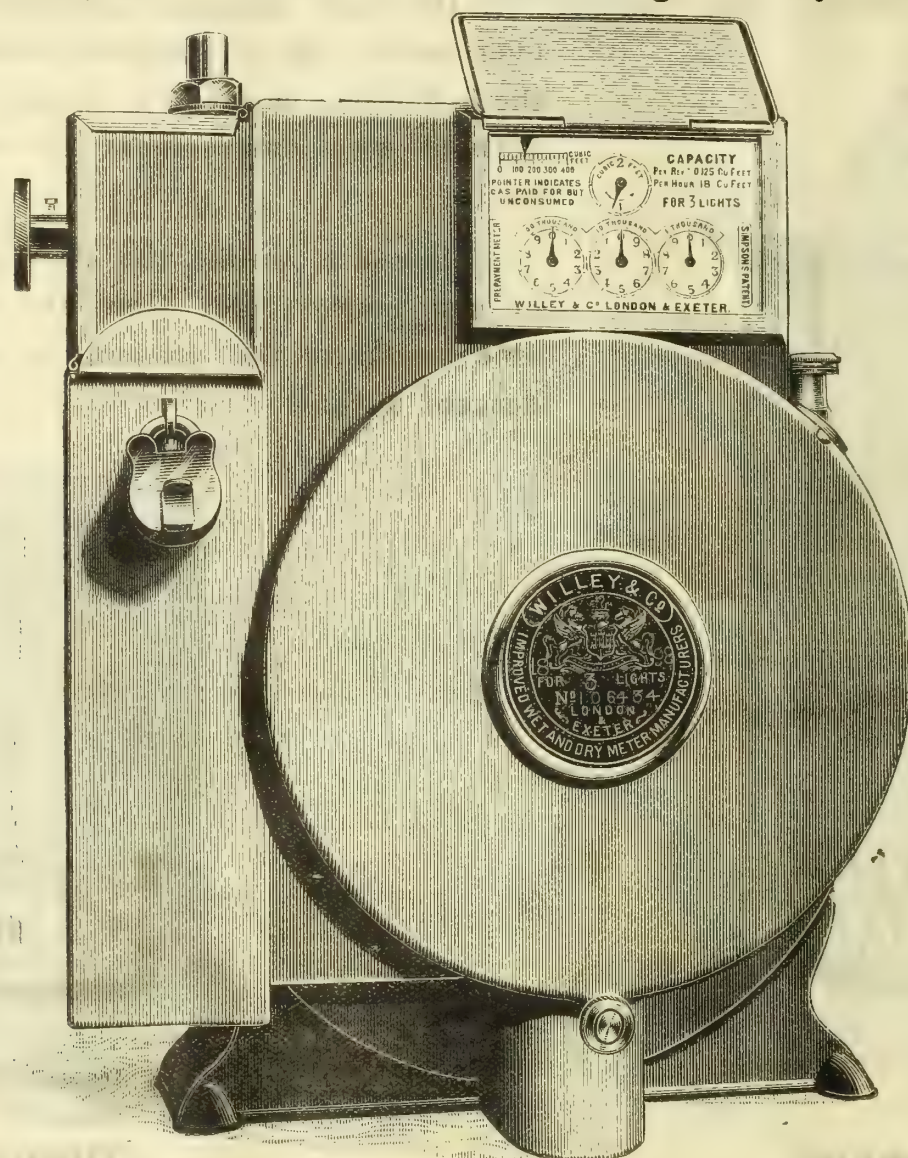
# WILLEY & CO.,

GAS ENGINEERS AND CONTRACTORS,

LONDON, EXETER, CARDIFF, MANCHESTER.

## IMPROVED COIN METERS, WET AND DRY.

Contracts entered into with Gas Companies for installing the System throughout, fitting up Houses, and maintenance of Gas-Fittings for any number of Years.



**Strongest and Simplest Mechanism. Price definitely and instantly adjusted.**

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Thousands of these Meters in use. Continuous supplies to the London and leading Provincial Companies, giving the greatest satisfaction. Gas Engineers may fix them with the confidence that they will give no trouble, Returns for readjustment average less than 1 per thousand.



when they were made up it was supplied by the following Companies and Local Authorities:—

| Companies.         |                        | Local Authorities. |
|--------------------|------------------------|--------------------|
| Bath.              | Liverpool.             | Belfast.           |
| Brentford.         | Lea Bridge.            | Birkenhead.        |
| Brighton.          | Norwich (British Co.). | Birmingham.        |
| Bridlington.       | Preston.               | Blackburn.         |
| Colchester.        | Southend.              | C Coventry.        |
| Commercial.        | Swansea.               | Edinburgh.         |
| Gaslight and Coke. | Swindon (New).         | Manchester.        |
| Hastings.          | Taunton.               | Middlesbrough.     |
| Hornsey.           | Tottenham.             | Southport.         |
| Hoyleake.          | Winchester.            | Stockport.         |
|                    |                        | Stockton-on-Tees.  |

The proportion in which water gas is supplied is generally 25 or 30 per cent.; the maximum being higher and the average lower in some instances. In the case of The Gaslight and Coke Company, it is stated that of the total quantity of gas sent out, 38 per cent. was unmixed with water gas. In the case of one-ninth of the remaining 62 per cent., the maximum proportion of water gas was 35 per cent.; and of the other eight-ninths, 15 per cent. The Commercial Company's make of water gas is about one-fifth. In Liverpool, the maximum is 50 per cent. At Hoyleake, none is supplied in summer. At Hastings, 33½ per cent. is the proportion; but it is exceeded in cases of emergency. At Manchester, it is 19·78 per cent. in make at the Bradford Road works, and 6·35 per cent. of the total make. In Edinburgh, no fixed percentage had been determined upon when the returns were made up.

Comparing the foregoing figures with similar returns for the previous nine years, it will be seen that the capital obligations of the Companies are as follows:—

| Year. | Share and Premium Capital Paid up. | Loan Capital Issued. | Capital Sold under Auction Clauses. | Premiums Realized. |
|-------|------------------------------------|----------------------|-------------------------------------|--------------------|
| 1888. | £31,736,024                        | £6,002,510           | £3,488,588                          | £1,517,902         |
| 1889. | 32,117,202                         | 6,090,546            | 3,641,730                           | 1,563,595          |
| 1890. | 32,884,026                         | 6,568,676            | 4,008,465                           | 1,765,557          |
| 1891. | 34,282,164½                        | 6,862,117            | 4,300,266                           | 1,823,068          |
| 1892. | 35,266,898½                        | 7,149,367            | 4,755,597                           | 2,144,619          |
| 1893. | 36,491,562½                        | 7,544,563            | 5,417,667                           | 2,432,970          |
| 1894. | 37,059,199½                        | 7,739,678            | 5,715,024                           | 2,637,019          |
| 1895. | 37,307,330½                        | 7,888,086            | 5,974,455                           | 2,779,604          |
| 1896. | 41,433,325                         | 8,185,710            | 6,783,468                           | 3,512,818          |
| 1897. | 42,368,976                         | 8,891,218            | 7,248,545                           | 3,405,345          |

Some of the other comparative details in the Companies' returns are—

| Year. | Tons of Coal Carbonized. | Cubic Feet of Gas Made. | Number of Consumers. | Public Lamps Lighted. |
|-------|--------------------------|-------------------------|----------------------|-----------------------|
| 1888. | 6,050,588                | 62,328,542,470          | 1,103,198            | 259,921               |
| 1889. | 6,309,495                | 64,627,914,489          | 1,128,838            | 268,013               |
| 1890. | 6,618,460                | 67,214,546,500          | 1,153,989            | 275,611               |
| 1891. | 7,071,161                | 70,953,927,023          | 1,180,333            | 282,761               |
| 1892. | 7,119,189                | 72,178,028,396          | 1,213,322            | 288,021               |
| 1893. | 6,995,125                | 71,050,955,154          | 1,225,253            | 296,910               |
| 1894. | 7,128,126                | 72,610,842,498          | 1,266,943            | 295,787               |
| 1895. | 7,531,131                | 77,245,618,489          | 1,339,712            | 302,015               |
| 1896. | 7,681,770                | 80,015,323,004          | 1,439,272            | 308,180               |
| 1897. | 7,963,465                | 84,040,175,901          | 1,549,627            | 314,451               |

The somewhat similar figures for the Local Authorities are—

| Year.    | Amount Borrowed, including Annuities (not deducting Repayments). | Receipts.  | Expenditure (exclusive of Amount in the next Column). | Interest, &c., Paid.* | Net Profit after Payment of Items in preceding Column. |
|----------|------------------------------------------------------------------|------------|-------------------------------------------------------|-----------------------|--------------------------------------------------------|
| 1888-89. | £21,333,833                                                      | £4,817,269 | £3,375,197                                            | £977,154              | £479,489                                               |
| 1889-90. | 21,669,789                                                       | 5,067,843  | 3,627,578                                             | 971,755               | 486,483                                                |
| 1890-91. | 21,891,655                                                       | 5,628,212  | 4,231,643                                             | 956,183               | 460,608                                                |
| 1891-92. | 22,476,180                                                       | 5,906,319  | 4,589,109                                             | 965,533               | 397,947                                                |
| 1892-93. | 22,734,556                                                       | 5,983,359  | 4,702,179                                             | 994,517               | 305,040                                                |
| 1893-94. | 23,619,082                                                       | 6,219,460  | 4,866,486                                             | 1,038,462             | 341,470                                                |
| 1894-95. | 24,624,554                                                       | 6,402,046  | 4,681,035                                             | 1,114,014             | 622,366                                                |
| 1895-96. | 25,624,326                                                       | 6,478,191  | 4,881,944                                             | 1,126,170             | 493,886                                                |
| 1896-97. | 26,561,689                                                       | 6,639,342  | 4,989,283                                             | 1,136,789             | 534,390                                                |
| 1897-98. | 27,376,324                                                       | 6,759,883  | 5,058,705                                             | 1,161,171             | 554,014                                                |

\* These figures include: (1) Interest paid on loans; (2) amount paid for annuities; (3) amount of loans repaid; (4) amount paid for redemption of annuities; (5) amount placed to sinking fund.

| Year.    | Tons of Coal Carbonized. | Cubic Feet of Gas Made. | Number of Consumers. | Public Lamps Lighted. |
|----------|--------------------------|-------------------------|----------------------|-----------------------|
| 1888-89. | 3,204,982                | 32,381,124,770          | 1,089,748            | 174,191               |
| 1889-90. | 3,353,516                | 33,453,368,830          | 1,115,267            | 178,867               |
| 1890-91. | 3,623,967                | 35,796,491,799          | 1,143,289            | 184,773               |
| 1891-92. | 4,148,131                | 37,749,332,448          | 1,172,704            | 192,323               |
| 1892-93. | 3,977,201                | 39,303,250,095          | 1,203,574            | 201,484               |
| 1893-94. | 4,025,167                | 39,730,833,247          | 1,226,332            | 210,316               |
| 1894-95. | 4,191,175                | 41,684,838,142          | 1,257,274            | 217,069               |
| 1895-96. | 4,406,315                | 44,176,134,202          | 1,320,059            | 224,873               |
| 1896-97. | 4,614,969                | 47,026,280,408          | 1,406,456            | 232,464               |
| 1897-98. | 4,652,688                | 48,652,558,526          | 1,475,749            | 239,352               |

## THE CONFERENCE OF ITALIAN GAS MANAGERS.

In a previous issue (*ante*, p. 1349), a brief summary was given of the proceedings at the conference of gas managers held in Turin last June, as set forth in a report made by M. Godinet, of Lyons, to the President of the Société Technique du Gaz en France, of which Society he was the representative at the gathering. In addition to the technical business, visits were paid to the gas-works in Turin, as well as to the General Exhibition then being held in the city. The works of the Consumers' Company were first inspected; and the party were much struck with this well-equipped and well-ordered establishment, the chief features of which were pointed out by M. Zina, the Engineer. The next day the works of the Italian Company were visited; M. le baron Lucifero conducting his colleagues over the place, in which some important alterations were being carried out. The two works are alike in many respects; a certain similarity in the type of appliances indicating local fashion. At the same time notable differences are apparent which seem to record the history of the two Companies owning them—formerly competitors, now working in amity. In each establishment upwards of 45,000 tons of coal are carbonized per annum; and the maximum make of gas is about 2½ million cubic feet per day. Both of these works are provided with grate and Radot furnaces, vertical tubular condensers, Beale's exhausters, and Pelouze condensers. In the works of the Consumers' Company, very large coke scrubbers are employed; whereas in those of the Italian Company, "Standard" washer-scrubbers are used. In both establishments the gas is first purified with oxide of iron, then with lime, and finally with oxide again. The second passage through the oxide has been necessitated on account of the gas showing traces of sulphur impurity on leaving the lime boxes. M. Godinet is curious to know the cause of this re-appearance of sulphur compounds in gas which was believed to have been thoroughly purified. He asks whether, as is supposed in Turin, it results from dissociation, in the presence of the lime, of some sulphite which the sesquioxide failed to arrest, or whether there are left in the first purifiers sulphurous deposits which contaminate the gas on its way to the outlet. He thinks the latter is the explanation of a trouble which has also been experienced in France, where gas which has been considered clean at the gasholder inlet has stained acetate of lead paper at the outlet. He records the fact of the re-painting of a gasholder by means of a mechanical painter worked by compressed air—a system which has been described in the "JOURNAL;" and he directs his colleagues' attention to this ingenious process, which he commends for doing rapid and at the same time good work. At the time of the visit, a large three-lift holder, capable of containing about 1½ million cubic feet of gas, was in course of erection, in a metal tank, by the firm of MM. Bonnet, Spazin, et Cie., of Lyons.

M. Godinet found a great difference in the extent of ground-space occupied by the two works, as well as in the disposition of the buildings and plant. The works of the Italian Company have been erected in a part of the city which has been entirely covered; consequently, extensions are costly, and difficult to carry out. The buildings on the works, already old, stand very close together, and the yard space is limited. A quite different state of things obtains with the Consumers' Company. Their works have been erected upon an extensive site, in the midst of a large unoccupied area, affording as much room as can be desired. Fine modern erections, rising from spacious yards, at once attract the attention of the visitor. But there is a drawback even to this admittedly excellent arrangement; and when M. Godinet saw the distance from the coal-store to the retorts, and from these to the coke heap, his thoughts involuntarily turned to the transport and manipulation of material, and he naturally asked himself whether, after all, such spacious yards are really economical.

The Italian Company is, of course, the older undertaking. Formerly the Company supplied the entire city, at prices which M. Godinet says were "very remunerative." As a necessary consequence, the dividends were good. The Company had—or rather thought they had—a concession for ever; but they one day awoke to the fact that an unlimited concession was useless to protect them against the competition sprung upon them by the Consumers' Company, which had been started with a small capital, and with dividends restricted to 10 per cent. As all the shareholders were consumers, the Company did a good business; and by making liberal provision for the development of the plant, and building up a good reserve to meet fresh demands, they were not only able to pay maximum dividends, but also to lower the price of gas. Concessions have been granted for the supply of electricity; and both of the Companies have renewed their contracts with the city authorities. Moreover, as already remarked, they now work harmoniously together; and, thanks to the low price charged and to the efficient management of the business, the quantity of gas sold is very considerable. By the terms of the contract now in force, the charge for gas varies with the price of coal; rising or falling about 2½d. per 1000 cubic feet when the price of coal, delivered in Turin, goes up or down to the extent of 2s. per ton. At the time of M. Godinet's visit, the price charged to the private consumers was 4s. 4d. per 1000 cubic feet. The Municipality were paying



2s. 8½d., and, in addition 30s. per lamp per annum for lighting, extinguishing, and maintenance. In this fine old Italian city, therefore, gas is sold at a cheap rate; and its 350,000 inhabitants burn yearly upwards of 918 million cubic feet. It must be observed, however, that petroleum is very dear in Italy—costing in Turin about 2s. a gallon even when bought in tolerably large quantities. The electric light is fairly extensively used. In the public lighting, 400 arc lamps, of about 10 ampères each, are employed; and among private consumers the two Companies supplying the city—the Piedmontese Company and the Electric Light Company of Northern Italy—have between them installed more than 16,000 incandescent lamps of 16-candle power each, and are putting in others every day. Current is sold at the rate of 9d. per kilowatt-hour; and the existing contracts provide for a reduction in 1905. Electricity is used for the tram service of the city, which M. Godinet describes in his report.

The author was much struck with both the gas and electric appliances shown at the Turin Exhibition. Seeing that it was not international, except for electricity, the number and importance of the exhibits of French firms having branch establishments in Italy was gratifying to the visitor. The principal meter makers in France have branches in Italy; and they produced a good display of instruments for the measurement of gas and electricity, and for testing the former, as well as of fittings, lustres, &c. There were also exhibits of cooking and heating stoves. But M. Godinet thinks the most interesting and most representative show in connection with the gas industry was made by the gas-engine makers. By the side of the gas-engines were some petroleum engines, notwithstanding the high price of this combustible; and likewise some engines worked by producer gas. All the larger gas-engines were horizontal; but among the smaller ones, many were vertical, and very ingeniously constructed. Ignition was in nearly every case by incandescent tubes. M. Godinet says the progress made with gas-engines, as witnessed at the Exhibition, is such as to inspire confidence among gas engineers; and he advises them to become better acquainted with these motors, so that they may be recommended to customers, and in this way keep gas in the place which its economy as a power producer assigns to it.

In the portion of the Exhibition set apart for Italians residing in foreign countries were shown the plans prepared by M. Sospizio, Engineer of the gas-works at Trieste, for the large gas-making establishment which he is reconstructing in that city. M. Godinet had the advantage of a personal explanation of the scheme from its author. The undertaking is in the hands of the Municipality; and although they also supply electricity, they are rebuilding the works in order to increase their productive capacity and at the same time enable them to be carried on more economically. Inclined retorts, 11 ft. 6 in. long, have been adopted; and there are six settings of nine in the house. The coal-stores are like those at Geneva—formed of parallel sheds. The floor slopes from the sides at an angle of 25°, ending in a subterranean channel in the centre of each shed. The coal rolls almost naturally towards the channel, by which it is conveyed to the retorts. But whereas the filling of the stores at Geneva is done by an archimedean screw fixed to the trusses of the roof, at Trieste it is effected by means of two small trucks attached to a metal cable passing over pulleys. These trucks run upon rails laid at a slight incline—not quite an inch in a yard. Being of the same weight, they balance each other when empty; but when one is filled, it descends the incline and pulls up the other. The empty truck comes to a stand under a hopper, from which it is filled automatically at the moment when the full one, reaching the bottom, comes in contact with a suitably-placed buffer, which causes it to turn over and discharge its load. The transport of material is effected in this way without any expenditure of energy; whereas at Geneva the removal of 10 tons of coal per hour by the screw requires about 10-horse power for a run of some 27 yards. M. Sospizio has also designed an arrangement for stacking coke of different sizes. The coke is first of all removed from the retort-house by a De Brouwer conveyor, quenched, and carried on to the breaker and sorter. It is not then thrown on to the heap, and allowed to roll down, in the usual way, which tends to break it, but is carried in skips to the proper place, where it is deposited—not shot. The skips are worked by mechanism fixed to the woodwork of the roof. The arrangement is certainly original; but it appeared to M. Godinet to be costly both in first establishment and in maintenance.

In laying out his new works, M. Sospizio has left space for an installation of plant for producing about 1½ million cubic feet of water gas per day on Messrs. Humphreys and Glasgow's system. M. Godinet makes the cost of the raw material and labour to produce a cubic metre (35·3 cubic feet) of gas rather less than ½d., or 1s. 1½d. per 1000 cubic feet. The area reserved for this plant is less than 1200 square yards; and yet all the appliances have ample space. There will not be any holders; those used for the storage of the coal gas being utilized. M. Godinet expresses the opinion that his colleagues should encourage such attempts as this to establish water-gas manufacture, and endeavour to undertake it where existing contracts permit, and where the consumption is liable to sudden variation—water gas being produced with so much facility. He thinks the adoption of such improvements as this will enable gas managers to keep the price low, and thus assist in retaining gas in the important position it has so long held among the lighting industries of the world.

## THE LECOMTE SYSTEM OF BUNSEN BURNER CONSTRUCTION.

It has been understood for some time past that the design of the bunsen burner has a very great deal to do with the efficiency of an incandescent gas-light. All the latest improvements of the Welsbach light have been concerned with the burner—as witness the Bandsept, Denayrouze, Kern, and (in part) the de Mare models. In the issue of the "JOURNAL" for May 10 last (p. 1057) we described and discussed the Kern burner as representing the most advanced practice in the design of bunsen burners for incandescent lighting; and we referred in the course of the article to Mr. Frank Livesey's demonstration of the importance of a thorough mixing of the air and gas for this purpose. We have now to call attention to the work in this field of M. A. Lecomte, whose "low-pressure economical bunsen burner" was deemed worth a prize of 500 frs. by the Société Technique de l'Industrie du Gaz en France, at this year's meeting. As we have had a previous occasion to remark, it is by no means creditable to English gas engineering and mechanical science that in so many of these cases of modern inventiveness directed to the improvement of gas apparatus, the patentee is a foreigner. Englishmen do not seem to be doing anything at all worth mentioning in this particular regard.

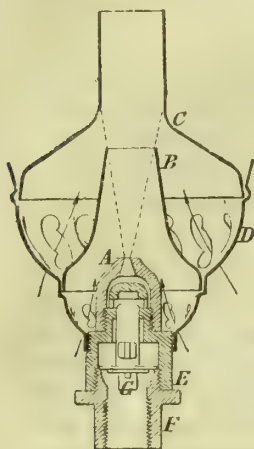
M. Lecomte is associated in the patenting of his burner with M. Loeser, of the firm of Loeser Ainé & Co., of Paris, whose regulator is used with the burner. It is hardly necessary to say how absolutely essential to the successful working of a burner of this kind is a proper regulator; and M. Lecomte regards himself as happy in having found an excellent rheometer, with an aluminium valve, satisfying all the exacting conditions of the successful working of an incandescent burner at the low pressure of 2 centimetres of water. A brief notice of this patent was published in the "JOURNAL" for June 29, 1897 (p. 1503); and a statement of its performance was given as a "Note" on Oct. 5 the same year. In view of the prize award of the Société Technique, and the circumstance of the burner being actually introduced into the English market by Mr. A. Flürschheim, of 20, High Holborn (where specimens are on view), we have deemed it worth a more extended notice. We have inspected Lecomte burners of different sizes, working with incandescent mantles, at this address. At as little as 4-10ths of water pressure, the mantles of burners rated at 2, 3, 4, and 5 cubic feet of gas consumption per hour were kept fairly bright, which, of course, was vastly improved by increasing the pressure to (say) 14-10ths. A separate exhibit of high-intensity burners, driven at a gas pressure of 7 inches by a motive-power meter actuated by a tiny hot-air engine, displays the higher range of efficiency of the Lecomte system; the reputed duty of the mantles being 25-candle power per cubic foot of gas. The patentees claim that their burner will work perfectly, giving full light, at a gas pressure of 10 millimetres, with an economy of about one-third of the gas consumption of an old-pattern Welsbach burner. They claim also to beat the Kern burner on its own ground.

M. Lecomte's account of the principles upon which he has based his improved bunsen is given in the form of an appendix to this year's "Transactions" of the Société Technique. It is an interesting and instructive essay on the bunsen, treated with all the pomp and circumstance of a French scientific memoir, as an appliance for inducing the flow of fluids. The author sets out his problem to be solved in the plainest terms. He recounts how hitherto the usual kinds of gas-burners in use have worked best at a low pressure; while the distribution of gas in the mains has also been kept at the lowest pressure that would suffice to supply the consumers' requirements, governed chiefly by the consideration of the needs of the burners in question. With the introduction of the incandescent gas-burner, however, a different requirement arose, because this burner would not work satisfactorily at less than 25 millimetres pressure. M. Lecomte set about remedying this. First, he investigated the "ejector" part of a common bunsen burner for incandescent lighting, and found it wrong in respect of the phenomenon of the *vena contracta*. Where the outlet-hole is cylindrical, the stream of issuing fluid becomes contracted just outside the orifice; and it is the dimension of this contracted part, not that of the hole, which governs the rate of discharge. The discharge of such an orifice is only 60 per cent. of the apparent capacity of the opening. M. Lecomte accordingly makes his discharging orifice conical, with the object of realizing the phenomenon of the *vena contracta* in the ejector itself, and not outside it. So much for his means of obtaining the utmost possible flow of gas for the pressure that may be available.

The next consideration is the mixing of the air and gas, which is a matter of *entrainment*. The idea is illustrated by the accompanying drawing of the Lecomte burner, in vertical section. This shows the conical ejector A, which is claimed to give the best results when the aperture is bored out at an angle of about 30°. As the gas issues from this orifice, it expands as shown by the dotted lines. In so doing, it draws in air, first underneath the cone B, which has an angle equal to that of the dispersion of the gas. The mixture of gas and air thus made is not perfect. It has not enough air. There is no penetration of the air, as comburant, into the combustible. To effect this is the function of the second cone C. All this is a question of the shape and disposition of the ejector and the two cones. As



the author says: "Here are the two essential principles of the construction of the Lecomte bunsen: First, an ejector having the highest dynamic effect; secondly, a system of cones possessing the peculiarity that the widest cone is always uppermost, and produces, by the penetration of the aspired air into the interior of the gaseous mass, a very intimate mixture of air and gas." The governor is shown at G. E and F are the body of the burner and its connector.



As stated in the patent specification, the desired results "are only obtained on the express condition that the angles of expansion of the gas and of entry of the air be well observed." In practice, the arrangement of cones is covered by a perforated screen D, and lends itself well to the manufacture of a neat burner body. It is stated that by this means the gas draws in and mixes itself with rather more than five times its own volume of air. In order to burn this mixture at the required point, without firing-back, a covering tube with a perforated or wire-gauze cap is slipped over the top of the burner. M. Lecomte declares his object in devising his low-pressure bunsen to have been that of improving the incandescent gas-light sufficiently to enable it to replace everywhere, under all conditions, the old argand

and flat-flame gas-burners. He admits that the mantles of the incandescent gas-lights are nearly perfect things of their kind. The gallery of the burner is fairly good, and is not susceptible of much improvement. There only remained the bunsen; and with this he evidently thinks he has done wonders.

The report of the Committee of the Société Technique, upon which M. Lecomte received his prize, states that for equal pressures his burners proved in their hands neither worse nor better than other well-made incandescent burners, such as those of the Welsbach Company. What the Committee did find, as a speciality of M. Lecomte, was "that his economical low-pressure burner worked normally, starting from a pressure of about 10 millimetres when fitted with its own regulator;" and that it "gave for consumption and intensity the same results as the Welsbach burners No. 2 and No. 3 which only began to work regularly at from 30 to 35 millimetres, and need a still higher pressure to yield their best effect. . . . The bunsen of M. Lecomte realizes, therefore, the advantage of yielding at the lowest gas pressures usual in a town the same results as the best incandescent burners in the market. These results do not sensibly alter under the influence of ordinary changes of pressure." This is the merit recognized by the Société Technique.

With regard to the high-power gas-burners on the Lecomte system, we can but record the fact that by means of a motive-power meter, driven as already mentioned by the agency of a hot-air engine deriving its energy from a flame of gas, a brilliant show of lighting, rivalling the effect of the electric arc, is producible. It is not for us to criticize these high-power gas-lights, nor the means by which they are kept going. There is this to be said for the Lecomte system—that the inventor has a neat arrangement, whereby the delivery of the gas under pressure automatically adjusts itself to the number of the lights in service. There are many devices with the same object in the market; and we welcome them all without awarding preference to any on the faith of an experimental installation. We do not know, by the way, that any factory or workshop has adopted one of these systems on its merits. For street lighting, M. Lecomte has a neat device upon the principle of the "trombe," or water-blast, which can be put into the base of a street-lamp column and arranged to maintain from one to three high-power burners, each giving a light of 300-candle power, for the expenditure of 5 gallons of water per hour. Thus it will be seen that Messrs. Lecomte and Loeser have a very complete equipment of gas-burners and accessories for popularizing the incandescent system of lighting in the house, the factory, and the street. Whatever may be the absolute and comparative merits of these specialities, they at least go to show that the use of gas for lighting purposes under different conditions is being progressively developed, with every regard for consumers' requirements.

It may be a weakness, but we do experience a feeling of regret that this work should be so completely abandoned to foreigners. It would be much more satisfactory if these improvements in gas-burners and their accessories did not all come from France or Germany, where the conditions of the gas industry are not the same as we have in England. At a time when so much is being said concerning the successful rivalry of foreigners with British manufactures, it is very discomposing to find the English market flooded with gas apparatus that owes nothing to English ingenuity. Where is this kind of thing going to end? Is the manufacture of gas specialities about to die out of the land; and is British gas to be burnt always by the aid of French or German fittings and appliances? These are serious questions; and we cannot suggest a satisfactory answer for them. Meanwhile, it is something to be thankful for that the Frenchmen and the Germans are able to show us how to burn gas to the best advantage.

## PERSONAL.

The vacancy on the directorate of the Wakefield Gas Company, caused by the death of Mr. Thomas Howden, has been filled by the election of Mr. G. A. MOORHOUSE, of that city.

Mr. DOUGLAS H. HELPS, who has been associated with his brother at Croydon, has been appointed Engineer and Manager of the Redhill Gas Company, and will commence his duties early next month.

Mr. W. R. DAVEY, who has been in the service of the Redhill Gas Company for sixteen years, during the last five of which he has held the position of Assistant-Manager, has been appointed Manager of the Newbury Corporation Gas-Works, in succession to Mr. R. M. Couper.

The Falkirk Town Council on Tuesday appointed Mr. J. KINCAID, of Peterhead, to be Manager of the Falkirk Corporation Gas-Works, in succession to Mr. P. B. Watson, resigned. Mr. Lighbody, of Renfrew, was also proposed; and Mr. Kincaid's appointment was secured by a majority of two votes. Mr. Kincaid has been Manager of the Peterhead Corporation Gas-Works for about six years, and has done good work there, under somewhat uphill conditions.

## OBITUARY.

The recent death is announced of Mr. J. W. HARRISON, the Secretary of the Yeaton Water Company.

By the death, on the 19th inst., in his 85th year, of Mr. W. HOGG, formerly Manager of the Melrose Gas-Works, one of the few remaining veterans of the gas industry has been removed.

The death occurred last Wednesday, as the result of a fall at the Stoney Lea Hydropathic Establishment at Ilkley, of Mr. J. H. BURN, a gentleman well known in Newcastle and the district, and the proprietor of the West Stanley Colliery.

By the death of Mr. JOHN DUCKWORTH, which took place recently at his residence at Poulton-le-Fylde, after a short illness, the Ramsbottom Gas Company have lost their Chairman. The deceased was one of the best-known gentlemen in the district; and from 1885 till 1894 had a seat upon the Local Board.

**An Assistant Water Commissioner to be Appointed.**—The Royal Commission on Water Supply are desirous of having assistance in dealing with the estimated costs of the Welsh and Thames schemes which have been laid before them; and it is understood that Lieut.-Col. Rathborne, commanding the Royal Engineers at Gibraltar, will be invited to co-operate with them in this special branch of their inquiry.

**Calculations in Hydraulic Engineering.**—We have received from Messrs. Longmans, Green, and Co., Part I. of "Calculations in Hydraulic Engineering," by T. Claxton Fidler, M.Inst.C.E., Professor of Engineering in University College, Dundee. It treats of fluid pressure and the calculation of its effects in engineering structures, and deals with the stability of a pipe-line and a floating gasholder. A fuller notice of the work must be left for a subsequent number.

**Phenol from Acetylene.**—M. Berthelot recently dealt, before the Paris Academy of Sciences, with the subject of the synthesis of phenol from acetylene. The operation is regarded as being of interest on account of the comparatively low temperature (200° C.) at which it can be effected. Acetylene is passed into fuming sulphuric acid, the liquid diluted, and the potassium salt prepared of the acid thus formed. This salt is submitted to a potash fusion at 180° to 220° C. for twenty minutes, and the mass acidified and distilled. Phenol is readily recognizable in the distillate. A repetition of the process on the residue in the retort yields more phenol.

**Water Supply from the Chalk.**—A recent number of the "Builder" opened with a thoughtful article on this subject. The writer asks: "Have we yet found out all that is possible concerning the capability of the chalk as a source of water supply?" He thinks not, and suggests a properly organized survey, extending over the entire kingdom, under Government control, which he believes would be "worth more than a dozen Royal Commissions, and much cheaper." He expresses the opinion that the sooner this survey is established the better, as "we have had enough of municipal political bantering, in which every councillor regards himself as a heaven-born authority on water supply matters, and the faddist reigns supreme."

**Centrifugal Pumps, &c.**—The Technical Publishing Company, Limited, of Manchester, have just brought out a second edition of Mr. C. H. Innes's book on "Centrifugal Pumps, Turbines, and Water Motors; including the Theory and Practice of Hydraulics." The author is lecturer on engineering at the Rutherford College, Newcastle-on-Tyne, and he has adapted his work especially to the requirements of engineers. In the arrangement of his matter, he deals first with general principles, next with pressure engines producing rotary motion, and then with turbines; and he has endeavoured to make the text clear by copious illustrations. The book will be found specially valuable to engineering students preparing for examination in machine construction and mechanical engineering.



TECHNICAL RECORD.

ACETYLENE v. ETHYLENE.

In connection with the series of Cantor lectures on "Acetylene" recently delivered at the Society of Arts by Professor Lewes (*ante*, pp. 1228, 1290, 1351, 1408), the following article, which appeared in the "Engineer" on the 16th inst., will doubtless prove interesting :—

At intervals since the commencement of the year there have appeared in various directions sundry semi-lucid hints that a new carbide has been discovered, which yields on treatment with water a gas of higher illuminating power than acetylene, and which incidentally, therefore, already threatens with extinction a small but promising industry that is only just beginning to "feel its feet." A Mr. Hartenstein, of Bellaire, Ohio, has taken out patents for the manufacture of a carbide from blast-furnace slag, by adding carbon and heating the mixture in an electric furnace in the same fashion as is done in the preparation of calcium carbide. This new material is designated "Carbolite;" and certain persons—whether the inventor or not is still obscure—have claimed that it can be made for \$5 per ton, that it yields ethylene (otherwise known as olefant gas) when immersed in water, and that ethylene is a more powerful illuminant than acetylene. Authoritative and satisfactory details respecting the process have not yet been made public; but seeing that the idea is being largely written about already, and wild speculations are being freely indulged in regarding the prospects of carbolite as a future article of commerce, it may be well to explain the present state of knowledge on the subject of carbides and the gas ethylene.

Calcium carbide is only one of a large number of similar compounds which are now, principally owing to the valuable researches carried out by M. Moissan with the aid of his electric furnace, recognized by chemists. Not all of these behave like the calcium salt on addition of water. Some, such as the carbides of molybdenum, tungsten, and chromium, are not decomposed at ordinary temperatures. Silicon carbide—a analogous product, but with a non-metallic basis—is also unattacked, and forms the highly serviceable abrasive material called "carborundum," which is widely used in the States as a substitute for emery. Aluminium carbide yields pure methane—marsh gas; the carbides of the alkali and alkaline earth metals, of which calcium is one, all evolve pure acetylene; while those of the rare cerium group of metals produce a mixture of methane and acetylene. The carbides of manganese and uranium alone have hitherto been found to give off any ethylene, and they yield methane and free hydrogen at the same time. It therefore appears highly improbable that carbolite, or any other carbide which can conceivably be turned out at a merchantable price, can actually produce the real hydrocarbon ethylene in noteworthy proportion. But assuming, for the sake of argument, that such is nevertheless the case, the position of ethylene *versus* acetylene may be briefly summed up as follows.

Ethylene is a colourless gas, having a faint ethereal odour when it is pure. It contains about 6·5 per cent. less carbon than acetylene, and it should accordingly be a trifle easier to burn, and less liable to emit smoke in an unsuitable burner; but its luminosity is lower than that of its rival. It requires instead of 2·5 3 times its volume of oxygen for perfect combustion; and this extra consumption of the atmosphere would be still further increased in practice owing to the larger amount of gas needed to yield an equivalent quantity of light. According to Lewes, burning ethylene begins to give light at a slightly lower temperature than acetylene; but the temperatures of the other parts of the flame are materially higher, although they are all below those observed in the corresponding positions of the coal-gas flame. In Table I. are exhibited Professor Lewes's results, which he considers to be some 100° or 200° too low, by reason of the cooling action of the wire of the thermo-couple employed in making the determinations :—

TABLE I.—Temperature of Various Gas-Flames.

|                                      | Acetylene.<br>Deg. C. | Ethylene.<br>Deg. C. | Coal Gas.<br>Deg. C. |
|--------------------------------------|-----------------------|----------------------|----------------------|
| Non-luminous zone . . . . .          | 459 ..                | 952 ..               | 1023 ..              |
| Commencement of luminosity . . . . . | 1411 ..               | 1340 ..              | 1658 ..              |
| Near top of luminous zone . . . . .  | 1517 ..               | 1865 ..              | 2117 ..              |

It will be observed that, viewing heat as an objectionable by-product in the evolution of light, acetylene is distinctly the best of the three illuminants; for if it be lawful to average the figures appertaining to each flame, the mean temperature of burning acetylene is roughly, 2100°, that of ethylene 2500°, and that of coal gas 2900°, whereas the illuminating power falls as the temperature rises.

The limits of explosibility in presence of air, as determined by Dr. Clowes, for ethylene and several other gases, are given below in Table II., where the risk evidently increases in the order named from the comparatively safe methane to the relatively dangerous acetylene. The figures quoted for the latter gas are not quite the same as those recorded by other investigators; but, without entering into the question as to which are the most correct, the results of Dr. Clowes have been selected for insertion on the present occasion because they were deduced under identical conditions, and therefore, being absolutely comparable one with

another, afford the best opportunity of contrasting the properties of these several gases.

TABLE II.—Limits and Range of Explosibility.

|                          | Lower Limit,<br>Per Cent. | Upper Limit,<br>Per Cent. | Range,<br>Per Cent. |
|--------------------------|---------------------------|---------------------------|---------------------|
| Methane . . . . .        | 5 ..                      | 13 ..                     | 8                   |
| Ethylene . . . . .       | 4 ..                      | 22 ..                     | 18                  |
| Coal gas . . . . .       | 5 ..                      | 28 ..                     | 23                  |
| Water gas . . . . .      | 9 ..                      | 55 ..                     | 46                  |
| Carbonic oxide . . . . . | 13 ..                     | 75 ..                     | 62                  |
| Hydrogen . . . . .       | 5 ..                      | 72 ..                     | 67                  |
| Acetylene . . . . .      | 3 ..                      | 81 ..                     | 78                  |

An inspection of Table II. shows that, with the exception of carbonic oxide and water gas, which are not at the moment under review, the inferior limits are all very similar, and the main variations are at the upper end of the scale. Now, in ordinary circumstances, a gas explosion is always caused by an escape from a leaky pipe, a water-sealed chandelier that has become dry, or an open cock. All these events naturally lead to a mixture of inflammable gas with a large excess of air; and, assuming a light to be present, explosion takes place when the lower limit is reached. The upper limit of explosibility can only be attained in practice if air enters the pipe—which is very unlikely—or if it is not completely driven out of the generating apparatus before the gas is admitted to the service. The latter contingency may easily occur with any illuminant prepared domestically, either through the use of a badly designed generator, or through carelessness in manipulating it. But the danger can as easily be avoided by selecting the proper kind of apparatus in the first instance, and placing it in the charge of some reasonably intelligent attendant.

The practical relative danger of explosion with acetylene, ethylene, and coal gas, disregarding the extra speed at which the latter will escape because of the larger burners used for consuming it; and its lower specific gravity is therefore as 5 : 4 : 4; the total or absolute danger is as 78 : 18 : 23. The actual illuminating value of ethylene does not seem yet to have been determined; so that these figures cannot be corrected for the size of the orifices, &c. But supposing it to be only slightly below that of acetylene, the advantage of ethylene on the score of safety is manifestly more apparent than real. Moreover, now that it is fully realized that all possible illuminants become explosives if unfairly handled, and that no apparatus can be made "fool-proof," to quote the current elegant phrase, there is as yet not much reason to fear that acetylene will only "blaze the comet of a season."

Returning now to the mysterious substance carbolite. As aluminium carbide when treated with water gives off methane, if this carbide be mixed with an acetylene-yielding carbide—*e.g.*, calcium—in such proportion that the resulting gas consists of equal volumes of acetylene and methane, the said gas will have the same percentage composition as true ethylene, although the latter is entirely absent. This is explained in Table III., which records the chemical formulæ and percentage composition of the three hydrocarbons acetylene, ethylene, and marsh gas. For a gas composed of equal parts by volume of acetylene and marsh gas may be represented by the symbols C<sub>2</sub>H<sub>2</sub> + CH<sub>4</sub>, which correspond to 85·7 per cent. of hydrogen and 14·3 per cent. of carbon—the same arithmetically, though by no means chemically, as 1½ C<sub>2</sub>H<sub>4</sub>. By accident, also, or by the exercise of some ingenuity, a mixture of the carbides of calcium, aluminium, and manganese might be prepared, which should evolve a gas (1) containing a certain proportion of true ethylene, but consisting chiefly of hydrogen, methane, and acetylene, and (2) giving, on ultimate analysis, figures agreeing fairly well, as a whole, with the formula C<sub>2</sub> + H<sub>4</sub>; and if such a gas were submitted to a hasty examination, it might easily be pronounced pure ethylene.

TABLE III.—Percentage Composition of Gases.

|                     | Formula.                         | C per Cent. | H per Cent. |
|---------------------|----------------------------------|-------------|-------------|
| Acetylene . . . . . | C <sub>2</sub> H <sub>2</sub> .. | 92·3 ..     | 7·7         |
| Ethylene . . . . .  | C <sub>2</sub> H <sub>4</sub> .. | 85·7 ..     | 14·3        |
| Methane . . . . .   | CH <sub>4</sub> ..               | 75·0 ..     | 25·0        |

This, then, is probably the real nature of the gaseous product yielded by carbolite—*viz.*, a mixture of acetylene, methane, and hydrogen, with or without a small percentage of ethylene. As an illuminant, it should rank between pure acetylene and the diluted gas, or mixture of acetylene, methane, and water gas, recommended by Professor Lewes; being, in fact, very similar to the latter, but with perhaps less hydrogen and no carbonic oxide. It cannot have a higher illuminating value than acetylene; but, as a slightly weaker light-giving body, it may be found suitable for adoption in some places. As to its hygienic, pecuniary, and therefore industrial value, nothing can be said definitely at present until further information is vouchsafed regarding the obnoxious impurities that may possibly accompany its evolution, the actual yield per pound of carbolite, its practical candle power, and the real price at which it can be put on the market.

NEW ENGLAND WATER-WORKS ASSOCIATION.

The Seventeenth Annual Meeting of the above-named Association was held at Portsmouth (New Haven), under the presidency of Mr. W. KENT, of Narragansett Pier (R.I.). The proceedings have been reported in the "Engineering Record," to which we



are indebted for the following abstracts of two very interesting papers presented on the occasion.

#### TUBE-WELL EXPERIMENTS AT LOWELL (MASS.).

Mr. G. Bowers, the City Engineer of Lowell, described the results obtained with the third set of tube-wells sunk for the water-works of the city. The plant is located on a strip of land owned by the city. A line of wells was laid out and driven about 34 feet south of the south line of the Boulevard and parallel to it, being about 500 feet from the river. Sixty wells were driven on this line; those on either end yielding so small an amount of water that the line was not extended. Twenty-six of these wells were connected temporarily, and pumped four days; yielding 570 gallons of water per minute. During this test the ground water was lowered 12 feet; and later 29 of the whole number were pulled up—the yield being insufficient to warrant their being retained in the plant.

Another line of 66 wells was then driven parallel to the first, and 280 feet nearer to the river. These were connected and tested in groups of 20 each; the average yield per well, when pumped in this manner, being 25 gallons per minute. Samples of water collected from these wells and analyzed showed the presence of free ammonia and iron, in consequence of which they were abandoned and the pipes pulled up. A line of 22 wells was next driven at right angles to those connecting with the line first driven. When these were tested, all but five proved good.

The next wells were laid out and driven in a line parallel with the first two lines described, and 170 feet south of the one first driven. In this line are 122 wells, which have been tested for quantity, in groups of from 15 to 20 wells each. When the water here was analyzed, each supply was found to be of excellent quality. The plant contains 169 2½-inch wells, which vary in depth from 27 to 40 feet. They are driven wells, and a very large point was employed to protect the screens in driving. The screens used here varied in length to correspond with the depth of the water-bearing stratum at each well. This lies about 25 feet below the surface, and varies in depth from 5 to 15 feet. The earth above this stratum is composed of very fine sand and river silt, which is almost impervious to water. Between this bed of water-bearing sand and bed rock is a quicksand, varying in depth from 30 to 40 feet, in which no water is met with even at the surface of the rock where it is generally found. The wells are connected by flanged suction-pipes of the following sizes: 20-inch, 13 feet; 14-inch, 1152 feet; 12-inch, 326 feet; 10-inch, 170 feet; 8-inch, 130 feet; 6-inch, 265 feet—total 2056 feet. On every length of the suction-pipe is cast a 2½-inch branch connection, at an angle of 45° to the main pipe. This causes all the pipe to be classed under the head of "specials." This is far better than the custom of connecting one or two lengths of pipe with a short branch special, as it greatly reduces the number of joints—an important item in work of this kind.

The connection of the suction-pipe with the well is made as follows: Into the branch is screwed a piece of 2½-inch pipe, to which a gate of the same size is attached; next is placed a piece of lead pipe about 3 feet long with a flanged joint nearest the well; and last, a piece of 2½-inch pipe of the right length to make the connection with the curved T joint at the well. This is a very easy way of connecting the wells, as the lead pipe may be used to correct any small error in line or grade—a difficult undertaking with iron pipe. A lead pipe should never be used for a water supply until it is known that the water will have no effect upon it; and as the service-pipes in Lowell are lead, this was the first problem to solve.

The suction-mains are connected with a large horizontal air-receiver 11 feet long and 6 feet in diameter; and each pump is connected independently with the receiver. The suction-mains are laid about 3 feet below the surface of the ground on a pile foundation, on a true grade declining from the pumps. Great care was taken by the contractors in making the suction-mains, branches, and all connections air-tight. Every pipe and special was tested for air before it was laid, and many of them which had passed the water test were found defective under the air test. Of the first shipment of pipes, more than half were found by the air test to be defective, and were returned to the foundry. Most of the small specials found in stock were defective also; and the contractors were obliged to have extra heavy ones made to meet the test. All the testing for air was done in the field, by connecting the piece to be tested with a pump, and forcing air into it while submerged in a tank of water. That this was a wise precaution has been well proved, as this plant has been very free from air.

The air receiver is placed in the pump pit, which is 26 ft. by 28 ft., and with it are connected two 10 in. by 18 in. by 10 in. Blake pumps, each having a capacity of 3 million gallons per day. As the pumps deliver the water into a conduit only 4 feet above the plungers, their work is very light. Over this pit is erected a temporary building; and when this is replaced by a permanent one, and permanent pumps are put in, Mr. Bowers sees no reason why this plant should not be run by electricity, generated at the central pumping-station, as economically as by a separate steam plant.

The contract for this plant was similar to that for the others; the contractors agreeing to furnish a plant capable of providing a stated amount of water per day during a year's test for a given price per million gallons, and, in addition to this, to be paid for all the water delivered which was pumped during the

year. On April 30, Mr. Bowers's certificate was sent to the Water Board, stating that the contract was completed, and that the contractors were entitled to the full payment for 3 million gallons, also a supplementary contract for 1½ million gallons; making 4½ million gallons in all. This plant has never been pumped to its limit; the amount of water the contractors were allowed to pump each day being fixed by the Superintendent of the Water-Works.

The City of Lowell has now an abundant supply of water of excellent quality. The first plant was accepted and paid for as a 2½ million gallon plant in September, 1893; and it has continued to supply this quantity, when wanted, ever since. The second plant was accepted in April, 1896, as a 3 million gallon plant. During its year's trial, it yielded, on an average, 3,109,186 gallons per day. The third, just described, is called a 4½ million gallon plant, though it has yielded 5 million gallons, and is capable of doing so when necessary. This makes a total of 10 million gallons per day when running in a normal condition. This amount could, of course, be increased very much in case of emergency. The average quantity of water used by the city for the year 1897 was 6,594,364 gallons per day; while the average for the month of January (this being the month of greatest consumption) was 7,422,483 gallons daily—showing that, for the present at least, there is an ample surplus. The quality of the water has from the first been excellent; and now that the quantity is assured, Mr. Bowers is entirely satisfied with the result of tube-well experiments.

#### WATER-DISTRIBUTING SYSTEMS.

Mr. W. R. Hill, Chief Engineer and Superintendent of the Syracuse Water-Works, presented a paper on some things that should be done in constructing a distributing system of water-mains. In order to reduce repairs to a minimum, he said, the plans and specifications should be drawn by competent engineers, the most perfect fittings should be adopted, material should be inspected carefully, and none but reliable workmen should be employed.

In many municipalities, but little attention is paid to the inspection of the materials. It is important that the cast-iron pipe should be scrutinized during every stage of its manufacture, both as to the quality of the metal and the workmanship. Without a rigid inspection, the employees at the foundry will become careless, and cause a poor material to be put on the market, even though it is the desire of the manufacturer to furnish none but the best possible. This is true not only in relation to the manufacture of pipes, but to all the materials and fixtures used. Special attention should be given to the form of the lead groove in the hub of the pipe. It should be of such a shape that it will permit the lead to be easily driven and gradually expanded.

The pipe should be laid in a straight line, and on a grade without any abrupt angles, in order to ensure a uniform space in the joint for the lead. The pipes should also be in lines located a uniform distance from the centre of the streets, so that they can be easily found. No joints should be run or caulked until the pipe is placed in line in the trench. It might be a little cheaper to join three or four lengths of pipe together before they are lowered in the trench; but there is a liability of injuring the joint. No short pieces of pipe without a proper spigot should be used at any end, as the pressure will tend to open the joint. Bends should be made by using special castings, and not short pieces of straight pipe. There should be a block of masonry built at the back of all bends and hydrants, as well as against the ends of all lines of pipe 8 inches or more in diameter. After the pipe is laid, it should be subjected to a pressure test of at least 100 lbs. per square inch more than can be obtained from the ordinary pressure under which the plant is to operate. The pipe and joints should be carefully examined while they are under pressure; and if any defects are found, they should be corrected before the trench is filled. A section of pipe should be very slowly filled; otherwise it would be subject to a severe shock by the surging of the water. Hydrants or other appliances should be open for the escape of the air, or the pressure might burst the pipe.

All corporation and kerb cocks should be made subject to inspection during all phases and processes of their manufacture. They should be made of a mixture of metal that will ensure a strong and tough casting. A good casting for this purpose can be made of 88 parts of refined copper, 6 parts of tin, 3 parts of lead, and 3 parts of zinc. If there is alkali or salt in the soil where the cocks are to be used, the zinc should be omitted, as the alkali and salt will corrode and destroy it. The castings should not be allowed to cool in the sand. From 15 to 20 minutes after they have been poured, depending upon the heat of the metal when poured, they should be placed and allowed to cool in water before the sand is removed. This operation anneals the metal. The cocks should be made strong in all their parts, with little regard to the saving of an ounce or so of metal. The plugs should be lubricated by plumbago and Albany grease or vaseline. Beeswax and tallow should not be used, as it will get hard, and make it difficult to open or close the valve. The finished cocks should be tested by hydraulic pressure of not less than 200 lbs. per square inch; and while they are under pressure, the valve should be opened and closed, and examined to see if there are any defects.

Service-pipes should be laid in straight lines at right angles



to the axis of the street, so that at a time of a leak the location of the corporation cock can be easily determined from the position of the kerb cock. This, together with the fact that the main is laid at a fixed distance from the centre of the street, will enable the repair to be made with the least possible disturbance to the pavement.

If the service-pipe is of lead, all the solder joints between the main and the kerb should be made in the shop, as better work can be done there than in the trench. To one end of the pipe the tail-piece of the corporation cock is soldered, while to the other end the kerb cock and a piece of pipe about a foot long are attached. The pipe is then coiled up and taken to the trench where it is to be used. The tail-piece is attached to the corporation cock, and the service is complete to a point a foot beyond the kerb cock, where the joint connecting with the service to the building is made. None but the best solder for the purpose should be used. The service-pipe between the main and the kerb should be made of one piece, and no unnecessary joints should be permitted. All short pieces of lead pipe can be melted up and used for caulking joints in cast-iron pipe.

A service-pipe should not be laid in the same trench as, or close to, a sewer. It would be hard to discover a leak should one occur in such a service, as the water would not appear on the surface of the ground, but would find its way to the sewer. Where a sewer or other trench is excavated crossing under a lead service-pipe, the pipe should be properly supported, as when the trench settles it would carry the pipe with it, and would be apt to cause a leak at the nearest joint.

Fire hydrants should not be used to fill sprinkling-carts with water, unless they are provided with a special valve and nozzle for the purpose. Such a valve and nozzle can be made in the dome or cap of the hydrant. During the season when sprinkling is done, the drip is closed, and the main valve in the hydrant slightly opened, so that there is a constant supply of water in the barrel of the hydrant. The men who sprinkle cannot interfere with the main valve or nozzles, as their wrench will not fit them. To use these hydrants for fire purposes, the firemen first close the main valve with three turns of the valve-rod. They cannot make a mistake and take off the upper nozzle, as this requires a smaller wrench. No one but a fireman or an employee of the water department should be permitted to have a wrench which will open the main valve. These special hydrants should be placed at points convenient for the purpose of sprinkling. In Syracuse, there are 200 that have been in use two years, and have been very satisfactory, both to the Water and Fire Departments. A frequent cause of trouble with hydrants arises because they are not properly drained to a sewer. If this connection were made with a lead or wrought-iron pipe, there should be no liability of the hydrant becoming frozen.

The establishment of a system of water-works with the best material and workmanship will result not only in reducing the cost of repairs to the plant and to the pavements, but will effect a saving in the cost of pumping water that would be lost in leaks, and this might be considerable.

In conclusion, Mr. Hill said it was to the credit of American manufacturers that they had kept their products up to the present standard. If poor goods had been used, it was in a great measure the fault of the purchasers, who had accepted the lowest proposal for furnishing them, without any inspection of the metal, weight, or workmanship, and had rejected the proposals of parties who had given to their product a life's study, and had struggled in competition with others who furnished fittings of light weight, poor workmanship, and of a metal composed of a mixture of scraps.

**The Hampton Reservoir Rating Case.**—At the meeting of the Hampton District Council on the 13th inst., the Clerk (Mr. F. Addenbrooke Kent) formally presented the judgment of the Court of Appeal in the above case (*ante*, p. 1362); and it was resolved that a meeting of the whole Council in Committee should be called to consider the question of carrying the matter to the House of Lords.

**Completion of New Water-Gas Plant at Liverpool.**—About a fortnight since, the second installation of water-gas plant for the Liverpool United Gaslight Company was completed by Messrs. Humphreys and Glasgow, and was partly put into operation. The new plant has been erected at the Linacre station, and consists of six sections, with a total daily manufacturing power of about 4½ million cubic feet. This is two sections larger than the plant the same firm laid down at the Garston station, which is capable of producing 3½ millions. Therefore the two plants are equal to an output of 8 millions daily.

**Lighting and Water Affairs at Wolverhampton.**—The Wolverhampton Corporation are promoting a Bill, in which, *inter alia*, further provision is made in regard to their electric lighting and water undertakings. It is intended also to take power to apply electricity to the trams, and to supply it to companies if desired, as well as to wire houses and hire the fittings to the occupiers. A public meeting to consider these proposals was held on Monday last week; and in the course of the proceedings, the question of purchasing the Gas Company's works again cropped up. An inquiry on the subject was made, to which the Town Clerk (Mr. H. Brevitt) replied that negotiations were commenced some time ago, with a view of acquiring the undertaking, but terms could not be arranged; and he was sure it would not be to the interest of the rate-payers to take powers to secure it compulsorily. The terms mentioned by the Company were not such as the Corporation could accept; but it was not too late to reconsider them. The subject was not followed up; and, after some discussion, the Bill was approved.

## REGISTER OF PATENTS.

**Incandescent Bodies for Illuminating Purposes.**—De Manin, G. L. A., of Cornwall Gardens, W. No. 30,112; Dec. 20, 1897.

The patentee proposes to impregnate the mantle (made of any suitable fabric) with an aqueous or alcoholic solution or thin paste of a mixture of a salt of lime and a salt of magnesia, dissolved in hydrochloric or nitric acid, or other suitable solvent. A salt of aluminium, or a silicate of calcium or magnesia or meerschaum, calcined oyster shells, may be added. A small percentage of bichromate of potash, nitrate of cobalt, uranium, strontium, or similar colouring salt, may be added to colour the light.

The following proportions are named as giving "excellent results": (1) 7 drachms chloride of calcium, 7 drachms chloride of magnesium, 1 grain tungstic acid, 1 grain nitrate of aluminium, in three ounces of water. (2) 7 drachms chloride of magnesium, 7 drachms nitrate of calcium, 1 grain tungstic acid, 1 grain nitrate or chloride of aluminium, in three ounces of water. (3) 7 drachms acetate of calcium, 7 drachms acetate of magnesium, 1 grain tungstic acid, 1 grain nitrate or chloride of aluminium or silicate of lime, in three ounces of water.

**Burners for Incandescent Gas-Lights.**—Petereit, A. H., of New York. No. 5026; March 1, 1898.

This is a burner so arranged that all the parts can be readily assembled—being formed of integral pieces of metal, and in which the burner proper is provided with means for regulating simultaneously the supply of gas and air, so that a uniform proportion of the gas and air mixture is supplied to the incandescent mantle for various gas pressures. The invention further consists of a peculiar construction of the gallery for supporting the chimney and cup; of a novel construction of the burner top, which also serves for holding the mantle-supporting rod; of a special construction of chimney and shade-supporting uprights; and, lastly, of some construction details which are not describable apart from the specification drawings.

**Automatic Gas-Lighting Appliance.**—Breslauer, E., of Leipzig, Germany. No. 16,027; July 22, 1898.

This invention relates to lighting appliances for gas-burners in which the gas impinges upon platinum black or the like, and the heat evolved from which renders a platinum wire sufficiently incandescent to ignite the gas. In order to avoid the disadvantages found, in practice, to exist in many forms of this kind of appliance now on the market, the patentee proposes to employ, instead of fine platinum wires, sheet platinum of suitable thickness—thin enough to lie closely on to the igniting block and to render possible an effective surface-contact. By means of such surface-contact, "a lasting effect of the igniting block is made far more certain than was the case with point-to-point contacts hitherto used."

**Regulating the Pressure of, and Distributing Gas.**—Lecomte, A., and Loeser, I., of Paris. No. 16,672; July 30, 1898. Date claimed under International Convention, July 11, 1898.

The patentees claim: (1) An automatic gas regulator and distributor (more especially applicable to compressors employed for increasing the pressure of the gas), constituted in principle by two compartments, one of which is in communication with the gas-inlet and with the pipe conducting the gas to the compressor, the other receiving the gas compressed by this latter, and communicating directly with the distributing pipe. This second compartment, which is of variable capacity, consists either of a dome or bell, a flexible membrane, a bellows, or other equivalent device, and is capable of communicating with the first compartment when the pressure rises above any predetermined limit, in order to enable the gas to pass back; and also when it falls below a certain limit, which is determined by the pressure required for raising the moveable part, for the purpose of permitting of the direct passage of the gas. (2) An automatic distributor-regulator, in which communication between the two compartments is established by means of a single valve, submitted, on the one hand, to the action of a spring (the tension of which is equal to the pressure at which it is intended that the gas shall be distributed), and, on the other hand, capable of opening under the action of the weight of the dome or bell which forms the second compartment when the pressure falls below a certain limit in this latter. (3) An automatic distributor-regulator in which communication between the two compartments is established by means of two valves, one of which is submitted to the action of a spring (the tension of which is equal to the pressure at which the gas is intended to be distributed), while the other valve opens under the action of the weight of the dome or bell which constitutes the second compartment when the pressure has fallen below a certain limit.

**Producing Acetylene Gas.**—Gehlert, F., of Basle, Switzerland. No. 17,079; Aug. 8, 1898.

The apparatus which forms the object of the present invention is more particularly intended to remove the drawback attending the use of many acetylene plants—"the constant strong smell of this gas." It claims to attain this by means of an arrangement of a removable filling and charging apparatus, which allows of the carbide container being only brought into contact with the water when the gas-developing apparatus is hermetically closed; and it also enables the washing apparatus connected with the gas-producer to effect an absolutely clean and thorough removal of the waste carbide or carbide milk, so that even when the gas-developer is subsequently opened no smell of gas becomes apparent.

**Automatic Gas-Igniter.**—Stendebach, C. F. P., of Leipzig, Germany. No. 17,700; Aug. 16, 1898.

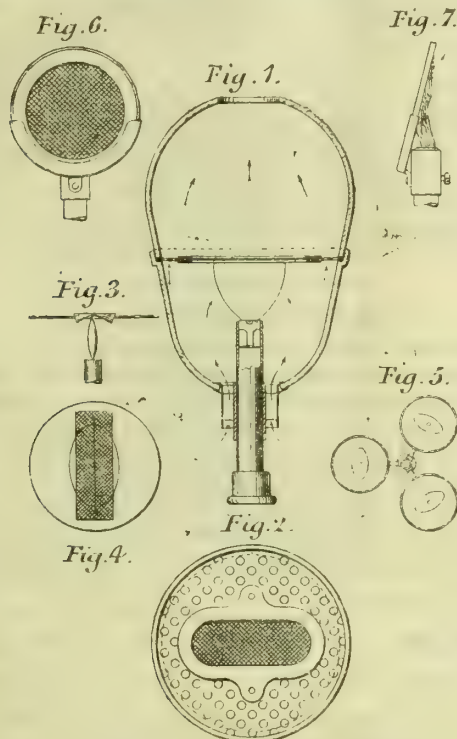
This automatic gas-igniter has for its distinguishing feature that its action is regulated by means of a piston-slide, which, when set in motion, is under the influence of external pressure, and when out of action is under the influence of its own gravity. The action of the external pressure on the regulating piston-slide is effected in such a manner that it is brought into co-operation with an expansive body, so that the increase in the volume of such body resulting from the heating of it by means of the igniting flame causes the regulating piston-slide to be raised, so that a subordinate channel is opened.



**Incandescent Gas-Lamps.**—Trobach, K., and Schultze, K., of Berlin. No. 17,885; Aug. 19, 1898.

This "gas incandescence lamp" consists of a burner with channels or bores of capillary width, combined with an incandescence body having the shape of a disc or band, and with a "bipartite bulb," resembling preferably the bulb of an electric incandescence lamp, and being about the same size. The bipartite form of the bulb is an important point of the invention; and the disc or band-like incandescence body is located in about the middle of it, but in such a manner that it may be adjusted with regard to the blue or non-luminous flame of the burner.

The flame is produced, not by a mixture of gas and air, but solely by gas, which is divided into as many very thin currents as there are capillary channels or bores in the burner. The gas mixes with the air only outside the burner, or at the top of it; and owing to the fine distribution of the gas, it comes into contact with so great a quantity of oxygen that there arises a blue or non-luminous flame of very great heat—this being also due to the low rate of speed at which the gas issues from the capillary channels of the burner, through being throttled in it, and thus each of the small currents has ample time to mix perfectly with the surrounding air.



The patentees say that they have found, by an extended series of experiments, that by far the best effect is obtained by letting the flame act upon the incandescence body formed like a disc or band, and manufactured in accordance with the directions at present known; and this part of the invention is combined with another point consisting in enclosing the burner and incandescence body in a bipartite bulb, as already stated. They prefer to use the lower half of the bulb as a bearing for the incandescence body, or more precisely for a plate or frame consisting of a bad conductor of heat, and forming in its turn the bearing or support for the incandescence body. The latter is preferably enclosed in a bipartite frame or ring, which holds the correspondingly shaped incandescence body in such a manner that the latter is not subjected to any pressure, but is free to exercise a certain degree of vibration. It is important that the space below the plate or frame be in communication with the space above, so that the products of combustion may freely escape without exerting an injurious effect upon the incandescence body.

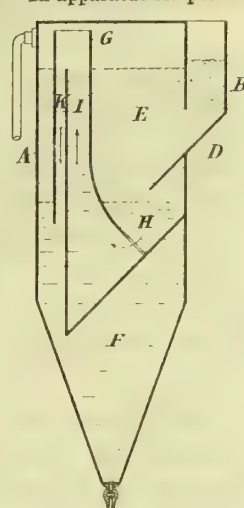
In figs. 1 and 2 are shown such a gas-lamp constructed according to the invention. The incandescence body in this case is perfectly flat, and is attached to a perforated plate consisting of mica, and having two superposed oblong frames holding the body securely between them, but not pressing upon it. It can thus make certain slight vertical movements, "which is important to secure the integral coherence between the free or actually lighting main-part of the body, and the part which is covered by, or located between, the frames." Instead of providing the mica plate with many small apertures, it may be furnished with a few large apertures or recesses, or one large central opening may be made use of, which is not completely covered by the incandescence body or its support or holder, as shown in figs. 3 and 4. In this case, the band-like incandescence body is supported by a platinum wire; the middle part of the body hanging slightly down over the wire so as to form a kind of roof, and there remain between its lateral rims and the opposite parts of the mica plate, the openings through which the products of combustion escape. The mica plate is preferably located between the two parts of the glass bulb, as shown in fig. 1. The glass bulb itself is held so that the whole of it, with its contents, may be adjusted in height with respect to the flame, or to the hottest zone of it. The lamps may be placed in a slightly angular position, more especially if the incandescence body is arranged as in figs. 6 and 7.

**Automatic Gas-Igniter.**—Borchardt, H., of Berlin. No. 18,944; Sept. 5, 1898.

This automatic gas-igniter is distinguished from other forms of igniters in that the platinum sponge remains permanently outside the chimney glass, and is connected with a conduit which, when the gas-cock is opened, diverts the outflowing gas to the side, and conducts it to the sponge, so that ignition is effected. The platinum sponge thus does not come into contact with the heated products of combustion, and so its effectiveness is not impaired by the heat of the burner.

**Acetylene Gas Apparatus.**—Gustafsson, K. G., of Stockholm. No. 18,063; Aug. 22, 1898.

In apparatus for producing acetylene gas, where the carbide is allowed



to drop into the generator through the free surface of a liquid, it is necessary, in order to prevent the generation of gas commencing before the carbide has had time to sink to the place where the generation of gas is intended to take place, to let the carbide pass through a sufficiently deep layer of a liquid—such as oil, for instance—which floats on the water and does not generate gas with the carbide, and, moreover, does not retard the generation of gas too much on the introduction of the carbide in the water. As, however, the bubbles of gas formed cause considerable disturbance of the liquid as they rise to the surface, an emulsion of the oil and water is soon formed, which is unable to protect the fresh carbide fed in from generating gas prematurely.

In the arrangement shown, A is a water and oil reservoir; and B, the feed-passage for the carbide, which falls along an inclined plane D into the water F, which is covered by a layer of oil E. The improvement mainly consists in placing in the gas-generating chamber a chimney or flue G, the lower end of which reaches below the surface of the water, while its upper end projects somewhat above the layer of oil. It is closed at the bottom except at H, where the carbide descending along the inclined plane can enter into it. Moreover, by means of a partition I, there is formed in the flue a passage K, the upper end of which terminates about on a level with the surface of the layer of oil, while its lower end is in the water at the bottom of the flue. When the carbide is fed into the apparatus, it slides into it along the bottom of the flue; and the generation of gas commences as soon as the water has had time to penetrate through the adhering film of oil, when the rising bubbles of gas communicate an ascending motion to the body of water in G. Should there be any oil floating on the water in this flue, it is forced to accompany the current of water which flows down over the edge of the partition I through the passage K, and finally issues at the bottom of the flue, where the oil rises to the layer of oil above, while the water again flows into the flue G through the aperture H. In this way, a circulation of the water is brought about, which results, on the one hand, in the flue G as a rule remaining filled with pure water only (not with water and oil); and, on the other hand, in bubbles of gas not being able to find their way out through the aperture H. Consequently, no emulsion of the oil and water is formed; the oil remaining unaltered.

#### APPLICATIONS FOR LETTERS PATENT.

- 26,215.—RODWELL, W. J., "Enriching gases by acetylene." Dec. 12.
- 26,221.—MISSIRE, F. & M. L., "Mantles for incandescent gas lighting." Dec. 12.
- 26,235.—KNOFF, W., "Regulating devices for gas or vapour burners." Dec. 12.
- 26,237.—VAN PRAAG, D. J., and HARKER, F. W., "Generating acetylene gas." Dec. 12.
- 26,238.—THE ECONOMIC GAS APPARATUS CONSTRUCTION COMPANY, LTD., and PAYNE, A. I., "Valves of apparatus for the manufacture of water and producer gas." Dec. 12.
- 26,250.—PHARE, A. E., "Coin-controlled mechanism for automatically delivering a fore-determined quantity of liquid." Dec. 12.
- 26,254.—SIEVERTS, W. H. A., "Mantles for incandescent gas lighting." Dec. 12.
- 26,259.—BUEB, J., "Separation or production of hydrocyanic acid from gases containing such acid or cyanogen." Dec. 12.
- 26,273.—STANDEBACH, C. F. P., "Automatic gas-igniter." Dec. 12.
- 26,309.—HECKFORD, A. E., "Ignition tube for gas-engines." Dec. 13.
- 26,338.—PALMER, J. R., and FISK, E., "Acetylene gas-lamp." Dec. 13.
- 26,347.—NEEDLES, J. H., and CROZIER, H. W., "Acetylene gas-generators." Dec. 13.
- 26,376.—THOMPSON, W. P., "Gas-engines." A communication from A. A. Vansickle and T. M. de Frees. Dec. 13.
- 26,416.—WILLWAY, A. B., "Valve for controlling the flow of gases." Dec. 14.
- 26,428.—WALKER, F. E., "Joint for steam, gas, water, or other pipes." Dec. 14.
- 26,432.—PENNEY, J., "Outside stop taps and boxes for water and gas service pipes." Dec. 14.
- 26,444.—PARNELL, F. A., THOMAS, J., and SYDNEY, F. C., "Production and application of gas to be used as a motive power." Dec. 14.
- 26,469.—BENNIS, E., "Gas-producers." Dec. 14.
- 26,474.—DENAYROUZE, L., "Incandescence lamps." Dec. 14.
- 26,477.—D'ORLOWSKY, J., "Manufacturing calcium carbide." Dec. 14.
- 26,485.—MURMANN, E., and OPAWSKI, A., "Incandescent lamps." Dec. 14.
- 26,488.—WILSON, J., "Incandescent gas-burners." Dec. 15.
- 26,533.—REY, H., "Producing carburetted air." Dec. 15.
- 26,534.—FORBES, E., "Gas-burner governor and device to regulate the flow of fluids in pipes." Dec. 15.
- 26,541.—LAKE, H. H., "Coin-freed apparatus for the delivery of gases or liquids." A communication from P. C. Shaffer. Dec. 15.
- 26,548.—SETTLE, T., and PADFIELD, W. A., "Taps and cocks." Dec. 15.
- 26,581.—HETHERINGTON, J. M., "Gas and similar engines." Dec. 16.
- 26,584.—WALTON, J., "Gas and oil engines." Dec. 16.
- 26,616.—STRAKOSCH, M., and SCHMIDT, F., "Acetylene gas-producers." Dec. 16.
- 26,628.—GOODWIN, J. S., "Acetylene generating apparatus." Dec. 16.
- 26,651.—BUSH, G. S., "Receptacle for acetylene gas." Dec. 16.
- 26,665.—JACKSON, J., "Incandescent gas-burners." Dec. 17.
- 26,691.—LYONS, C., "Acetylene gas-lamp." Dec. 17.
- 26,697.—SUGG, W. T., "Compressing gases." Dec. 17.



## CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

### The Carburation of Coal Gas.

SIR,—Mr. Young, at the commencement of his last letter, mentions the word "controversy" as possible to apply to this correspondence. I prefer to regard it as a friendly discussion on an important subject; the object being to establish the truth, and the relation that theory and practice have to the effect accomplished. Mr. Young admits all along that such a process as we have in use at Hastings will accomplish the desired effect; but when he suggests, in the concluding paragraph of his last letter, that we should do better by "getting the mist of solvent oil as far as possible precipitated before the gas leaves the works," I join issue. As I have pointed out before, the oil used for carburation has but slight solvent properties; and the idea of denuding the gas of naphthalene to save after-trouble, and then enriching it by other means, we have tried and found commercially unsuccessful. A fundamental principle of the carburation process here is to get the oil mist as far as possible through the canalization.

I will only touch on one other point raised by Mr. Young—viz., the amount of oil recovered from the drip-wells on the works, and used in the carburetted water-gas plant. On referring to the published figures, this will be found to have been 850 gallons during the year 1897. This drip oil we are satisfied is caused by the action of atomizing; and when the mist comes into contact with the gas, the lighter portion is seized upon by the gas and carried forward, while the heavier portion of the oil falls in combination with water, and is carried to the drip-wells, where it is withdrawn and used over and over again until the specific gravity is too high, and the water is too difficult to separate. But, as previously stated, it rarely, or never, contains naphthalene by analysis.

There are such a host of details which can be discussed in connection with the working of the process, that unless it has been seen in operation, I feel it would be hopeless in a correspondence to deal with them all. Many of our best-known engineers have been to Hastings, and investigated the system for themselves; and should Mr. Young be able to do so, I feel sure that I shall likewise be able to prove to him that generally his contentions are not maintainable in the face of results accomplished. Meanwhile, I have only to thank Mr. Young for the kind way in which his criticism of the process has been made, and for the information he has afforded.

Hastings, Dec. 21, 1898.

CHAS. E. BOTLEY.

### The Estimation of Carbonic Acid in Minerals.

SIR,—In your notice of my improved apparatus for the estimation of carbonic acid in minerals, &c., you remark that "the tension of concentrated hydrochloric acid cannot be ignored." The tension of the acid used by me is, however, not very different from that of the acid recommended by Scheibler. Some experiments I have made indicate that the acid absorbs aqueous vapour from the air in the apparatus, and that the volume absorbed is greater than the volume of hydrogen chloride given off. It is practically impossible to ascertain exactly what may occur under various conditions; but I have found by experiment that the error from this cause is too small to interfere with the accuracy of the results. The same applies to the absorption of gas by the petroleum; this is quite negligible in my apparatus.

I am confident that gas engineers will find my calcimeter very convenient, as no corrections have to be made for temperature or pressure or gas dissolved. The results it gives are considerably more accurate than those obtained with Scheibler's form.

Leadenhall Street, E.C., Dec. 22, 1898.

ARTHUR MARSHALL, F.C.S.

## LEGAL INTELLIGENCE.

### An Infringer of the Welsbach Patents Sent to Prison.

In the First Division of the Court of Session last Tuesday, the Lord President and Lords Adam, McLaren, and Kinnear had before them for discussion, upon the proof led some months ago, a petition and complaint by the Incandescent Gas-Light Company, Limited, against George Munro, residing at 47, Oswald Street, Glasgow. The complainers alleged that the respondent had been guilty of a breach of interdict, by continuing to sell infringing mantles. The respondent denied the allegation. The complainers were represented by Mr. Clyde; Mr. Munro appeared on his own behalf. The Lord President said the respondent was served on March 18, 1898, with an interdict which forbade the manufacture and sale of certain articles, the invention of which had been patented by the complainers. It was alleged that, after such service, the respondent had persisted in selling the forbidden articles; and certain occasions were specified on which sales were made. The Court were of opinion that each and all of these acts had been proved; and, by evidence of the most definite character, the respondent had been connected individually with the transactions. It had, however, been endeavoured by the respondent to dissociate himself from certain of the sales, by the statement that he had disposed of the business prior to them taking place. But it had been abundantly proved that, after the sale, as well as before it, the respondent was directly involved in the conduct of the business; and therefore it was impossible to dissociate the cases in which his personal complicity had been clearly proved from those in which it was rather to be inferred by his continuing in, and resorting to, the place where the sales took place. In considering what sentence should be pronounced, the Court could not avoid taking notice of the prevalence of this mean and illegal trade. It appeared that a group of persons in Glasgow had disregarded the Court's orders, and, for anything known to the contrary, were continuing to disregard them. It was necessary, therefore, to pass an exemplary sentence, and Court decided that the respondent must go to prison for two months. Mr. Clyde moved for expenses, and for a warrant, in terms of the prayer of the petition, requiring delivery of infringing mantles and articles of

manufacture. The Lord President said expenses would follow the result, in the usual way. But the other matter was a serious one; and as it had not been discussed, while they did not express any opinion upon it, in the circumstances, they must refuse the motion. In the same Court, David M'Mann, residing at 13, South Street, Perth, was cited to appear to answer to a similar petition and complaint, to which he had not lodged any answer. He failed to appear; and a warrant was granted for his apprehension.

### Liability for an Accident through a Transformer Box Explosion.

In the City of London Court, before Mr. G. Pitt-Lewis, Q.C., Deputy Judge, an action was recently brought by Charles H. Wild, of 16, Seckford Street, Clerkenwell, against the County of London Brush and Provincial Electric Lighting Company, Limited, to recover £50 as compensation, under the Employers' Liability Act, for personal injuries sustained. Mr. W. M. Thompson appeared for the plaintiff; Mr. Lynden Bell represented the defendants. The evidence for the plaintiff showed that on July 22 last, having been in the service of the defendants for three or four years, he was told by the foreman to go to a transformer box in John Street Road, Clerkenwell, and do certain work in connection with high-tension mains. While there an explosion occurred, and the plaintiff was very severely hurt on the left arm and hand. He went to St. Bartholomew's Hospital, and was away from work for ten weeks. His case was that, as an unskilled electrician, he should not have been put to do the work which was the cause of the accident. The defence was that the plaintiff brought the accident about by not wearing india-rubber gloves, as provided by the rules. The plaintiff admitted having taken off his glove because of the intense heat then prevailing, but he declared that the accident would have occurred had he been wearing it. The Deputy Judge did not think the accident was caused by the plaintiff, but that it happened owing to a combination of circumstances which no one could have foreseen. He awarded him £15 and costs.

### A Gas Worker Fined for Assault.

At the Rotherham Borough Police Court, before Messrs. H. J. Knight and W. Spencer, last Thursday, a gas worker named Peter M'Soley was summoned for having assaulted Alfred Smith, another gas worker. Mr. Hickmott prosecuted, and said the parties lived in adjacent houses. On the 2nd inst., Smith was employed as a stoker at the Rotherham Corporation Gas-Works, having come from Leicester to fill one of the vacancies which had occurred in consequence of the stokers previously engaged there having terminated their engagements. The men afterwards desired to return to their old places; but they were informed that only as vacancies occurred would they be allowed to do so, and that no employee would be turned away. The defendant, who had formerly held a situation at the works, was employed as a labourer by a contractor who had undertaken certain extensions in connection with the gas undertaking; and there could be no doubt that the fact that Smith was working as a stoker had caused the defendant to consider he had a grievance. He had seen Smith's landlady—a Mrs. South—and told her he would have the blackleg out of her house during the week. On the night above named, Smith was at his lodgings when the defendant came to the door, and said: "Where is the blackleg now?" Mrs. South said there was no blackleg there, and ordered him to go away. The defendant rushed into the house, pushed Mrs. South down, kicked Smith on the arm, and knocked him over. Defendant put his hand in his pocket, pulled out a knife, and threatened him. Smith escaped into the back room, and defendant went out of the house. Smith's arm was hurt, and the injury was attended to by a surgeon. Mr. Hickmott thought the Bench must come to the conclusion that the attack was premeditated. The matter was reported to the Corporation, and he was instructed to prosecute. Witnesses were called—the complainant, his wife, and Mrs. South giving evidence. Mr. Gichard, who was instructed to defend, said the quarrel had nothing whatever to do with the dispute at the gas-works. Defendant denied having been in South's house on the night in question. He stated that he left the service of the Gas Department of the Corporation because when the stokers went out on strike he was asked to look after the fires. The Bench considered that an unprovoked and serious assault had been committed, and they imposed a fine of £2 and costs.

### The Storage of Calcium Carbide.

At the Clerkenwell Police Court, last Tuesday, before Mr. Bros, the Acetylene Gas Light, Power, and Calcium Carbide Company, Limited, of Newgate Street, were summoned for having on Nov. 15 kept, otherwise than in pursuance of a licence given by the Local Authority, a quantity of carbide of calcium, to which substance the Petroleum Acts, 1871 and 1879, had, by Orders in Council, been made to apply. Mr. Godfrey prosecuted on behalf of the London County Council; Mr. Schiller appeared for the defence. Mr. Godfrey said the Company had exhibited at the Earl's Court Exhibition, at the close of which they caused to be removed a quantity of carbide of calcium, which was placed in premises in the Clerkenwell Road. In consequence of information having been communicated to the Council, an Inspector visited the place and found about a ton of carbide of calcium contained in a number of drums, one of which was not hermetically sealed. There were several persons employed on the premises. Mr. Godfrey added that this was the first prosecution under the Act, which provided that not more than 5lbs. of this substance should be kept in other than hermetically sealed vessels. Mr. Schiller argued against the validity of the Order in Council so far as applied to section 14 of the Petroleum Act, 1871, and said he could adduce expert evidence to show that calcium carbide did not come within the section defining what were inflammable substances. The whole point was as to whether, under the Act, there was any power to make an Order in Council. Mr. Bros held that there was such power. Mr. Schiller said if the Magistrate was against him on this point he would admit that a technical offence had been committed. His clients were the manufacturers and patentees of a generator for the manufacture of acetylene gas, which was a process requiring very delicate handling; but there was no danger from calcium carbide until moisture was applied to it. They exhibited the

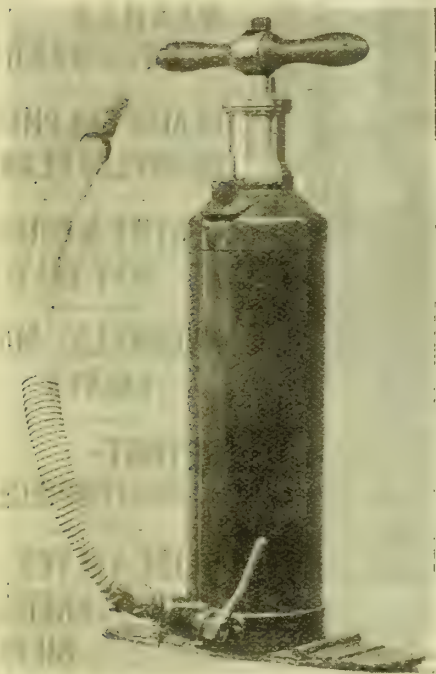


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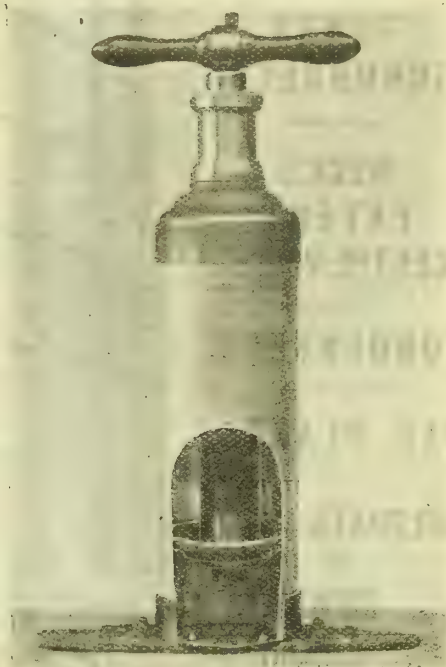
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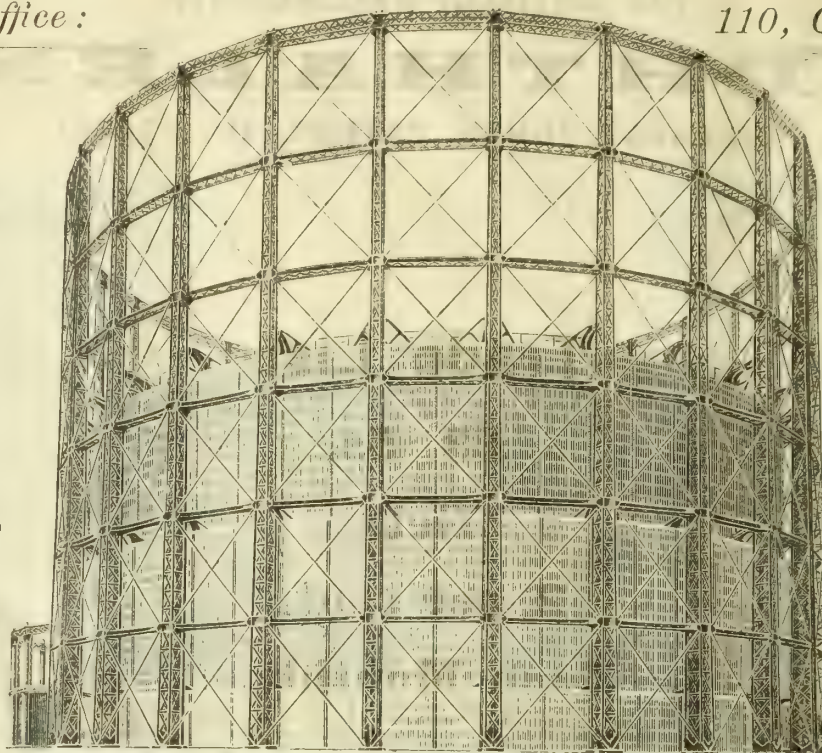
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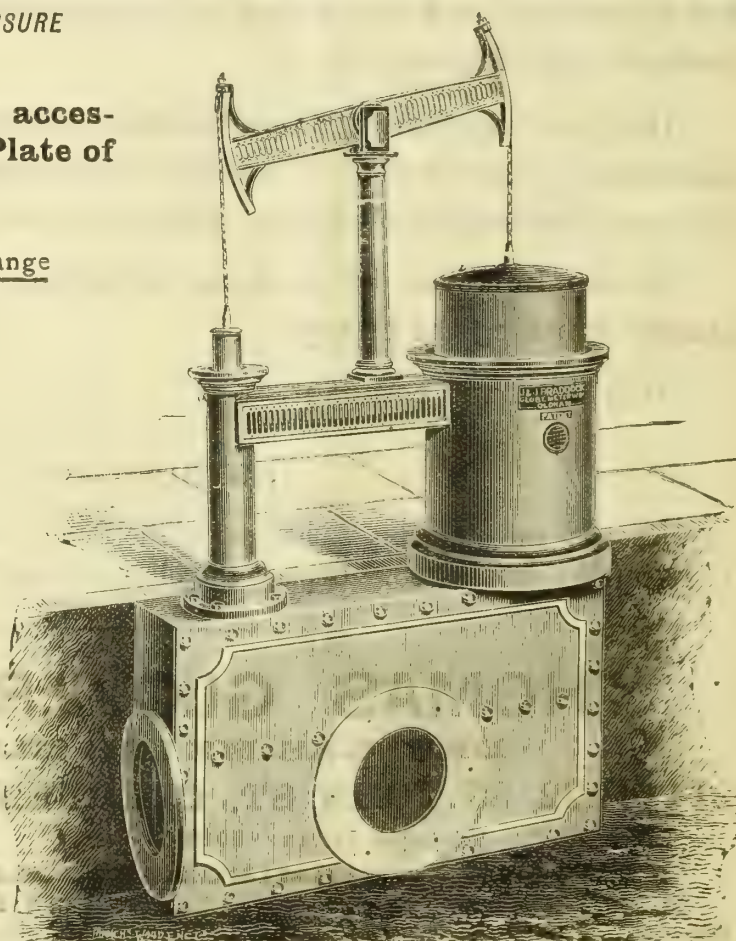
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generator at Earl's Court, and for this purpose stored there about 3 tons of carbide, for which they obtained a licence from the London County Council. At the close of the exhibition, they found it necessary to remove a remnant of the carbide. They accordingly placed it in premises they had in Clerkenwell, and failed to take out a licence. Calcium carbide was not an explosive. It had no flash-point like petroleum, and could only be generated when moisture got to it. Hence it required to be ignited. Mr. Bros said the substance was very dangerous, or else the Order in Council would not have been made. He imposed a fine of £5, and £1 ls. costs. Mr. Schiller asked the Magistrate to grant a case, in order that the validity of the Order in Council might be tested. Mr. Bros said he was willing to accede to the request.

### The Gas and Oil Engine Case.

This case, which was before the Court of Appeal on the 7th inst. (see *ante*, p. 1363), was heard, on further consideration, in the Queen's Bench Division of the High Court of Justice last Tuesday, by Mr. Justice Bigham. It may be remembered that his Lordship on a previous occasion decided that the modification of Day's gas-engine so as to convert it into an oil-engine did not constitute an "improvement" which, under the terms of an agreement, should pass on to the Valveless Gas-Engine Syndicate. The matter was taken to the Superior Court, where it was held that the oil-spray introduced was an improvement; and they allowed the appeal. The case was sent back to Mr. Justice Bigham on the point of rectification; the question now to be heard being whether the parts of the agreement which related to oil were expressly excluded. Mr. Bousfield, Q.C., and Mr. H. Tindal Atkinson appeared for Mr. Day; Mr. Terrell, Q.C., and Mr. Wood represented the defendants. Mr. Day was called, and stated that his oil rights were not included in the agreement, but they were mentioned in the draft agreement and scratched out. Mr. Harris, who negotiated the matter, was called, and said he would not pledge himself to contradict Mr. Day's evidence, but his recollection was different. A large number of cases were quoted by Counsel; and Mr. Bousfield contended that the evidence, both documentary and oral, clearly showed that it was the intention of the parties that Mr. Day should be left free to work his oil invention in any way he thought proper. Eventually his Lordship intimated that he would occupy part of the Christmas vacation in considering the matter.

**The Price of Gas at Keighley.**—The Keighley Town Council last Tuesday confirmed a recommendation of the Gas Committee that the price of gas should be reduced from 2s. 6d. to 2s. 3d. per 1000 cubic feet, as from July 1 next. The proposal gave rise to a long debate; and an ineffectual effort was made to bring the change into operation on Jan. 1. In addition to the reduction, discounts of 5, 7½, and 10 per cent. are to be allowed according to the quantity of gas consumed, if the accounts are paid within twenty-eight days of their delivery.

**Cottingham Gas and Water Company, Limited.**—This Company, which was incorporated in February last for the purposes of acquiring the business of the Cottingham Gas Company and of supplying the inhabitants with water, have fulfilled the first-named object. They have handed to the shareholders of the Gas Company 666 fully-paid ordinary shares of £2 10s. each out of an allotment of 846 shares. They are now raising additional capital, by the issue of 700 further shares, evidently for the water-supply works. A suitable piece of land has been secured for this purpose; and a well has already been sunk thereon.

**New Joint-Stock Companies.**—The Scarborough District Lighting Company, Limited, has been registered with a capital of £5000, in £1 shares, to manufacture, sell, and supply light in the villages of Ayton, Burniston, Cayton, Cloughton, Scalby, Seamer, Thornton Dale, and elsewhere in Yorkshire, and to carry on the business of a gas and lighting company, electricians, mechanical engineers, suppliers of electricity, electrical apparatus manufacturers, &c. The Ruabon Reservoir Company, Limited, has been established with a capital of £6000 in £5 shares, to construct and maintain a reservoir for storing water at Ruabon.

**The Fatal Acetylene Gas Explosion.**—An inquiry into the circumstances attending the death of Alfred Burlingham, the son of a jeweller at Lynn, who, as reported in the "JOURNAL" for the 13th inst., was killed by an explosion of acetylene gas while making some experiments, was opened on the 12th inst., and adjourned till last Wednesday, when Colonel Ford, Chief Inspector under the Explosives Act, and Mr. H. Sutcliffe, of the Safety Acetylene Gas Generator Company, of Halifax, were present. The latter said he supplied the apparatus to Burlingham without the instructions, and explained that this was customary, as sometimes in transit by rail portions of the machinery were broken, and trying it under these circumstances was likely to lead to serious consequences. The instructions were forwarded immediately on the receipt of information from customers that the apparatus had arrived safely. Colonel Ford observed that, without desiring to prejudice anyone, he thought perhaps Burlingham tried the machinery, and did not know sufficiently how it worked. The Jury found a verdict of "Death by misadventure."

**Water Rights on Burley Moor.**—At a public meeting at Burley last Tuesday, Mr. Willis, the Chairman of the District Council, stated that the ratepayers had been called together for the purpose of approving of an application in Parliament for powers to acquire the water rights on Burley Moor, in order to improve the supply of the district. Having explained the character of the water rights which it was sought to acquire, he referred to similar proposals on the part of the Menston Water Company and the Horsforth Water Company. The Menston Company were asking for power to appropriate and, he believed, purchase land to the extent of 32 acres. This was only a small portion of the moor, but it included two important springs; and, that being so, the Council had decided to oppose the scheme. It was possible, however, that arrangements might be come to by which they could supply the Company with water, and render opposition unnecessary. As to the Horsforth Company's proposals they were really identical with their own, except so far as the distribution of the water was concerned. To that scheme, therefore, they must offer no opposition. A resolution was passed empowering the Council to promote a Bill in Parliament, and to oppose the Bills of the Companies named.

## MISCELLANEOUS NEWS.

### THE NEW BILL OF THE GASLIGHT AND COKE COMPANY.

#### Proposed Large Issue of Additional Debenture Stock.

The Bill of which notice was given last month by The Gaslight and Coke Company, to enable them to raise additional capital, and to purchase and hold lands, has been deposited. The preamble sets forth that by the Act obtained last session the Company's debenture stocks were consolidated and converted into one stock, "3 per cent. consolidated debenture stock;" and that it is expedient that the Company should have further power to raise money by the creation and issue of £3,500,000 of debenture stock, to be one with the above-named stock. It is provided that the stock shall be offered by auction or tender; and, of course, any premium resulting from the sale, after deduction of expenses, is not to be considered as profits of the Company. Any stock unsold may be put up again at a subsequent sale, or be offered for tender under the previous conditions, and at a price either equal to or above the reserved price fixed. Holders of the Company's capital or debenture stock are not, as such, to be entitled to any preference or priority as regards tendering for or purchasing any stock authorized by the Act. The Bill, as already mentioned, is also to empower the Company to acquire and hold lands. It appears that they have from time to time purchased certain lands and hereditaments, described in the schedule to the Bill, which have been conveyed to the grantees in trust for the Company. Doubts have arisen as to the power of the Company to hold these lands; and therefore it is desired to set them at rest. The trustees are willing to convey the lands and hereditaments in question to the Company, and parliamentary sanction to the transaction is sought. The Company also wish to be authorized to purchase by agreement further lands, not exceeding 150 acres, which may be required for the purposes of the undertaking, but not to be used for the manufacture of gas or residual products. A clause of the Bill specifies that the Company are not to be authorized to purchase or acquire ten or more houses occupied wholly or partially by persons belonging to the labouring class as tenants or lodgers.

### PROJECTED REVOLUTION IN STREET LIGHTING IN SOUTH LONDON.

#### Suggested Adoption of the Welsbach System for Camberwell.

The following letter, which speaks for itself, has been received by the Vestry Clerk of Camberwell (Mr. C. W. Tagg) from Mr. Frank Bush the Secretary of the South Metropolitan Gas Company; and it will come before the Vestry after the Christmas recess:—

Since the early days of gas lighting, the old-fashioned square type of street lantern has been perpetuated with little alteration or improvement. That there has of late years been a desire for improvement is undoubted; but the difficulty has always been the cost. Delay only increases the number of lamps, and consequently the difficulty of making a change. The Directors now, however, think that the time has come for placing before the South London parishes supplied by the Company a definite proposal for a general improvement in the street lanterns and lighting; and they come first to Camberwell.

For some years they have felt that the Welsbach incandescent system contained the possibility of improvement; but hitherto it was not sufficiently worked out in detail to warrant any comprehensive alteration in street lighting. With the new burner introduced this year, and some other improvements, the Directors are now in a position to make the following suggestion: Their idea is to apply the incandescent system to the whole of the lamps in the parish, and to make use of the saving resulting from the reduced consumption of gas in improving the lanterns. At present the charge per lamp is £3 3s. 9d. per annum, with a 5 per cent. discount, for a 5-foot per hour burner giving a light equal to 13 or 14 candles. In October last, a letter was sent from the Company's Chief Engineer (Mr. F. Livesey) offering to supply the No. 2 Welsbach burner at £2 12s., and the No. 4 at £3 12s. per annum, with the discount of 5 per cent., of course. The No. 2 is capable of giving a light of from 40 to 50 candles—to be on the safe side, let us say 40; and the No. 4, from 80 to 100, (or say) a good 80 candles. It will therefore be seen that the No. 2 burner gives about three times, and the No. 4 six times, as much light as the present flat-flame burner. If the No. 2 is substituted for the flat-flame in all but the principal streets, there will be a saving of 11s. 9d. per lamp per annum, with a threefold increase of light.

The number of ordinary lamps in the parish of Camberwell is 3779 all told. Of this number there are 277 in the main thoroughfares. The Directors suggest that in the main roads, and perhaps in a few other places, the "Paris" lantern, or a handsome lantern of a similar design, with the No. 4 burner should be fixed; and in all other places the special lantern of the Incandescent Company or other suitable lantern that may be approved by the Vestries, should be used, in most cases with the No. 2 burner. But there are some streets in which the No. 3 burner will be advisable—to the number, possibly, of 200 or 300 lamps. The annual charge for the No. 3 burner will be £3 2s. The price of the "Paris" lantern, fitted complete with burner, &c., is £2 10s., and the other is £1 13s. 6d. exclusive of labour (say, from 2s. 6d. to 5s. per lamp), for which the Directors do not propose to make any charge.

Consequently, to renew the whole of the lanterns in the parish would cost not more than £6600. There will be a saving, as before stated, of 11s. 6d. per lamp on over 3000 lamps, or about £1800 a year, which would liquidate the £6600 within four years if the whole of the lamps could be changed in a year. This, however, is scarcely practicable. The proposal of the Directors is, therefore, as follows: The Company will advance the money without interest, and will accept as payment the saving effected; the parish paying, until the cost is recouped, the present price of £3 3s. 9d. for all the new lamps fitted, except in the main roads ("Paris" lanterns), which will be charged at the price named in the Chief Engineer's letter—viz., £3 12s. The Company will keep exact accounts, which will be open to the parish at any time; and an annual statement shall be rendered. In the event of any reduction being made



in the price of gas, or any other saving being effected, the parish shall have the full benefit.

In the following letter, addressed to Mr. Tagg on the 14th inst., Mr. Bush submitted a modified scheme, the terms of which will be offered to all the other parishes as soon as possible:—

Dear Sir,—Referring to the interview of the Chairman and myself with your Sub-Committee on Public Lighting on the 5th inst., I am instructed by the Board to deal with the questions raised by the Committee, and to amend the proposed charges for the new lamps.

In reply to the first question put to us, I am now authorized to confirm the answer then given that, in the improbable event of an increase in the price of gas, say during the next five years, no increase will be made in the proposed annual charge for the improved lamps and burners. As to the time required for the substitution of the new lamps throughout the parish, and the payment for the same, the Directors think the change can be completed in about a year, and that in  $3\frac{1}{2}$  years more the whole cost will have been cleared. They therefore undertake that it shall be done within  $4\frac{1}{2}$  years from the date of the order. As was stated in my original letter, an exact account shall be kept; and while guaranteeing that the time shall not exceed 4½ years, should it be recouped in a shorter time the parish shall have the benefit. They shall also have credit for the value received for old lanterns, which it is feared will not be much.

The proposed charges for the new lamps were, for Nos. 2 and 4, the figures given in the letter from the Engineer of the 10th of October last, which were: £2 12s. for No. 2 burner, and £3 12s. for No. 4 burner; while an intermediate price was added in the letter of the 3rd of December of £3 2s. for the No. 3 burner.

The Directors have now gone carefully into the question, and find some reduction can be made. They hope, if the price of coal does not rise unduly, that the price of gas may possibly be reduced, perhaps 2d. per 1000 cubic feet, within the period covered by the proposed change. They will therefore anticipate this, and reduce the charge for the new lamps, &c., at once 2d. per 1000. They also find they can further reduce the No. 4 some 3s.

The amended charges will therefore be—

No. 2—£2 10s. per annum (a reduction of 2s.)

No. 3—£2 18s. per annum (a reduction of 4s.)

No. 4—£3 6s. per annum (a reduction of 6s.)

The Directors have to-day resolved to reduce the price to private and public consumers 1d. per 1000 feet from Christmas next, and to increase the quantity from 27 feet to 29 feet per penny for gas sold by the penny-in-the-slot meters.

### THE LIGHTING OF LIVERPOOL STREETS BY THE INCANDESCENT GAS SYSTEM.

An Important Report by Mr. C. R. Bellamy.

As our readers are well aware, the Electric Power and Lighting Committee of the Liverpool Corporation have for some time past been giving special attention to the question of how best to obtain an effective system of lighting for the streets; and in their work in this direction they have, as our columns amply testify, been ably advised by Mr. C. R. Bellamy, the Superintendent of Street Lighting. The latest report which he has addressed to them on the subject is of an exceptionally interesting character; and we give the following abstract of its contents.

The report opens by referring to a resolution of the Lighting Committee on July 8 last, instructing Mr. Bellamy to report upon the general application of incandescent gas lighting to the whole of the streets of the city; and the Committee are reminded that an interim report was submitted on the subject, pointing out that it was advisable to postpone full consideration of this matter until the Welsbach Incandescent Gas-Light Company had completed their arrangements for placing a new series of burners upon the market. Mr. Bellamy had since had opportunities of fully testing these burners; and he proposes to adopt the one known as the "York," which is practically the counterpart of the burner at present in use. In dealing with the future lighting of the city, it is useful to review what has been accomplished in the way of improvement since the Corporation took over the street lighting in 1894. To this end a comparison can best be made with the conditions obtaining in 1890—a year uninfluenced by coal or labour troubles, and in every respect comparable with the present conditions affecting the public gas supply, excepting that the selling price of gas was 1d. per 1000 cubic feet lower than at present. In that year the total number of lamps of every description amounted to 11,330, lighting 276 miles of road, and 1761 courts. The total lighting power of the lamps, assuming the full standard value of the gas for illuminating purposes, of 4 candles per cubic foot, amounted to 744,699,163 candles; the total cost to the city being £39,000. In 1894 it was considered desirable to extend the system of reducing the power of the street lamps at midnight (which had previously been confined to the special lamps in the principal streets) to the whole of the city. As this matter could not be satisfactorily dealt with by the Gas Company, who had hitherto carried out the public lighting, except at an increased cost, it was taken over by the Corporation, and resulted in an annual saving of £7000. In 1895, as a result of negotiations with the Company, it was arranged, under section 24 of the Gas-Works Clauses Act, 1871, and in accordance with the general custom of the country, that the gas for public lighting should be charged at a lower rate than for ordinary purposes. The difference was fixed at 10 per cent., resulting in a further reduction in the lighting charges of £2500; showing a total reduction of £9500. In the same year it was decided to apply the greater portion of this amount to the improved lighting of the city; and the following work has been accomplished—viz., 255 new lamps have been set up in old streets; 878 passage lamps have been fixed, lighting the back entrances to 20,607 houses; and  $3\frac{1}{2}$  miles of road have been lighted by means of electric arc lamps; and  $7\frac{1}{2}$  miles by means of incandescent gas-lamps—the total number of lamps in use to date in the old city amounting to 11,646, with an illuminating value of 1,165,838,947 candles, at a cost of £36,012.

For the purpose of calculating the candle power of the lamps, the 10 ampere arc lamps have been assessed at 500 candles each, the incandescent gas-lamps as yielding an average light, through their average life of 1137 lamp-hours, of 13 candles, and the ordinary flat-flame burners at 4 candles per foot of gas. For a readier comparison, the figures applying to the two years have been tabulated; and they show that, notwithstanding 316 additional lamps have been fixed, and the aggregate illuminating power of the old city lamps increased by 56 per cent., the annual charge is £3000 per annum less than in 1890. It will be understood that the increased illumination is confined to the 150 miles of streets and passages that have been specially dealt with up to date. In 1895 the city boundaries were extended, adding 138 miles of road to the city, of which 118 were lighted by 2783 gas and 6 oil lamps, having an illuminating value of 137,514,384 candles, at an annual cost of £7914 12s. 8d.

The following work has been accomplished in the added areas: The annual hours of lamp-light have been increased from an average of 2907 to 3350. An additional  $8\frac{1}{2}$  miles of road have been lighted; and while the illuminating power of the lamps has been increased by 64 per cent., and the hours of lamp-light by 15 per cent., the annual maintenance charge has been reduced by £67. In the period 1895 up to date, £18,175 has been spent on new works, embracing electric, incandescent gas, and passage lighting. The present estimates provide a surplus of £5100 for similar purposes. Mr. Bellamy points out that about one-sixth (or 76 miles) of the total road mileage of the city is now lighted by incandescent gas-lamps, the greater portion of which are in main roads, and are fitted with double burners. In a report dated Sept. 29 last, it was pointed out that future extensions of this system to the secondary streets could be dealt with by single-burner lamps, and that under such a system, while the illuminating power would be increased to midnight by 146 per cent. and to sunrise by 176 per cent., the annual lighting charge would be reduced by 3s. per lamp. On these facts, it might be argued that the system should be applied generally to the city at once; but Mr. Bellamy states that, while during the past three years all new works have been charged to surplus revenue without any increased charge to the lighting rate, such a change would necessarily involve the opening of a capital account, the raising of from £20,000 to £25,000, an abnormal extension of the workshops and staff of the Lighting Department, and the possibility that subsequent improvements in incandescent lighting would either be lost to the city or have to be paid for a second time. He therefore strongly recommends that the system be extended at a rate which the surplus funds at the disposal of the Committee will cover. This sum would provide for the equipment of 2500 lamps in each year, the work to be carried out by the present staff; and the entire lighting of the city by means of incandescent gas-lamps would be completed in four years, at the end of which the lighting throughout the city would be increased by nearly three times where the single-burner lamp is adopted, and by over five times with the double-burner lamp, with a reduction of the permanent charges of between £3000 and £4000.

**Goole Water Scheme.**—By a good majority, a meeting of owners and ratepayers of Goole last Tuesday consented to the promotion of a Bill in Parliament to authorize the District Council to construct new water-works at Pollington. Mr. R. Jackson presided; and speaking in support of the Bill, stated that he had found the present Rawcliffe supply was of 47° of hardness and was totally unfit for drinking purposes. At Pollington, however, the hardness of the water was only about 11°; and he believed the scheme could be carried out without cost to the rates.

**The Colne Gas Undertaking as a Rate-Feeder.**—In an article on "Colne's Municipal Assets," which recently appeared in a local paper, the writer (Mr. W. H. Riding), remarked that the gas-works keep up their reputation as a rate-helping institution, for after bearing an abnormal strain for sundry items of expenditure amounting to £521 in the aggregate, this department passes over to the district fund £2282, which represents a little over a 7d. rate. He thinks it would be gratifying to point to other rate-feeders besides the gas-works; but unfortunately it appears that the other departments are a source of loss.

**The Cost of the Rochdale Water Act.**—According to the "Rochdale Observer," the costs incurred in carrying through Parliament the Rochdale Water Bill of the past session will not, it is understood, reach £10,000. The Corporation have to pay not only their own costs, but those of the Todmorden Water Company, and one or two opponents with whom arrangements were made during the progress of the Bill. The Todmorden Corporation are paying their own expenses, and so are the Littleborough District Council and some private firms who fought to the end and then suffered defeat. It appears that the Corporation cannot defray the costs out of the money raised for the water undertaking. Payment will be spread over five years, and as a rate of 1d. in the pound in Rochdale produces about £1200, the charge on the ratepayers will amount to about a 1½d. rate for the period named.

**The Belfast Water Bill.**—The occupiers of land in the neighbourhood of Carrickfergus are up in arms against the Bill which the Belfast Water Commissioners are introducing in the ensuing session of Parliament. At a public meeting held on the 17th inst. to protest against the scheme, the Chairman (Mr. J. Logan) described it as a proposition for wholesale eviction, which was enough to create disturbance among a peaceable and loyal people. So far as he could see, the proposed Bill touched some 4000 plots of ground, including farmsteads; and he believed that never before was an attempt made to promote such a Bill in Parliament. The law of the land did not recognize the right of any corporation to acquire more land than was absolutely necessary for the purposes of their undertaking; and it seemed to him astonishing that men like the Belfast Water Commissioners, with a clever Surveyor at their head, should propose such a thing. The Chairman then referred to the recent outbreak of fever in Belfast, which he attributed to the nature of the soil, and not to the impurity of the water supply. Belfast had ruined Carrickfergus by taking away the Woodburn waters; and now they were by their action going to drive away the inhabitants of the surrounding country. Those present pledged themselves to oppose the scheme, which, the resolution stated, was "iniquitous and most unjust," as it was based on erroneous statements regarding the pollution of the Belfast water supply.



### COMPARISONS OF GAS AND ELECTRIC LIGHTING.

It is not surprising to learn that, in common with other places, Enfield is occupying itself with the question of electric lighting. According to a local paper, the subject is at present in the "incubating or committee," stage, and will probably shortly emerge therefrom, and come before the open Council for discussion. When the report appears, if it shows that the public and private lighting of the town can be done by electricity very much cheaper than it is now done by gas, the ratepayers will probably agree to some steps being taken to secure its adoption; but if, on the other hand, the new illuminant is proved to be an expensive luxury, the townspeople will most likely decide that they cannot afford to indulge in it. The question for their consideration will be: Can the electric light be supplied at a cost which the ratepayers and consumers can be reasonably asked to pay for it? In order to help them in coming to a right conclusion, the Secretary and General Manager of the Enfield Gas Company (Mr. C. W. Offord) has presented to his Directors a report on the cost of electric lighting and the present position of electrical undertakings, in accordance with instructions contained in a resolution passed by them on the 14th ult. Mr. Offord has done good service to the cause of gas lighting—and, we may remark, to his fellow-townsmen—by laying before them, through the local papers (one of which gave his report as a full-page supplement), some data which they would do well to carefully consider before committing themselves to any electricity supply scheme. The figures collected are, however, of more than purely local interest; and therefore they call for notice in our columns.

Mr. Orford gives his particulars in four tables. In the first, he shows the cost of the quantity of gas required to supply a No. 4 Welsbach new burner of 100-candle power for 1000 hours, and the cost of electricity at various rates per unit to give a similar quantity of light during the same time. The charge for gas is taken at 3s. 11d. per 1000 cubic feet—this being the rate charged by his Company to users of cooking-stoves and gas-engines, as well as the average price received during the half year to June last; and it will be seen that gas at this rate is a trifle over one-twelfth the cost of electricity at 6d. per unit.

|                                      |                     |          |
|--------------------------------------|---------------------|----------|
|                                      | <i>Gas.</i>         |          |
| 4000 cubic feet, at 3s. 11d. . . . . |                     | £0 15 8  |
|                                      | <i>Electricity.</i> |          |
| At 7d. per unit . . . . .            |                     | £10 10 0 |
| 6d. " " . . . . .                    |                     | 9 0 0    |
| 5d. " " . . . . .                    |                     | 7 10 0   |
| 4d. " " . . . . .                    |                     | 6 0 0    |
| 3d. " " . . . . .                    |                     | 4 10 0   |
| 2d. " " . . . . .                    |                     | 3 0 0    |
| 1d. " " . . . . .                    |                     | 1 10 0   |

Mr. Orford acknowledges that the incandescent gas system involves the renewal of mantles. But he points out, on the other hand, that, as electric incandescent lamps only last, at the outside, 1000 hours, during the latter half of which time they fast deteriorate in power, and six

electric lamps of 16-candle power each are required concurrently to give the light of the one gas-burner, the balance is more likely to be in favour of gas than electricity in this respect.

So much for the cost of electric lighting as compared with gas. Dealing with the second matter on which he was requested to report—the present position of electrical undertakings—Mr. Offord passes by the accounts of corporations and other local authorities, and notices only those of companies, for the reason, he says, that companies, “though naturally anxious to present to the public the best view possible of their affairs, cannot improve that view at the expense of the ratepayer, directly or indirectly, by a plainly-shown contribution from the rates, or by equal, but hidden, assistance.” But there are some companies whose circumstances in regard to the district of supply make them of no use for comparison when such a district as Enfield has to be considered. These are enumerated in his second table. There are others (given in his third table) that either have sent no returns at all, or have sent incomplete ones to the work from which his particulars have been taken. He thinks it may be safely conjectured that, having no good results, they decline to publish failure. In the case of one company, besides giving the capital expended, and the date of the commencement of their operations (1888), it is noted that one dividend only has been paid—2½ per cent. in 1894—and that at the end of 1896 the small sum of £215 was carried forward towards the next. In regard to another concern, he says that a month or two ago its financial position was so bad that the Directors were compelled to ask for time to pay a fine of less than £2.

Mr. Offord's final table is the most important one of the series, as he gives therein the principal items of the accounts of the remaining twenty companies. It will be seen therefrom that five of these companies supply fashionable watering-places—viz., Bournemouth, Eastbourne, Hastings, Hove, and Scarborough—where the latest novelty, however expensive, is naturally in demand. Oxford and Cambridge account for two other companies, and to a large extent the same causes create the demand in these places. Among the rest there are Norwich, Dover, Preston, Northampton, and Reading; some of the towns being centres of considerable importance and density. There remain the Altrincham, Chelmsford, Crystal Palace District, Kelvinside, Pontypool, Richmond (Surrey), Windsor, and Woolwich Companies. He considers the district supplied by the Crystal Palace Company nearest in character to Enfield.

Referring to the data here presented, Mr. Orford says: "It is not possible, from the figures at my disposal, to find what each consumer paid for electricity, on an average, during 1897. But a very rough indication can be found, as the number of consumers only is given, without particulars of the public lamps, the income from which swell the receipts. Dividing the gross receipts by the stated number of consumers, £20 is arrived at; and the same operation with the figures of our last year's results gives £9. So that, by this rough method, the consumer of electricity at 6-17d. per unit pays more than double the sum paid by a consumer of gas at 3s. 11d. per 1000 cubic feet. I should expect to find, however, from more precise information, that the cost of electricity, at that rate per unit, is somewhere about three times that of gas at 3s. 11d." The average of the charges of the twenty companies is 5-97d. per unit:

| ELECTRICITY.          |                                   |                   |                   |                                |                 |                 |               |                   |             |                                 | GAS.                  |                   |                      |
|-----------------------|-----------------------------------|-------------------|-------------------|--------------------------------|-----------------|-----------------|---------------|-------------------|-------------|---------------------------------|-----------------------|-------------------|----------------------|
| Name of Company.      | Population of Gas Company's Area. | No. of Consumers. | Capital Expended. | Charge per Unit Sold. Average. | Total Receipts. | Total Expenses. | Gross Profit. | Interest Charges. | Net Profit. | Set Aside to Meet Depreciation. | Price per 1000 C. Ft. | No. of Consumers. | No. of Public Lamps. |
| Altrincham . . .      | 25,000                            | ..                | £ 27,205          | d. 4'48                        | £ 3,857*        | £ 2739          | £ 1118        | £ ..              | £ 1118      | £ ..                            | s. d. 2 9             | 3,000             | 695                  |
| Bournemouth . . .     | 60,000                            | ..                | 86,408            | 6'53                           | 9,863           | 6281            | 3582          | 3674              | 92½         | ..                              | 3 6                   | 3,734             | 1508                 |
| Cambridge . . .       | 47,000                            | 329               | 43,922            | 6'35                           | 6,623           | 4162            | 2461          | 48                | 2413        | 700                             | 2 10                  | 4,653             | 1300                 |
| Chelmsford . . .      | 15,000                            | 210               | 19,110            | 6'50                           | 3,187           | 2262            | 925           | 290               | 635         | ..                              | 4 0                   | 918               | 62                   |
| Crystal Pal. District | ..                                | 230               | 77,965            | 6'49                           | 4,604           | 5244            | 640§          | 989               | 1629§       | ..                              | 2 7                   | 20,780            | 2931                 |
| Dover . . . . .       | 40,000                            | ..                | 62,836            | 5'19                           | 5,301           | 4070            | 1231          | 1923              | 692½        | ..                              | 2 6                   | 2,627             | 852                  |
| Eastbourne . . .      | 45,000                            | 306               | 53,543            | 7'44                           | 8,003           | 4784            | 3219          | 1373              | 1846        | 3025                            | 2 10                  | 3,609             | 1115                 |
| Hastings . . . .      | 80,000                            | 287               | 54,734            | 5'94                           | 8,913           | 5455            | 3458          | 1351              | 2107        | 502                             | 3 0                   | 7,626             | 1489                 |
| Hove . . . . .        | ..                                | 397               | 66,896            | 6'12                           | 7,269           | 3707            | 3562          | 915               | 2647        | 914                             | 3 3 | \|\| | \|\| |
| Kelvinside . . .      | ..                                | ..                | 26,426            | 5'48                           | 1,576           | 1080            | 496           | 705               | 209§        | ..                              | ..                    | ..                | ..                   |
| Preston . . . . .     | 120,000                           | 450               | 70,200            | 4'91                           | 7,868           | 4454            | 3414          | 1188              | 2226        | 2018                            | 3 1                   | 23,000            | 3000                 |
| Northampton . .       | 70,000                            | ..                | 30,880            | 6'35                           | 3,295           | 2385            | 910           | 411               | 499         | 1350                            | 2 3                   | 7,830             | 1511                 |
| Norwich . . . .       | 101,000                           | ..                | 78,642            | 4'38                           | 11,708          | 7907            | 3801          | 805               | 2996        | 6500                            | 3 6                   | 8,207             | 1712                 |
| Oxford . . . . .      | 53,000                            | 317               | 84,545            | 5'69                           | 8,576†          | 4782            | 3794          | 1499              | 2295        | ..                              | 3 0                   | 4,880             | 1100                 |
| Pontypool . . .       | 23,000                            | ..                | 7,790             | 6'00                           | 1,040           | 752             | 288           | 78                | 210         | 306                             | 3 6                   | 415               | 190                  |
| Reading . . . . .     | 61,000                            | 201               | 42,412            | 5'94                           | 3,210           | 3257            | 47§           | 641               | 688§        | 862                             | 2 10                  | 4,625             | 1327                 |
| Richmond (Surrey).    | 30,000                            | 191               | 44,794            | 6'79                           | 4,469†          | 2785            | 1684          | 644               | 1040        | 500                             | 3 0                   | 3,839             | 885                  |
| Scarborough . .       | 35,000                            | 330               | 35,563            | 5'70                           | 5,129           | 3458            | 1671          | 18                | 1653        | 250                             | 2 10                  | 6,130             | 1363                 |
| Windsor . . . .       | 22,000                            | ..                | 20,469            | 7'15                           | 1,733           | 1191            | 542           | ..                | 542         | ..                              | 3 6                   | 1,050             | 262                  |
| Woolwich . . . .      | ..                                | ..                | 15,745            | 6'00                           | 1,904           | 1827            | 77            | 205               | 128§        | ..                              | 2 3 | \|\| | \|\| |

\* Includes profit on sales, £486. † Including other receipts, £417. ‡ Includes other receipts, £539. § Deficit.

|| Not separated from consumers in adjoining places.

of those of the companies in the final group, 6-11d. The prices charged by the Crystal Palace District Company are 7d., 6½d., and 6d.—giving an average of 6-49d. per unit sold; and as each unit cost them 7-66d. for generating, distributing, and management charges, the loss resulting was at the rate of 1-17d. per unit sold.

Mr. Orford says the most palpable weakness is shown in connection with the writing-off of depreciation. He points out, very justly, that mains and machinery cannot, year by year, be maintained up to prime condition, so that the renewals and replacements must fall in heavily at unknown and uneven periods. It must also be borne in mind that a company must sell their undertaking after a 42 years' life if the local authority desire it, and sell it, not as a going concern, but for the then value of the lands, buildings, works, materials, and plant—due regard being had to the nature and then condition of such buildings, &c., and to the state of repair thereof, and to their suitability, but without addition for compulsory purchase, for goodwill, or for any profits which may or might have been made from the undertaking; and yet the above table shows that, with the solitary exception of Norwich, not one of the twenty companies dealt with have made any provision worth the name

of a depreciation fund—a fund which should, under the peculiar circumstances referred to, secure to the shareholder the return of his capital.

The Newport (Mon.) Gas Company have lately been sending to their consumers a circular containing comparisons between gas and electric lighting, which have probably surprised many of them, as it certainly has the Editor of the "Western Mail," who last Wednesday devoted a leaderette to the subject. He says: "The circular which the Company has sent out is, on the face of it, essentially a claim for gas, which, of course, is natural, coming from a concern which makes and sells that article. But the comparison is so extraordinary that no apology is needed for making it widely known—the qualifying proviso being understood that it is *ex parte*. The new Welsbach burner is stated to give a light of from 25 to 30 candles per cubic foot of gas; and taking gas at 3s. per 1000 cubic feet—the price in vogue at Newport—and assuming the burner to be in use 1000 hours in a year, the cost for a light of 25-candle power for 1000 hours would be 3s. A 16-candle power electric incandescent lamp is estimated in 1000 hours



to absorb energy represented by 60 units, which at 6d. per unit costs 30s. The example is extended to a house having ten lights; and, on the basis of the figures already given, the cost of gas passing by a Welsbach burner and giving 25-candle power illumination comes in 1000 hours to £1 10s., whereas electricity at 6d. per unit runs away, in giving the same results, with £23 8s. 9d.—a balance of £21 18s. 9d. in favour of gas. The suggestion naturally occurs that the cost of renewing mantles and burners for gas makes the figures fallacious. But when it is claimed that burners, mantles, and shades of the best design cost from 8s. to 10s., as against 30s. per lamp for electricity (including wiring), we begin to open our eyes, and we go on to gaze with wonder when we see that contracts may be made to inspect and clean incandescent burners and renew mantles at 2s. per burner per annum. The electricians will, no doubt, answer these statements; and they certainly need a good deal of answering."

METROPOLITAN WATER SUPPLY COMMISSION.

Forty-Second Day—Monday, Dec. 19.

(Viscount LLANDAFF, Chairman, Sir G. B. BRUCE, M.Inst.C.E., Major-Gen. A. DE COURCY SCOTT, R.E., Mr. A. DE BOCK PORTER, C.B., Mr. H. W. CRIPPS, Q.C., and Mr. R. LEWIS.)

The Commission sat at the Guildhall, Westminster.  
The following are the Counsel engaged: Mr. POPE, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., for the New River and the Southwark and Vauxhall Water Companies; Mr. LITTLER, Q.C., and Mr. LEWIS COWARD for the Kent Water Company; Mr. PEMBER, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. RICKARDS for the Chelsea Water Company; Lord R. CECIL for the Hertfordshire County Council; Sir JOSEPH LEESE, Q.C., M.P., for the Kent County Council and Kent Local Authorities; Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN, Q.C., for the London County Council; Sir R. NICHOLSON for the Middlesex County Council; and Mr. GABRIEL P. GOLDNEY (Remembrancer) for the Corporation of the City of London.

Mr. Charles Hawksley, examined by the CHAIRMAN, said he had had considerable experience in the design and construction of water-works for provincial companies and local authorities. He was formerly in partnership with his father, who had as much experience of water matters as anyone in the country. In opening, he said he purposed dealing with the London Water Question as a whole, and not in relation to any individual Companies, which he understood was the aspect the Commission had to consider; and he had adhered as closely as possible to the finding of the Balfour Commission. This Commission based their calculations on a population in Greater London in 1891 of 5,656,909, and in the outlying parts of Water London of 76,041; and on a population actually supplied of 5,237,062. The latter figure did not quite agree with that of the Water Examiner—viz., 5,232,155; but he could not explain the difference.

Witness handed in a table showing the increase per decennium of population from 1891 to 1941, based on a growth for Greater London at the rate of 18·2 per cent. per decennium, and for the outlying parts of Water London at the rate of 19·7 per cent. per decennium—the figures of Lord Balfour's Commission. According to this, the population would be 13,043,712 in 1941. The experience of the past seven years showed that the calculations of the Balfour Commission in regard to this matter were on the safe side. In considering future requirements, he had taken 35 gallons per head daily, on the finding of the Balfour Commission, as a safe basis, though he thought this might be an excessive amount. Witness handed in another table giving the daily average supply of the population, as it increased year by year, from 1891 to 1897, based on the Water Examiner's returns, which supplies showed smaller quantities than if they had been calculated on the rates of increase (18·2 and 19·7 per cent. per decennium) assumed by the Balfour Commission. The average daily supply in 1897 was 202,102,544 gallons. To meet the daily quantity required, the Balfour Commission reckoned upon 52½ million gallons daily from the Lea, 40 million gallons from wells in the Lea Valley, and 27½ million gallons from the Kent Company's district—a total of 120 million gallons a day. There was thus left to come from the Thames, or wells in the Thames Valley, the difference between 120 million gallons and the daily quantity required. The total quantity would, on his table, rise in 1941 to 343 million gallons odd daily. He was of opinion that the Thames alone would suffice to furnish this additional supply. He had given a great deal of attention to this subject, and was convinced that the Thames would not only supply this 343 million gallons a day, but much more besides.

By Mr. DE BOCK PORTER: When all the available water of the Thames had been used up, it would be necessary to go elsewhere.

Mr. DE BOCK PORTER: For the next hundred years, at all events, you think it will not be necessary to go to Wales?

Witness: I do not think so.

The CHAIRMAN: Not even to secure a claim to the Welsh water, without going to the expense of works to bring it?

Witness: Well, if Parliament will allow water to be secured in advance in that way, I do not know that there is any objection, except that the money will be lying idle.

Mr. DE BOCK PORTER: You think it an unnecessary precaution at the present time?

Witness: Yes, at all events until there is talk of appropriation.

The CHAIRMAN: You do not regard even the 343 million gallons a day to be obtained from the Thames in 1941 as the limit of supply to be derived from the river?

Witness: I think more might be obtained.

Have you fixed the limit at which you would stop—at which it would be improper to take more?—No; but I can give you the data on which I could fix it. It would depend on the quantity which is allowed to flow over Teddington Weir, and on the limit which would be placed to an extension of the storage system by financial considerations.

What do you think is the proper limit of the quantity to have flowing over Teddington Weir?—I think that the limit might very properly be reduced

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1460.

| Issue.         | Share. | When ex- Dividend. | Dividend or Dividend & Bonus. | NAME.                           | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. | Issue.                     | Share.  | When ex- Dividend. | Dividend or Dividend & Bonus. | NAME.                                 | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |  |  |  |  |  |  |  |
|----------------|--------|--------------------|-------------------------------|---------------------------------|-----------------|---------------------|------------------------|----------------------------|---------|--------------------|-------------------------------|---------------------------------------|-----------------|---------------------|------------------------|--|--|--|--|--|--|--|
| £              |        |                    | p. c.                         |                                 |                 |                     | £ s. d.                | £                          |         |                    | p. c.                         |                                       |                 |                     | £ s. d.                |  |  |  |  |  |  |  |
| GAS COMPANIES. |        |                    |                               |                                 |                 |                     |                        | GAS COMPANIES.             |         |                    |                               |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 590,000        | 10     | Oct. 13            | 10½                           | Alliance & Dublin 10 p.c.       | 21—22           | ..                  | 4 15 5                 | 75,000                     | 5       | Nov. 30            | 6                             | Malta & Medn., Ltd.                   | 42—51           | ..                  | 5 14 8                 |  |  |  |  |  |  |  |
| 100,000        | 10     | "                  | 7½                            | Do. 7 p.c.                      | 16—17           | ..                  | 4 8 3                  | 541,920                    | 20      | Nov. 11            | 5                             | Monte Video, Ltd.                     | 13—14           | ..                  | 7 2 10                 |  |  |  |  |  |  |  |
| 300,000        | 100    | July 1             | 5                             | Australian 5 p.c. Db.           | 105—107         | ..                  | 4 13 6                 | 617,946                    | Stk.    | Aug. 31            | 9½                            | Newc'tle & Gatesh'd Con.              | 232—238         | ..                  | 4 2 8                  |  |  |  |  |  |  |  |
| 200,000        | 5      | Nov. 11            | 6                             | Bombay, Ltd.                    | 61—63           | ..                  | 4 8 11                 | 252,355                    | Stk.    | Jan. 3             | 3½                            | Do. 8½ p.c. Db. Stk.                  | 113—117         | ..                  | 2 19 10                |  |  |  |  |  |  |  |
| 40,000         | 5      | "                  | 6                             | Do. New, £4 paid.               | 41—43           | ..                  | 5 1 1                  | 150,000                    | 5       | Nov. 30            | 8                             | Oriental, Ltd.                        | 7—7½            | ..                  | 5 6 8                  |  |  |  |  |  |  |  |
| 880,000        | Stk.   | Aug. 12            | 12                            | Brentford Consolidated          | 275—280         | ..                  | 4 5 9                  | 135,000                    | 5       | "                  | 8                             | Do. New, £410s. pd.                   | 61—63           | ..                  | 5 6 8                  |  |  |  |  |  |  |  |
| 240,000        | "      | "                  | 9                             | Do. New                         | 210—215         | ..                  | 4 3 9                  | 15,000                     | 5       | "                  | 8                             | Do. do. 1879, £1 pd.                  | 11—11½          | ..                  | 4 11 5                 |  |  |  |  |  |  |  |
| 50,000         | "      | "                  | 5                             | Do. 5 p.c. Prf.                 | 140—145         | ..                  | 3 9 0                  | 60,000                     | 5       | Sept. 29           | 7                             | Ottoman, Ltd.                         | 6—6½            | ..                  | 6 6 2                  |  |  |  |  |  |  |  |
| 159,375        | "      | Dec. 15            | 4                             | Do. 4 p.c. Db. Stk.             | 128—133         | ..                  | 3 0 2                  | 500,000                    | 100     | Dec. 1             | 6                             | People's Gas & 2nd M. of Chicago, Bd. | 102—106         | ..                  | 5 13 2                 |  |  |  |  |  |  |  |
| 220,000        | Stk.   | Sept. 15           | 11½                           | Brighton & Hove Orig.           | 163—168         | ..                  | 4 5 10                 | 848,070                    | 10      | Oct. 13            | 6                             | River Plate Ord.                      | 9—9½            | ..                  | 6 6 4                  |  |  |  |  |  |  |  |
| 226,820        | "      | "                  | 8½                            | Do. A. Ord. Stk.                | 192—196         | +1½                 | 4 6 9                  | 250,000                    | Stk.    | June 29            | 4                             | Do. 4 p.c. Db. Stk.                   | 99—101          | ..                  | 3 19 3                 |  |  |  |  |  |  |  |
| 933,500        | Stk.   | Aug. 31            | 5                             | Bristol, 5 p.c. max.            | 125—130         | ..                  | 3 16 11                | 250,000                    | 10      | Sept. 29           | 10                            | San Paulo, Ltd.                       | 15—16           | ..                  | 6 5 0                  |  |  |  |  |  |  |  |
| 420,000        | 20     | Sept. 29           | 10                            | British                         | 45—47           | ..                  | 4 5 1                  | 135,000                    | Stk.    | Sept. 15           | 10                            | Sheffield A.                          | 242—245         | ..                  | 4 1 8                  |  |  |  |  |  |  |  |
| 50,000         | 10     | Aug. 12            | 11½                           | Bromley, Ord. 10 p.c.           | 26—28           | ..                  | 4 2 2                  | 209,053                    | "       | "                  | 10                            | Do. B.                                | 242—245         | ..                  | 4 1 8                  |  |  |  |  |  |  |  |
| 75,000         | 10     | "                  | 8½                            | Do. 7 p.c.                      | 20—22           | ..                  | 3 17 3                 | 447,427                    | "       | "                  | 10                            | Do. C.                                | 242—245         | ..                  | 4 1 8                  |  |  |  |  |  |  |  |
| 500,000        | 10     | Oct. 13            | 6                             | Buenos Ayres (New) Ltd          | 91—100          | ..                  | 6 0 0                  | 5,600,000                  | Stk.    | Aug. 12            | 5½                            | South Metrop., 4 p.c. Ord.            | 136—139         | ..                  | 3 16 7                 |  |  |  |  |  |  |  |
| 98,122         | Stk.   | June 29            | 4                             | Do. 4 p.c. Db. Stk.             | 98—100          | ..                  | 4 0 0                  | 1,460,000                  | "       | July 14            | 3                             | Do. 3 p.c. Db. Stk.                   | 102—105         | ..                  | 2 17 2                 |  |  |  |  |  |  |  |
| 150,000        | 20     | July 14            | 8                             | Cagliari, Ltd.                  | 29—30           | ..                  | 5 10 0                 | 60,000                     | Stk.    | Aug. 31            | 12                            | Tottenham & A.                        | 280—290         | ..                  | 4 2 9                  |  |  |  |  |  |  |  |
| 100,000        | 10     | Sept. 29           | 7                             | Cape Town & Dis., Ltd.          | 14—15           | ..                  | 4 13 4                 | 60,000                     | "       | "                  | 9                             | Edmonton J. B.                        | 200—210         | ..                  | 4 5 9                  |  |  |  |  |  |  |  |
| 50,000         | 50     | Nov. 2             | 6                             | Do. 6 p.c. 1st Mort.            | 57—59           | ..                  | 5 1 8                  | 182,380                    | 10      | June 10            | 7                             | Tuscan, Ltd.                          | 10—11           | ..                  | 6 7 3                  |  |  |  |  |  |  |  |
| 550,000        | Stk.   | Oct. 13            | 13½                           | Commercial Old Stock.           | 310—315         | ..                  | 4 5 9                  | 149,900                    | 10      | July 1             | 5                             | Do. 5 p.c. Dbs. Red.                  | 160—168         | ..                  | 4 17 1                 |  |  |  |  |  |  |  |
| 200,750        | "      | Dec. 15            | 10½                           | Do. New do.                     | 240—245         | ..                  | 4 5 9                  | WATER COMPANIES.           |         |                    |                               |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 200,750        | "      | "                  | 4½                            | Do. 4½ p.c. Db. dc.             | 145—150         | ..                  | 3 0 0                  | Chelsea, Ord.              | 815—820 | ..                 | 8 8 9                         |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 800,000        | Stk.   | Dec. 15            | 10                            | Continental Union, Ltd.         | 200—205         | ..                  | 4 17 7                 | Do. 5 p.c. Prf.            | 170—175 | ..                 | 2 17 2                        |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 200,000        | "      | "                  | 7                             | Do. 7 p.c. Prf.                 | 187—192         | ..                  | 3 12 11                | Do. 4½ p.c. Pf. Stk., 1875 | 148—152 | ..                 | 2 19 3                        |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 51,600         | Stk.   | Aug. 31            | 14                            | Croydon A 10 p.c.               | 305—310         | ..                  | 4 0 4                  | Do. 4½ p.c. Db. Stk.       | 157—162 | ..                 | 2 15 7                        |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 168,400        | "      | "                  | 11                            | Do. B 7 p.c.                    | 255—265         | ..                  | 4 3 0                  | Do. 4½ p.c. Db. Stk.       | 210—215 | -2                 | 3 5 1                         |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 555,000        | Stk.   | Aug. 12            | 5½                            | Crystal Palace Ord. 5 p.c.      | 125—130         | ..                  | 4 0 9                  | Do. 4½ p.c. Db. Stk.       | 158—162 | ..                 | 2 15 7                        |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 60,000         | "      | "                  | 5                             | Do. 5 p.c. Prf.                 | 140—145         | ..                  | 3 9 0                  | Do. 4½ p.c. Db. Stk.       | 102—104 | ..                 | 2 17 8                        |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 466,090        | 10     | July 28            | 11                            | European, Ltd.                  | 28—24           | ..                  | 4 11 8                 | Do. 4½ p.c. Db. Stk.       | 112—115 | ..                 | 3 5 3                         |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 5,922,280      | Stk.   | Aug. 12            | 12½                           | Do. 47 10s. paid.               | 17—18           | ..                  | 4 11 9                 | G'd Junction, 10 p.c. max. | 138—143 | ..                 | 2 15 11                       |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 100,000        | "      | "                  | 4                             | Gaslight & Coke, A Ord          | 285—290         | ..                  | 4 4 6                  | Do. 4 p.c. Db. Stk.        | 365—370 | ..                 | 3 15 8                        |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 605,000        | "      | "                  | 10                            | Do. B, 4 p.c. max.              | 120—125         | ..                  | 8 4 0                  | Kent                       | 212—217 | ..                 | 3 4 6                         |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 30,000         | "      | "                  | 5                             | Do. C, D, E, 10 p.c. Prf.       | 308—313         | ..                  | 3 3 11                 | Lambeth, 10 p.c. max.      | 800—805 | ..                 | 3 8 10                        |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 60,000         | "      | "                  | 7½                            | Do. F, 5 p.c. Prf.              | 152—157         | ..                  | 3 3 8                  | Do. 7½ p.c. max.           | 280—285 | ..                 | 3 9 10                        |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 1,900,000      | "      | "                  | 7                             | Do. G, 7½ p.c. do.              | 283—288         | ..                  | 3 3 0                  | Do. 4 p.c. Db. Stk.        | 138—143 | ..                 | 2 15 11                       |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 469,000        | "      | "                  | 10                            | Do. H, 7 p.c. max.              | 195—200         | ..                  | 8 10 0                 | Do. 4 p.c. Db. Stk.        | 432—437 | +2                 | 3 0 8                         |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 476,000        | "      | "                  | 6                             | Do. J, 10 p.c. Prf.             | 308—313         | ..                  | 3 3 2                  | Do. 4 p.c. Db. Stk.        | 138—143 | ..                 | 2 15 11                       |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 1,061,150      | "      | Dec. 15            | 4                             | Do. K, 6 p.c. Prf.              | 185—190         | ..                  | 3 0 7                  | New River, New Shares      | 182—187 | +5                 | 4 0 3                         |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 294,850        | "      | "                  | 4½                            | Do. 4 p.c. Db. Stk.             | 190—192         | ..                  | 3 0 0                  | Do. 4 p.c. Db. Stk.        | 168—171 | +3                 | 4 5 9                         |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 955,000        | "      | "                  | 6                             | Do. 4½ p.c. do.                 | 145—150         | ..                  | 3 0 0                  | Do. do. 5 p.c. Prf.        | 168—171 | ..                 | 2 18 6                        |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 70,000         | 10     | Nov. 11            | 8                             | Do. 6 p.c. do.                  | 195—200         | ..                  | 3 0 0                  | Do. 4 p.c. A Db. Stk.      | 138—143 | ..                 | 2 15 11                       |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 3,800,000      | Stk.   | "                  | 10                            | Hongkong & China, Ltd.          | 131—142         | ..                  | 5 10 4                 | West Middlesex             | 290—295 | ..                 | 3 7 9                         |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 376,400        | 100    | Aug. 2             | 4                             | Imperial Continental            | 225—230         | +2½                 | 4 6 11                 | Do. 4½ p.c. Db. Stk.       | 160—165 | ..                 | 2 15 3                        |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 473,600        | Stk.   | Aug. 12            | 3½                            | Do. 8½ p.c. Dbs. Red.           | 98—101          | ..                  | 3 19 3                 | Do. 8 p.c. Db. Stk.        | 102—105 | ..                 | 2 17 2                        |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 560,000        | 100    | Oct. 1             | 5                             | Do. 8½ p.c. Db. Stk.            | 102—105         | ..                  | 3 6 8                  | Ex div.                    |         |                    |                               |                                       |                 |                     |                        |  |  |  |  |  |  |  |
| 250,000        | 100    | "                  | 4½                            | Met. of Mel- bourne 4½ p.c. Db. | 110—112         | ..                  | 4 9 3                  |                            |         |                    |                               |                                       |                 |                     |                        |  |  |  |  |  |  |  |
|                |        |                    |                               |                                 | 105—107         | ..                  | 4 4 1                  |                            |         |                    |                               |                                       |                 |                     |                        |  |  |  |  |  |  |  |

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to 100 million gallons a day, and to an even smaller quantity in exceptional years. In dealing with the subject, however, I have adhered to 200 million gallons, because I understood you wished this figure to be kept to as far as possible.

In further examination, witness said he concurred in Messrs. Hunter and Middleton's estimates for the extension of the Staines scheme to enable 400 million gallons a day to be taken from the Thames. The drought of this year caused an extension of the storage calculated as necessary to obtain the various daily quantities from the Thames. In his calculations, he had assumed that if the drought of 1898 recurred annually, the storage provided would be sufficient. He put in a table showing the reservoirs necessary to supply the requirements of London in the years 1921, 1931, and 1941; the total figures being 19,376, 30,176, and 40,976 million gallons respectively. These figures included the storage for 15,776 million gallons required for a daily supply of 185½ million gallons already authorized. The cost of this was not included in the Thames estimates, because it would have to be provided even if the further supply were obtained from Wales. He allowed only 10 per cent. for evaporation and bottom water, which, in his judgment, was quite sufficient. He could not, however, refer to any actual experience in support of this allowance.

Mr. DE BOCK PORTER: Is there any customary allowance?

Witness: No; usually we make no allowance. You see, there is the rainfall on the surface of the reservoirs, which counteracts to a great extent the evaporation. As to the bottom water, it is only very occasionally that we resort to it.

By Major-General SCOTT: In the case of reservoirs formed by a dam across a valley, everything brought down by the rain would enter the reservoirs; and in the course of time (unless they were cleaned out), they would become entirely filled up, as had occurred with some lakes. In the case of the pumping reservoirs, the pumping was always at a certain height above the bottom of the river; and therefore it would not take the worst and most heavily charged water. The enormous reservoirs to be constructed at Staines would be cleaned out as occasion arose—say, in a period of great drought, as in the present year. Assuming there was always water in the reservoirs, there would be no waste from evaporation. The rainfall would quite make up for evaporation on the whole.

Further examined by the CHAIRMAN: His figures of the future storage required were somewhat larger than those of Mr. Middleton; the reason being that Mr. Middleton took the drought of 1898 to have ended in October, whereas witness (coming after Mr. Middleton) knew the drought continued into November, which fact led him to allow an increase in the estimated storage. He did not think it was necessary to reject any flood water, unless the various Engineers of the Companies were of that opinion, having regard to the condition of their filter-beds. There would be no difficulty in filling these enormous reservoirs in time of flood.

Major-General SCOTT: Sir Edward Frankland has always laid considerable stress, has he not, on the necessity of leaving flood water in the river when taking water for use?

Witness: I think you will have evidence from some of the most eminent Chemists of the day that this is not a necessity.

Elaborate tables were then put in by witness, giving his estimates of the cost of the Thames scheme to 1941, which were slightly larger than those of Mr. Middleton. This fact was due to witness having taken more account of the drought of 1898 than Mr. Middleton had done. The capital cost was based on the actual contract prices for the authorized Staines reservoirs; and the pumping charges were calculated on actual experience. The cost of labour had risen considerably, and was likely to continue to rise; but this fact would not impair a comparison between the Welsh and Thames schemes, because it would be common to both. It would affect the argument on analogy, by adding a sum to the estimate of the cost of the Welsh scheme—seeing that those works obviously would have to be constructed in the future. In his estimate of the Thames scheme, he treated the cost of pumping as an annual charge to be borne in perpetuity. In his estimate of the cost of the Welsh scheme, he accepted (in order to preclude discussion) the figures of Sir A. Binnie, though he was convinced, from general experience, that the scheme could not be carried out for the sums given by Sir A. Binnie. Witness next handed in another table contrasting the cost of the Welsh and Thames schemes.

The CHAIRMAN: From this table, it appears that up to the year 1941 the capital expenditure in the case of the Welsh scheme, reckoning on Sir A. Binnie's figures, will exceed your estimate of the Thames scheme by £6,781,402.

Mr. PORE: That is the capital cost.

Witness: Yes.

The CHAIRMAN: The annual expenditure for interest alone in the Welsh scheme, by 1941, will exceed the expenditure for both interest and pumping in the Thames scheme by the sum of £28,273 per annum?—Yes, in perpetuity; and this notwithstanding that the rate of interest against the Thames scheme was charged at one-eighth more than against the Welsh scheme.

On the other hand, the annual expenditure in 1941 in the case of the Welsh scheme will be £5,464,179 in excess of the corresponding expenditure for the Thames scheme?—That is so.

These excesses will have to be paid for by the water consumers or the ratepayers?—Yes.

You do not, in this or any other table, make any charge for a sinking fund?—None whatever.

Well, if the Companies continue as they are, I suppose the Thames scheme will escape from any sinking fund charge in the strict sense of the word. There will be sinking fund clauses; but there will be no sinking fund charges. But, on the other hand, if any public body purchases the Companies, the probability is that Parliament will impose a sinking fund to redeem the debt in a given number of years?—Yes; but I have not thought it fair to take that into account.

What do you say as to the comparative merits of public and private management of water undertakings?—I think that the management is generally better in the case of a company. A company is not subject to being influenced by political considerations, which is generally the case with a public authority; and they look at matters from a more solid and commercial basis. Then, again, the company are looked after by the

# JOSEPH AIRD

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local authority, who are constantly keeping them up to the mark; whereas there is no one to look after a local authority. The result of this may be seen in many places—Leicester for example. I think the water famine was worse in Leicester than in East London.

Is it not your experience that corporations or public bodies who have acquired the supply in their districts have ultimately reduced the charge?—Usually not until a considerable period has elapsed. Then they have, in many instances, been able to effect a reduction; but in the meantime there has very frequently been a large loss incurred, until the time when the revenue balanced the expenditure.

That is, ultimately the increase of income goes for the benefit of the water consumers, instead of for the benefit of the shareholders?—Yes; but in the meantime the water consumers or the ratepayers have had to bear a very considerable loss, and there are instances where the charges have actually been increased. At Heywood, Blackburn, and Rochdale the charges have been raised; while at Cardiff, Swansea, Liverpool, Manchester, and Bradford rates-in-aid have been imposed. In numerous places where a profit, great or small, is now shown, large losses have accrued in previous years—as at Huddersfield.

Is it not a general rule of purchase by corporations that they go through a period of stress and extra expenditure (loss, if you like), but that they recover themselves at last and have a surplus?—I think that if they pay a fair sum for the undertaking they purchase, including an amount due for future prospects, it follows that there must be a loss in the earlier years, because they are purchasing practically a deferred annuity. The people receiving the ultimate advantage are not always those who provide the deficiencies.

You contend that these water undertakings are capable of being ultimately worked at a profit?—I think ultimately they will be, if the rates are sufficiently high.

Take the London Companies. Are not their rates sufficiently high to yield a profit to any public authority who works them with decent economy and skill?—If they adhere to the Thames as a source, certainly. If they go elsewhere, it is a question.

Do you know of any corporation that would like to go back to private management?—Oh, no; because, quite apart from the results, they would not like to give up the power and patronage which the control of the water-works gives them.

Do you think if the consumers were polled they would like to go back?—It is very difficult to say, because the consumers generally can seldom understand these matters.

Witness then handed in very extensive tables, giving particulars of water charges in the towns of England of over 100,000 population, and the corresponding figures with regard to the London Companies. In the majority of cases, the London charges were below the average of the provincial towns.

The CHAIRMAN remarked that, as far as he could see, it was the poorer parts of London that were worst off. The districts supplied by the Southwark and Vauxhall, the Lambeth, and East London Companies were the only ones where the charge was higher than in the provincial towns.

Witness said that even there the poor people got their water cheaper

than in the towns in his table, because it was only in the case of the more highly-rented houses that the charge was higher. Continuing, witness said his objection to charge by meter was that it was liable to induce the use of a smaller quantity of water among the poorer classes. He thought this point, however, would be sufficiently met by starting the meter charge after supplying a quantity of water sufficient to abundantly satisfy the character and requirements of each house. Still, an objection to even this system was that the rent for the meter would come to more than the amount which the consumer now paid for the water; so that in the case of the poorer classes, the rent of the meter and the cost of the water would come to double, or more than double, what they now paid.

After some conversation, it was decided that, as there was not sufficient evidence at present available to occupy a day, the Commission should adjourn till Jan. 9.

The CHAIRMAN remarked that the Companies had had ample notice to be prepared with their evidence; and that, while not desiring to shut out any evidence, if it was not ready when required, the Commission would go on without it.

## THE EMPLOYERS' PARLIAMENTARY COUNCIL.

### Constitution and Rules.

In the last number of the "JOURNAL," reference was made, in the "Editorial Notes," to the formation of the Employers' Parliamentary Council, under the presidency of the Earl of Wemyss (Mr. George Livesey being one of the Vice-Presidents), with the object of watching over the interests of both employers and employed, which are continually being attacked in what is popularly known as the cause of Labour. We have received a copy of the constitution and rules of the new body; and we give them to show the lines upon which its operations are intended to be carried on.

- 1.—The Council shall be called the Employers' Parliamentary Council.
- 2.—The Parliamentary Council shall consist of the Chairman or other accredited representatives of Associations of Employers, and of individual employers, connected with the various trades and industries in the United Kingdom, with power to add to its number such other representatives or individual employers as the Council may consider it advisable to elect for any special purpose.
- 3.—The Parliamentary Council shall appoint an Executive Committee, which shall meet at regular intervals during the parliamentary session, and at such other times as may be necessary. The Executive Committee shall have power to convene the Parliamentary Council when required.
- 4.—It shall be the duty of the Secretary to send to each member of the Parliamentary Council a copy of every Bill introduced into either House of Parliament dealing with matters affecting the interests of trade generally, or of any industry in particular, together with a short digest of the Bill, with a request that the members of the Parliamentary Council will bring the Bill before their respective Associations or Committee thereof, and

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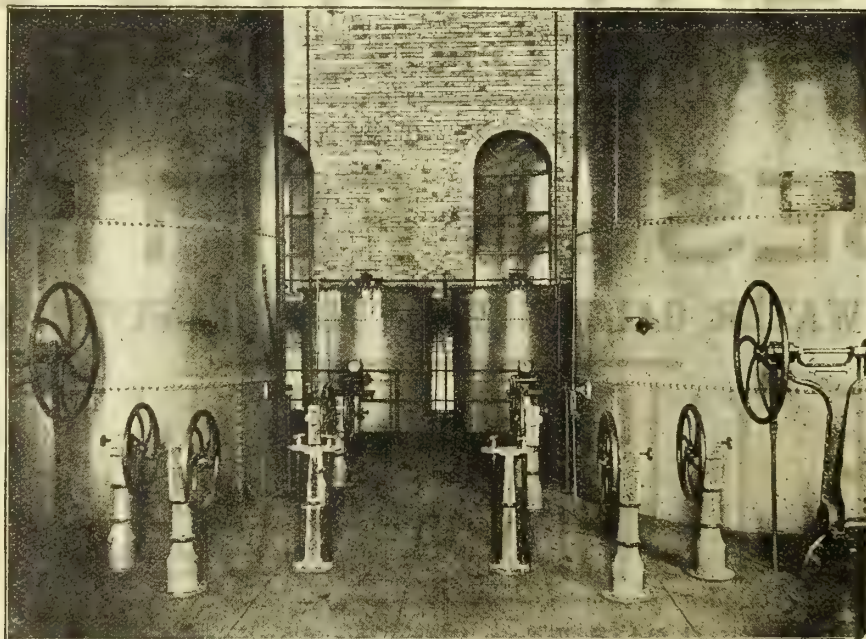
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obtain instructions to act at the meeting of the Parliamentary Council at which the Bill will be considered and the action of the Parliamentary Council thereon determined.

5.—During the parliamentary session, the Parliamentary Council shall issue, as often as necessary, a list of Bills promoted, supported, or opposed by them, for distribution among Members of Parliament and the Press; such list to contain a short summary of each Bill, a statement of the reasons of the Parliamentary Council for supporting the Bill, or the reasons of the Council for opposing it (as the case may be), together with the names of the Members of Parliament introducing the Bill, and particulars of the stage, date, and order of the Bill.

6.—The Parliamentary Council shall draft, sign, and present to Parliament petitions in favour of, or against, any Bills in respect of which action is taken by the Council.

7.—No action shall be taken in promoting, supporting, or opposing any Bill or Motion before Parliament in the name of the Parliamentary Council unless such action has the unanimous consent of the representatives of the particular Associations of Employers on the Parliamentary Council whose industry might be affected thereby, and is approved by a two-thirds majority of the representatives on the Council present at the meeting at which such a Bill or Motion is considered.

8.—The Parliamentary Council shall, whenever advisable or necessary, prepare or cause to be prepared, in leaflet or other form, detailed statements of "Reasons" in favour of, or against, Bills supported or opposed by the Council; and these "Reasons" shall be circulated among Members of Parliament, the Press, and in such other quarters as may seem desirable.

9.—In addition to the joint action of the Parliamentary Council in respect to any Bill or Motion before Parliament, the Council shall request the Associations having representatives on the Council to take individual action in respect to such Bill or Motion, particularly in the direction of bringing influence to bear on local Members of Parliament to support the action of the Council. To this end the Council shall draft petitions and resolutions, and supply copies of "Reasons," &c., for use by the individual Associations.

10.—The Parliamentary Council shall, whenever necessary or desirable, arrange deputations to Ministers for the purpose of laying before them the views of the trades of the United Kingdom with regard to Bills or Motions before Parliament, or with regard to any reform or amendment of the law which the Council may desire to see brought about.

11.—The Secretary of the Parliamentary Council may be empowered to act as the Parliamentary Agent of the Council; and it shall be his duty to give effect to the resolutions of the Council in accordance with such instructions as may be given by the Council from time to time.

12.—The Parliamentary Council shall take steps to ensure that their views on proposed legislation shall be brought under the notice of candidates at parliamentary elections.

13.—The general expenses of the Parliamentary Council shall be defrayed by contributions from the various Employers' Associations and individual employers represented on the Council, or who have signified their adhesion to the Council. Personal expenses incurred by members of the Council in

connection with their attendance at the meetings of the Council shall not be chargeable to the Council.

14.—The minimum annual subscription payable by Associations, or individual employers who are members of the Council, towards the funds of the Parliamentary Council shall be ten guineas; and the Parliamentary Council shall have power to make a levy on the Associations, or on the individual employers aforesaid, to meet any special expenditure—such levy not to exceed in any year one halfpenny per person employed by such Association or individual.

#### NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners held their monthly meeting on Monday, with Bailie Kinloch Anderson, the Convener of the Works Committee, in the chair. The report by the Engineer (Mr. W. R. Herring) showed that the output of gas during November was 10,492,000 cubic feet greater than in the same month of last year; and that since May 16, the increased output had been 22,174,300 cubic feet. The Chairman said that the increase during November was nearly 5 per cent. Of course, they must bear in mind that the weather in November was extremely dull; but most Novembers were alike, and this was a comparison of one November with another. The report showed that although electricity was going ahead, they were doing very well in the Gas Commission. The Works Committee had considered a circular which had been prepared by Mr. Herring, to be issued to builders, in which it was pointed out that many houses in course of erection were being wired for electricity, but no provision was being made for the use of gas (whereas there might be many people who would like to have gas for cooking and heating purposes); and the public, as well as the Gas Commission, were thereby put to great inconvenience. The Commissioners approved of the issue of the circular. The Chairman stated that an inquiry had been received as to the ground in Salamander Street, which the Commissioners purchased some years ago with the view of extending the Leith works. As they knew, they were now going to erect new works at Granton; and the ground at Salamander Street would not be required. The offer they had received was many times the price they paid for the ground; but the Works Committee had resolved that they would not sell any part of it at Leith, until they could put the whole of the Leith site into the market, when they would have a much better chance of realizing a good price. This, also, was agreed to.

A statement was submitted by the Engineer, showing in detail the output of gas, with the cost per ton of coal and per 1000 cubic feet of gas, for every year since the institution of the Commission in 1888. In Edinburgh, the output of gas has increased from 736,837,000 to 1,102,892,000 cubic feet; in Leith, from 349,886,000 to 562,323,000 cubic feet; and in Portobello (from 1896, when the gas undertaking there was acquired), from 22,000,000 to 43,336,000 cubic feet. In Edinburgh, in 1888 the average cost of coal per ton was 12s. 5d., and the yield of gas per ton 9825 cubic feet; last year the average cost of coal was 10s. 10d., and

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the yield of gas 10,482 cubic feet. The total cost of gas in 1888 amounted to 20-41d. per 1000 cubic feet; in 1896-97, it was 23-43d.; and last year, it was 20-40d. In Leith, the average cost of coal in 1888 was 10s. 5d. per ton, and the yield of gas per ton 9751 cubic feet; last year the cost of coal was 10s. 5d., and the yield of gas 10,540 cubic feet. The total cost of gas in 1888 amounted to 18-43d. per 1000 cubic feet; in 1896-97, it was 21-41d.; and last year, it was 20-97d. In Portobello, in 1896 the total cost of producing gas amounted to 23-93d., and last year to 26-75d. per 1000 cubic feet.

The Forfar Gas Corporation have, it is to be presumed, at last got to a quiescent stage in the matter of the conduct of the gas undertaking. On Monday night, they had before them the report by the two independent Auditors (Messrs. Bennie and M'Lees) on the books of the Corporation. The recommendations in the report were: (1) That the Manager draw from the Treasurer the money required to meet the petty expenses in connection with his office, and that a list of these be monthly laid before the Committee; (2) that the Treasurer shall make up a form of annual return, to be filled up by the Manager after June 15 each year, so that the entries falling to be made annually by the Treasurer shall correspond with the collector's books at the works; and (3) that a fee of £10 10s. be allowed the Auditors for their trouble. Mr. J. W. Adamson said that no doubt the report was a most voluminous one; but he looked upon it as a most unnecessary work altogether. Provost M'Dougall said he took quite a different view of the usefulness of the report. They knew that for a year or two they had had very heated discussions, which had perhaps left reflections that the gas-works were not in proper order, and that the books were badly kept. The report showed that everything was well kept in every way. It was satisfactory to know that the Auditors had not been able to point to anything detrimental to the working, though one or two improvements were recommended which would be attended to. The report had done good, because it had cleared up the whole concern and showed that there was nothing wrong. The report was adopted. Were it not that I approve of peaceful measures in all instances, I would venture to express regret at the adoption of the report. The movement for this re-audit was conceived in a spirit of antagonism to the Gas Manager, who, be it remembered, is not the book-keeper; and it has failed. I wonder where the Corporation find powers to pay the fee to the Auditors. There is an Auditor appointed under the statute; and to go beyond his report cannot be authorized, unless there should be an allegation of malversation on his part, which there was not here. There was, therefore, no *prima facie* case for an investigation. The proceedings were altogether irregular; and the cost of them should be charged upon the authors of the inquiry, and not upon the revenues of the Gas Corporation. It is open to any ratepayer to enforce this condition; but, of course, if the report should lead to the work of the Corporation being better done, the fee paid for it will not be money thrown away.

Terence M'Dermott, who in December, 1883, was sentenced to penal servitude for life, for "conspiracy to effect an alteration of the laws and constitution of the realm by force and violence," was liberated on Tuesday, after serving fifteen years' penal servitude. He was one of ten men

charged with being concerned in the attempts to wreck the Tradeston gas-holder, Possil Canal Bridge, and the Caledonian Railway shed at Glasgow, in January, 1883, and was distinguished from his fellow-prisoners by the unanimity of the Jury's finding in his case—all the others being convicted only by a majority vote, after a trial extending over five days.

The action of the First Division of the Court of Session on Tuesday, in sending George Munro to prison for two months for breach of interdict in the selling of mantles which are an infringement of the Welsbach patents, should be taken to heart by a class of persons who are altogether too numerous in Scotland. The Welsbach Company, or their Law Agents, I understand, have a heavy task in restraining the energies of the army of infringers, who wander from town to town, bag in hand, retailing their wares. I have been told by one who has used them that the infringing mantles are cheaper than the Welsbach, but are much inferior in quality, and do not last nearly so long; so that, though a trifle may be saved at first, the cost is, in the end, really greater than if a Welsbach mantle were procured. No action has, as yet, been brought against users of mantles, for the reason that, though hundreds of them have been written to, they always reply that they will desist from using the infringing mantles. The object of the Company is thus gained in this way. It may be, however, that if anyone be found using an infringing mantle after having promised to desist, a prosecution will follow. The punishment meted out to Munro this week—two months—is double what was given to the two men who were dealt with last summer. I was surprised to learn that those men were treated in a mild manner when in prison; being allowed to have their meals sent in to them. If the sale of infringing goods is to be put a stop to, more stringent measures will require to be adopted. In this connection, the remarks of the Lord President, and the doubling of the sentences, are significant.

#### CURRENT SALES OF GAS PRODUCTS.

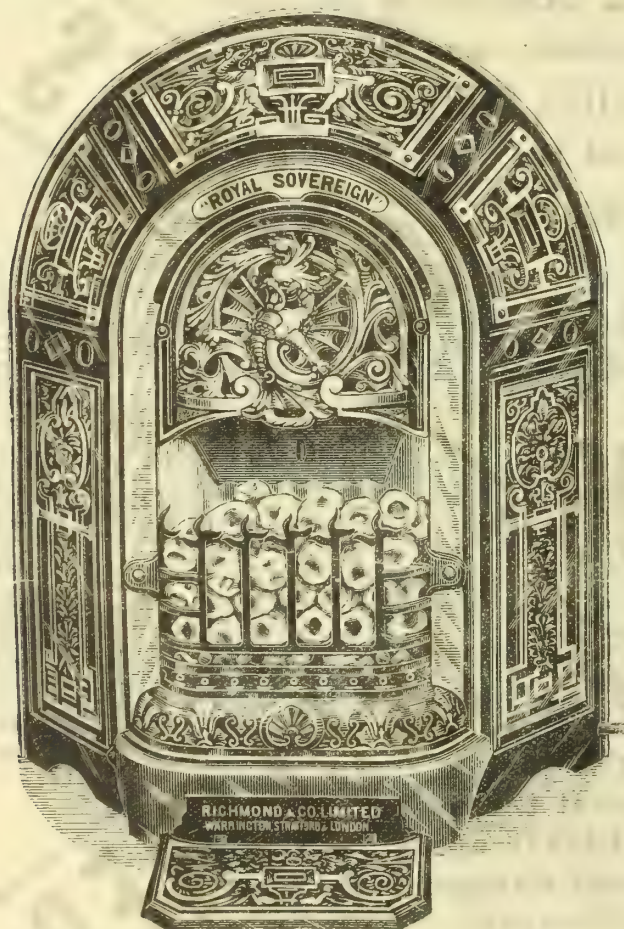
LIVERPOOL, Dec. 24.

**Sulphate of Ammonia.**—The increased firmness at the end of last week continues; and a good business has been done at hardening prices. The closing quotations are £10 2s. 6d. to £10 3s. 9d. per ton f.o.b. at the ports. The keenest buying has been for "covering" sales for December delivery; but demand from consumers is also well sustained. In the forward position, considerable business has been done at £10 5s. per ton f.o.b. Leith, ordinary terms, January-March and January-June delivery; and makers are very firm at the price. London (Beckton terms) has also been sold, over spring months, at £10 per ton; and £10 5s. is now required.

**Nitrate of Soda** is firm on spot at 7s. 6d. per cwt. for good, up to 7s. 9d. per cwt. for refined, quality.

LONDON, Dec. 24.

**Tar Products.**—A distinct improvement in the position of benzol is noticeable. It is not unlikely that the firmness is due to the very large quantities now being used for carburetting gas; thus relieving stocks and



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production. If it were not for the prospect of more benzol shortly coming into the market from new coke-ovens, both nineties and fifties, and particularly the latter, would rapidly realize better prices. Naphthas are in slightly better demand, without, so far, any change in value. Carboic acid is also in good request, with improved inquiry for it for forward delivery. Tar oils remain firm; and in some districts are said to be scarce. There is no improvement noted in the anthracene market, which continues to be quoted at nominal prices. It is felt, however, with the continued lessened production of this article, taken together with the enlarged output of alizarine, that before long this much-neglected product will improve in price. Pitch is moderately steady, with an inclination to slightly lower prices. But the demand is large; and the production will not show an increase. Moreover, makers have no stocks. There is therefore no reason for lessened values.

To-day's prices may be taken as: Tar, 14s. to 19s. 6d. Pitch, east coast, 24s. 6d.; west coast, 22s. Benzols, 90's and 50's, 9d. Toluol, 1s. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 2d. Crude, 30 per cent, naphtha, 3½d. Creosote, 3d. Heavy oils, 50s. Carboic acid, 60's, 1s. 11d. Creosote salts, 30s. Anthracene, nominal "A quality," 3½d.; "B," 2½d.

**Sulphate of Ammonia.**—An important improvement both in the demand and price has taken place during the week. Buyers are eager both for prompt and forward delivery. Shipments are large, and stocks are low. At all ports, £10 2s. 6d. per ton, less 3½ per cent., is obtainable.

### COAL TRADE REPORTS.

From Our Own Correspondents.

**Lancashire Coal Trade.**—There is a continued hardening tendency in the coal trade of this district; and though no actual decision has so far been come to with regard to a further official advance in prices with the close of the present month (which was generally talked of last week) the matter has been brought forward in such a manner by one of the largest concerns in Lancashire, and has been under such serious consideration by the other principal colliery proprietors (who have decided under certain conditions to co-operate in a general upward move), that the probability of an advance has to some extent taken more definite shape, and has more than come within the range of possibility. For the present, the position of the market is exceedingly strong. House-fire qualities are moving away freely. Prices are very firm at 11s. to 11s. 6d. per ton at the pit for best Wigan Arley; 9s. 6d. to 10s. 6d., for Pemberton four-feet and seconds Arley; and 8s. to 8s. 6d., for common house coal. The lower qualities of round coal are in brisk demand, for steam, forge, and general manufacturing purposes, with also a fairly active inquiry for shipment, and rather better prices obtainable. At the pit, good qualities of steam and forge coal readily fetch 7s. 9d. to 8s. 3d. per ton; and for delivery at ports on the Mersey, average prices for steam coal are 9s. 6d. to 10s. With regard to engine fuel, the position is one of increasing scarcity of all descriptions of slack, and a strong hardening tendency in prices. Most collieries are so heavily sold to their regular

customers, that they are unable to entertain new business, of which there is a large quantity offering; and to secure prompt deliveries, buyers in many cases are prepared to pay special prices. Common qualities of slack are readily fetching 4s. to 4s. 6d. per ton at the pit; and better sorts range from 5s. to 5s. 6d., with colliery proprietors indisposed to entertain forward contracts except at some advance on these figures.

**Northern Coal Trade.**—There has been very great activity in the coal trade, in preparation for the holidays. Best Northumberland steam coals are now priced at 10s. per ton f.o.b.; and some lots have been sold at this price for delivery over early months of next year. Second-class steam is about 9s. 3d. per ton, and steam smalls from 4s. to 4s. 3d. Manufacturing coals have been mainly sold on contracts over next year; and the price shows an advance on that for expiring deliveries, as does also the price for locomotive coals. In the gas coal trade, there has been a good demand. For best gas coals, the general price is from 8s. to 8s. 9d. per ton f.o.b.; but there are collieries very favourably situated that can ask 3d. to 6d. per ton above these prices. Gas coke is well taken up; and prices are firm, without alteration.

**Scotch Coal Trade.**—Trade is going into a holiday state. There is not much bulk in current transactions. Forward inquiries are re-appearing, but only for short periods. The prices asked for such contracts are not so high as many expected, with the result that books are filling up with orders for a month or two ahead. The prices quoted are: Main, 8s. 6d. to 8s. 9d. per ton f.o.b. Glasgow; ell, 9s. 6d. to 9s. 9d.; and splint, 9s. 9d. to 10s. Current prices, however, are not of so much consequence at this season. The shipments for the week amounted to 149,605 tons—a decrease of 2245 tons when compared with the preceding week, and of 19,059 tons on the corresponding week of last year. For the year to date, the total shipments have been 9,655,804 tons—an increase of 1,693,080 tons on the same period of last year.

**Porthcawl Water Supply.**—The Porthcawl District Council are about to carry out a new scheme of water supply, for which plans, specifications, &c., are to be prepared by Mr. E. B. Taylor, M.Inst.C.E.

**Suicide of a London Gas Collector.**—An inquest was held at Chelmsford last Thursday on the body of James Nicholls, a collector in the service of the Wandsworth and Putney Gas Company. The evidence showed that deceased obtained possession of some sulphuric acid from one of the employees. He left Liverpool Street Station by train, and when between Chelmsford and Witham took the poison. In his pocket was found a note asking his wife to forgive him for his rash act, and stating that it was due to extra work. The inquest was adjourned. Mr. H. H. Jones, the Company's Engineer, deposed that the deceased's duties of late had been to clear the automatic meters in one of their districts. There was absolutely no truth in the statement that he had been over-worked, and he had never complained. Owing to an accident to a labourer, who assisted the deceased, the latter would temporarily have had to bring in his bag to the office, and this appeared to be a grievance. He always did his work satisfactorily, and was a steady man. He worked from nine in the morning till about five. The inquiry was adjourned.

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## WINTER SEASON 1898-9.

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**The Water Scheme for Otley.**—A meeting of Otley ratepayers was held last Tuesday to discuss the advisability of promoting the Bill in Parliament, of which notice has been given, for securing the water rights of Bow Beck and other streams on the north side of the River Wharfe, near Ilkley, and for constructing a reservoir, and other works for supplying Otley with water. The scheme is estimated to cost £40,000, and will ultimately provide a supply of 400,000 gallons per day. A resolution in favour of the project was carried without a dissentient voice. It is stated that the scheme will require an extra rate of 1s. 6d. in the pound.

**The Derby Corporation Water Scheme.**—A public meeting of ratepayers was held at Derby on Monday last week, when the resolutions passed at the recent meeting of the Town Council, authorizing (1) the promotion of a Bill to empower them to appropriate the waters of the River Derwent, and (2) opposition to the Bills of Sheffield and Leicester, were unanimously confirmed. The attendance of ratepayers was exceedingly small; and the various speakers declared that this indicated complete acquiescence on the part of the inhabitants, who, as the meeting had been freely advertised, would have been present in force had they any objections to raise.

**Sales of Shares.**—Messrs. Hollis and Webb conducted a large sale of miscellaneous stocks and shares at Leeds last Tuesday; gas and water securities being prominent. The following prices were secured: For seven £10 fully-paid shares in the Beverley Water Company, £8 per share; for a £1000 Leeds Corporation water mortgage, bearing interest at 2½ per cent., £950; for £50 original consolidated stock in the Airedale Gas Company, paying 10 per cent., £222 per cent.; for fifty £1 fully-paid shares in the Ardsley Gas Company, 30s. per share; for fifty £10 fully-paid 5 per cent. preference shares in the Aberystwyth Gas Company, £10 10s. per share; and for four £10 fully-paid shares in the Pocklington New Gas Company, £2 5s. per share. On Thursday, Messrs. Leeson and Son sold five £10 shares in the Dover Gas Company at £19 each.

**Incandescent Gas-Burners for Public Lighting at Shanklin.**—At a meeting of the Shanklin District Council last Tuesday, the Lighting Committee reported that they had considered the question of improving the lighting of the town. The Gas Company were asked to affix the new 120-candle power incandescent burners to 50 lamps in the town, at £3 per lamp per annum, on a twelve months' contract, to be determinable on six months' notice. The Company replied that they could not agree to enter into anything less than a three years' agreement; and the Committee recommended that this offer be accepted—the lamps to be lighted throughout the year with the exception of two nights at full moon. Mr. Moorman moved the adoption of the report, and said that by such an arrangement they would have the lamps lighted for twelve instead of ten months; and the Council would save £2 per annum on five lamps. The Chairman (Mr. W. H. Willis) supported the proposition, which was carried by 7 votes to 4. The question of the positions of the new lamps was referred to the Committee.

**Bilston Gas Company.**—In the annual report to be presented to the shareholders of this Company at the general meeting to be held on the 2nd prox., the Directors state that the profit and loss account shows a balance of £4264, after paying the usual interim dividend. From this amount it is proposed to pay dividends of 5s. 6d. and 4s. per share on the "A" and "B" shares respectively; making with the interim dividends 11s. and 8s. respectively for the year, and leaving a balance of £1579. The Directors express their pleasure in reporting that the sales of gas during the year increased 5 million cubic feet, mainly due to the extended use of prepayment meters. There are already 1045 of these meters fixed; and it is expected that the number will be considerably added to during the ensuing year. The reduction in the price of gas which commenced at the end of the Lady-day quarter has only partially affected the accounts of the year. However, it is hoped that this concession will so stimulate the consumption among the ordinary consumers that the revenue from the sales of gas will be maintained.

**Advance in Wages at the Nottingham Gas-Works.**—The wages of the unskilled labourers employed at the Nottingham Corporation Gas-Works have been raised from 22s. and 24s. to 24s. and 26s. per week; and those of other workmen from 37s. 6d. to £2.

**New Water Supply for Llanwrtyd Wells.**—At the last ordinary meeting of the Builth District Council, Mr. R. L. Bamford, of Hereford, submitted plans, estimates, &c., for a new water supply for Llanwrtyd Wells from the Llwydville source; and they were unanimously approved. The Clerk (Mr. E. Owen) was directed to have copies of the plans, &c., deposited with the Parish Council of Llanwrtyd, and to ask the Local Government Board for sanction to a loan to carry out the scheme.

**Fatal Accident on the Belfast New Water-Works.**—A fatal accident occurred on Monday last week in the tunnel which is being cut through the Mourne Mountains in connection with the new water-works for Belfast. Early in the morning, a gang of men descended the tunnel for the purpose of clearing away the debris after an explosion of a number of cartridges of dynamite, when unfortunately something came in contact with a cartridge which had not gone off, and an explosion followed, killing William McDonagh, and seriously injuring two of the men. This is the second occurrence of a similar nature within a short time.

**Tunbridge Wells Water Supply.**—An inquiry was recently held at Tunbridge Wells on behalf of the Local Government Board, in regard to an application by the Corporation for a loan of £24,000 for the further development of the water-works. The Town Clerk (Mr. W. C. Cripps) explained the gradual growth of the population, which was at present more than 31,000; thus causing an increased demand for water. It was proposed to spend £24,000 on new filtration and borehole works and machinery near Pembury. The present supply from the borough was upwards of 11 million gallons per day, and the Corporation had the auxiliary borehole supply in the Pembury district. It was proposed to have an area of three more acres for filtration works. There was no opposition to the application.

**The Proposed Water Supply for Headcorn.**—A largely-attended parish meeting was recently held at Headcorn to consider the question of the water supply, and some discussion took place in regard to the action of the South Kent Water Company in beginning to lay their pipes in the district a few weeks after the Hollingbourne Rural District authority had applied to the Local Government Board for a loan to supply Headcorn with water (*ante*, p. 1372). It was unanimously resolved to protest against the scheme of the Council and the sanction of any loan for the supply of water from Liverton until all other sources had been fully investigated and submitted to the parishioners for consideration; and it was decided to send copies of the resolution to the Local Government Board, the District Council, and the Kent County Council.

**The Quality of the East London Water Supply.**—In the article on "Water and Sanitary Affairs" in the "JOURNAL" for the 29th ult., reference was made to a notice issued by the Hackney Vestry, advising the inhabitants, "as a precautionary measure, to boil all water to be used for drinking purposes." This, as was pointed out at the time, naturally created alarm, and excited a suspicion of typhoid. It may therefore be well to quote the remarks of Sir W. Crookes and Professor Dewar on the quality of the East London water supply last month, as contained in their report to the Official Water Examiner for the Metropolitan (Major-General A. de Courcy Scott). They ran as follows: "The bacteriological results for the month have been satisfactory. The East London water supply has been exceptionally good; the average of 26 samples being only 11 microbes per cubic centimetre, whereas the mean of 126 samples from the Thames-supplied Companies is 49. Both of these results prove highly efficient filtration; but it must be confessed that a reduction of the number of microbes to anything as low as 10 or 11 is highly exceptional, and more than could have been expected a few years ago, when between 100 and 200 microbes per cubic centimetre were considered allowable in a potable water."

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